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# DRAFT WORLD-WIDE STUDY OF THE LEATHER AND LEATHER PRODUCTS INDUSTRY: 1975–2000

PREPARED BY THE

INTERNATIONAL CENTRE FOR INDUSTRIAL STUDIES

## S U M M A R Y

In each of the two main components of the leather industry, leather production and leather products manufacture, the present study considers the availability of raw materials, methods of manufacture, manpower requirements, capital costs and possible value added, and trade and marketing.

As far as possible, United Nations statistics have been used. These, however, have been found to be incomplete, to have used different bases for different years and, in the case of leather products manufacture, have often included articles made of synthetics. (This situation is well recognised by statistics compilers.) Thus, recourse has been made to trade journals and to country questionnaires seeking reinforcement or confirmation of available statistics for past and current data. Estimates of future availability of raw materials have been based on FAO predictions of meat consumption, since these are considered to be more firm than those for hides and skins and, within limits, it can be assumed that an animal killed provides a hide or skin for processing. Allowances have also been made for rural slaughter and natural deaths.

It is estimated that developing countries will increase their production of hides and skins from 40 per cent of world production in 1975 to 48 per cent by the year 2000. As a result of the present decline in tanning in the developed countries, it is probable that the developing countries will increase their tanning activity from 31 to 65 per cent of world total in the same period. The escalation will be attributable to both increased

processing of indigenous material and increased imports from the developed countries.

In leather products manufacture, three alternative growth hypotheses are made, since the situation is less clear. These alternatives cover decreased production, stagnant production and a +0.9 per cent growth rate in the developed countries. They show, respectively, shares of 65, 56 and 45 per cent for the developing countries by the year 2000.

Capital and manpower requirements for the envisaged expansion are not considered to be a constraint. In both fields however, a better knowledge of marketing and adaptability to changing market requirements will be necessary.

A step-by-step development system, given in detail, is recommended, as is consideration of relocation (on a case-by-case basis) of complete plants made redundant in developed countries.

The need is expressed for the formation of a global liaison organization to deal with, inter-alia, negotiating trade agreements, training at regional and national levels, relocation of capacities, provision of expertise, and collation and dissemination of information.

* * * *

## NOTES

In this study:

The term "developed countries" includes the centrally planned economy countries of Eastern Europe and the USSR as well as the free-market economy countries.

All dollar ($) references are to United States dollars.

Billion means a thousand millions.

Leather area is expressed in $ft^2$ as this unit is the most widely employed in trade dealings.

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# Chapter I

## THE LEATHER AND LEATHER PRODUCTS INDUSTRY IN THE CONTEXT OF THE LIMA DECLARATION AND PLAN OF ACTION

### Introduction

At the Second General Conference of UNIDO, held in Peru, March 1975, the Lima Declaration and Plan of Action on Industrial Development and Co-operation was adopted in which the role of industry was re-asserted as a dynamic instrument of growth essential to the rapid economic and social development of the developing countries, and in which a target was set whereby the developing countries' share of world industrial production should be increased from its present level of around 7 per cent to at least 25 per cent by the year 2000. The Declaration and Plan of Action was subsequently endorsed by the General Assembly of the United Nations at its seventh special session.

### "Studies must be undertaken"

Among the mandates entrusted to UNIDO at Lima was one which stipulated that: "in order to give concrete content to the process of industrialization in the developing countries, studies must be undertaken and specific measures formulated in different sectors of industry, special attention being given to priority sectors". The Lima Declaration further drew attention to the need to promote agro-based or agro-related industries, in view of the basic complementarity between industry and agriculture.

The leather industry, one of the oldest in the world, one of vital importance to the developing countries, and one that obviously fitted the above description, was subsequently selected for study on a world-wide basis by UNIDO. Carried out by experienced consultants in the sector, with support from the staff of UNIDO, the study traces the development of the industry in both developed and developing countries, analyses its current production levels and makes projections to the end of the century. Both

the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Conference on Trade and Development (UNCTAD) have contributed to the study, in addition to Messrs. M. Berci, W.E. Chislett, D. Higham, T. Mathews, J.A. Villa and D. Winters.

Need for "urgent consultations"

In the opinion of the authors of the study, the Lima figure of 25 per cent by the end of the century is "unrealistically low" for the leather industry. Even now, if the developing countries could convert the raw hides and skins they produce to fully finished leather articles, their output would represent some 40 per cent of the world total.

Nevertheless, expansion of this nature can only take place within the framework of co-operation between developed and developing countries. If the developing countries are to produce a greater share of finished articles, they must have greater access to the markets of the developed countries, and be able to concert with them mutually beneficial joint investment projects. If this is to be achieved, countries and groups of countries must consult and co-operate with one another for the common good. In this respect, the Lima Plan of Action called for the convening of

> Urgent consultations, taking into account appropriate information with respect to the development of demand and supply, availability of production factors and their costs, the possibilities and conditions of investment and the availability of appropriate equipment and technologies, with a view to facilitating, within a dynamic context and in accord with authorities available to Governments, the redeployment of certain productive capacities existing in developed countries and the creation of new industrial facilities in developing countries. These consultations should in particular relate to industries processing raw materials exported by developing countries .....

Before meaningful consultations can take place on any industrial sector, however, in-depth knowledge is needed of its economic, technological, financial and human aspects, its relative position, actual and potential production trends, and its potential impact on the environment.

This draft study, the third in a series of such sectoral studies featuring long-term projections, has been prepared by the Sectoral Studies Section of UNIDO's International Centre for Industrial Studies with the purpose of providing the above information, including projected estimates of supply and consumption to the year 2000, as a contribution to the process of consultation.

Both the study and its projections are subject to revision upon receipt of comments and as world circumstances change.

The main aspects considered in order to achieve full coverage of all relevant factors are:

- Availability of raw materials (including slaughter, collection, transportation and curing)
- Process technology and machinery
- Availability of skilled manpower, particularly management, and business organization
- Marketing and trade in modern economic conditions
- Environmental aspects, water quality, quantity and effluent disposal
- Capital investment requirements and value added in the various process stages
- National and international strategy development.

## Background

The leather industry is ripe for expansion in the developing countries for a number of reasons:

1. Those countries currently produce some 40 per cent of the total global supply of hides and skins of which they process only part. They are in a strong position to control the distribution of the excess materials, and the location of manufacturing capacity, since demand is high and supply restricted.

2. The technologies employed in leather and leather products manufacture are not unduly sophisticated, may be used by relatively small-scale units, and are certainly within the realm of competence of most developing countries. The possibility of using a step-by-step approach also facilitates their entry into this sector of industry with minimised foreign investment.

3. The initial production processes are wet and arduous, and produce relatively large volumes of noxious effluent. This has led environment-conscious governments in many developed countries to impose stringent effluent-control standards which have, in some cases, restricted the production and expansion programmes of their tanneries and led to stagnation and decline.

This need not occur in developing countries when the sector is expanded since it is less costly to install pollution-control equipment, or employ less polluting technologies, in new plants than to improve existing ones.

4. As a consequence of the foregoing, the last decade has witnessed a significant natural "migration" of leather sector activity from the developed to the developing regions of the world, and indications are that this pattern will continue, possibly at an accelerated rate. The migration has generally been marked by the establishment of new production units rather than the relocation of existing plant.

The rapid expansion of the sector in the developing countries, however, has not been based on any globally agreed sectoral development plan, and there is cause for disquiet on a number of points. For example, it is generally agreed that, world-wide, there is currently a significant over-installation of tanning capacity. While the demand for leather and leather products is buoyant, the supply of raw material is inelastic - finite, renewable annually with growth at less than 2 per cent per annum. Many new production units, therefore, operate at uneconomically low capacity utilization levels.

The leather and leather products industries of the developing countries have directed much of the increased production resulting from their expansion programmes towards the markets of the developed world, and have made significant inroads in some areas. Now, however, the developing countries consider that their export programmes are being restricted by tariff and non-tariff barriers, especially in the field of finished leather products.

The leather and leather products sector in the developed regions view the situation differently. They suggest that they are being subjected to unfair competition due to the incentives and government protection enjoyed by the sector in many developing countries. They further claim that the products from some developing countries are not compatible with established international quality standards and are lowering the prestige and image of real leather.

The leather industry is a by-product industry, dependent in most countries on the meat industry for its raw material. Thus the supply of raw material, hides and skins, is virtually inelastic and an increase in

demand for hides and skins or leather is generally reflected by increases in prices. Over the last decade, the price of raw hides and skins has fluctuated erratically.

Historically, the tanning and leather products sectors have consumed virtually all the hides and skins produced by the world's meat industries, the balance of their demands being met by substitute materials. Currently, these substitutes are inferior to leather on both technical and aesthetic grounds; however, given the expansive research programmes being carried on in this substitute field, the situation may change.

Up to a decade ago, some 70 - 80 per cent of the leather produced globally was consumed by the footwear industry. In recent years, however, in the developed countries, there has been a swing towards the use of leather in garment manufacture, with the result that, in some areas, the volume of leather now going to the footwear industry is less than 50 per cent of the total supply. The demand for footwear is increasing, however, and the shortfall has been taken up by synthetic materials which may therefore be considered as a cheaper complement to leather.

The present study has the following major limitations:

1. Due to lack of reliable basic industry statistics covering actual hide and skin production and leather and leather products production and usage, it has been necessary to estimate these factors for many of the countries concerned. In some areas it has been found impossible to build even a simple statistical picture, and this has led to the adoption of a somewhat circuitous approach.

2. The study, carried out in 1977, is in general based on the most up-to-date statistics available (1974/5 in most cases) supplemented by industry questionnaires completed in 1977 by authorities in the 12 developing countries of significance in the leather sector. Since 1975, however, there has been such rapid expansion in the leather sector that even with these efforts it is uncertain how much this study reflects the altered global pattern. Thus, the estimates of future developments made here must be considered as tentative.

3. In general, the study has concerned itself with hides and skins from bovines, sheep and goats. These form over 95 per cent of the volume of raw

material available, and the capital cost estimates and forecasts are concentrated on these materials. In a few countries, hides and skins from horses, donkeys, camels, pigs, game and reptiles are also available, but these have been ignored in the tabular representation, owing to their limited availability, the lack of statistics concerning them, and the specialized processing they entail. These materials could be an important throughput of local industry, however, as their unit value is generally significantly higher than that of the three major commodities.

4. This study has concerned itself only with real leather and real leather products as the study of substitute materials relates more to the petrochemical sector of industry and has little affinity with the agro-based real leather sector.

## Chapter II

## AVAILABILITY OF HIDES AND SKINS

It is essential that the problems regarding availability and substitutionability of hides and skins be understood - at least in outline. The leather industry is basically a by-product of the meat industry and as such suffers from a major structural defect: it is unable to regulate its supply of raw material. The supply of hides and skins is inelastic in respect of demand, and even given the high prices ruling in 1976/77 (discussed later), there is little evidence to show that the price paid for these items has much bearing on the number entering international markets. Indeed, although in some areas it may be assumed that the ruling price for the prime product, i.e. meat, affects the number of animals slaughtered, in other areas, particularly rural developing areas, climatic conditions, coupled with local traditions, may be a governing factor.

It is reported that in India, as well as in one or two other countries, the local kill of small ruminants has increased when skin prices have risen excessively; but statistical correlation between the high prices paid on international markets and the volume entering the market from such areas is not available.

The supply of raw material for the leather industry varies according to livestock availability, rate of kill for foodstuffs, mortality due to natural causes (e.g. drought and death through old age) and dependence on degree of recovery of hides and skins (an important feature of which is the method of slaughter).

### Methods of slaughter

#### Mechanized abattoirs

These are usually associated with meat canning and processing works. Most of the hides and skins are flay-free, and the cure - normally wet salted - yields maximum-value raw material. This, in some countries,

e.g. Argentina and Botswana, accounts for the best part of total production of hides and skins. In other countries, e.g. Kenya, such production may represent 10 - 20 per cent of production. Few of the developing countries, however, have such sophisticated plants, due to the high capital requirement and the need for large refrigerated stores and transport.

The hides from these units usually gain a premium over hides from other units. This is due in part to the good regular processing, and in part to the fact that the units discriminate in the selection of animals for slaughter. Although this recovery method is ideal, yielding top-grade hides and getting full value from the carcass, it is unlikely to spread rapidly due to the high capital requirement involved.

Large city/municipal abattoirs

Featuring well-supervised slaughter, these unmechanized units are being established throughout the developing world - catalyzed by the spread of urbanization and the demand for inspected meat. The hides and skins are not generally as good as those from mechanized abattoirs, and flay marks may be present to some degree. The hides and skins are usually sold direct to local hide and skin merchants, who cure them in their own yards, occasionally by salting, but usually by using air-drying/suspension methods. However, if the hides and skins are received fresh, and if air drying is well carried out, a good product fetching a premium in the export market can be obtained. Tanneries often buy direct from these sources.

Village slabs and local butchers

These produce products of variable quality, depending to a large degree on the amount of supervision applied, and on whether sufficient training has been given the workers by the hide and skins improvement service. Flay cuts from these sources are more common. Often, there is no washing or lifting tackle at the site, and the hide is used as a cushion on which the carcass is butchered. The hides and skins may be cured by local dealers, or they may be shipped hundreds of miles in the raw, unwashed state before curing takes place, thereby increasing the possibility of putrefaction. Curing may be done by suspension or ground drying methods.

It is at this level of slaughter and curing that increased supervision must be given if hide and skin qualities are to be improved. Drying facilities (frames) and godowns with grade differentials can yield great increases in hide and skin value.

Individual family/domestic slaughter

This may account for the majority of hides and skins produced in Africa and Asia and is likely to exist until retail and transport facilities have been greatly improved. Hides and skins from such sources are usually poorly prepared; flay cuts are numerous: curing may be long delayed; and ground drying is frequent. (Occasionally, however individuals frame dry). In many cases, hides and skins are left in the raw state for days before being transported to the nearest town. They may be dried (frame or ground) at this point, or transported further, to a larger town, for curing. In some countries, the marketing channel may include six or more links: primary-producer-agent-sub-dealer-dealer-larger-merchant-exporter. The products of such poorly organized systems are naturally low grade, with a high risk of putrefaction setting in prior to curing. In the vast majority of cases, no account is taken of quality or grades. This lack of direct incentive to the primary producer accounts for the poor treatment given the hides and skins. In some areas, primary producers receive only 30 - 50 per cent of the hide or skin value. A typical example of the low price paid to the primary producer is given by Lamade[17] who states that in Tanzania primary producers received shs. 1.70 - 3.50 for a goat, although the subsequent f.o.b. price was shs. 6.27. Well over 50 per cent of African hides and skins come from individual slaughter sources.

## Qualitative aspects

There is great global disparity in industrialization levels in the tanning sector, leading to vastly differing unit values for finished products. Some of this difference may be accounted for by the level of technology adopted in processing (machines and chemicals), but it may equally be due to the quality and character of the raw material.

Leather can be made from a wide variety of raw materials. Cattle hides and sheep, goat, pig and reptile skins are the major materials, but bird, fish and game skins are also employed. In terms of volume, however, only bovine (including buffalo) hides and sheep and goat skirs are significant. Reptile and other exotic raw materials have exceedingly high unit values, but their availability is limited, as are statistical data relating to their production and utilization.

There is no simple international or regional classification of hides and skins from a qualitative or "end use" aspect. Due to the wide variation in characteristics, hides and skins from different sources are used for different end products. In some cases several classes of hides or skins can be used for a specific end product, in other cases only one type of hide or skin may be suitable.

Three basic types of leather are obtained from cattle hide:

One traditional class is known as "light leather". This includes ordinary light bovine hides and calf skins, and is normally chrome-tanned for use as shoe uppers and the like. Today, this category incorporates leather destined for use in upholstery, clothing, leather goods, etc.

Another category of bovine leather is known as "heavy leather". This is usually made from hides weighing over 30 kg and yielding a heavy, strong, resilient material which may be employed in industrial belting, shoe soles and saddlery. Traditionally, it was vegetable tanned, but today it may be tanned using mineral or synthetic materials.

"Splits", the third category of bovine leather can be obtained from heavy or light bovine hides. Splits are generally used for linings, insoles and industrial gloves.

Goat and kid skins have traditionally been used in the manufacture of a wide variety of leathers. Shoe uppers (both ladies' and men's)were often made of glacé kid or the like. Goat skin is often employed in bookbinding and in the manufacture of clothing, gloves and fancy goods. Kid skins are used for dress gloves and high-quality ladies' fashion shoe uppers. Sheep skins may be used in slipper uppers, but not in formal shoe uppers, as they have low tensile strength and shape retention. Most sheep skins are employed as shoe linings, gloves, chamois as well as handbags and leather sports goods.

The qualitative differences between hides and skins may be due to: the character or breed of the animal; ante-mortem defects; or post-mortem defects. It is not possible to cover this broad subject in detail in the present study, but some of the major differences are discussed in order that the non-substitutionality of different raw materials, and the variations in unit values, may be appreciated.

Character/breed

North American and European breeds of bovines yield flat hides of over 40 $ft^2$. The typical bovine animal of Argentina, however, yields a hide of only around 25 $ft^2$, and the crossbred zebu of Africa may only yield some 24 $ft^2$ of hide at maturity, and this is lessened in value by the hump of the animal which results in a hide that may not be processed whole, as it is not flat.

Hide quality differs also with the sex and age of the animal. Female hides tend to be smooth and soft, with loose flanks (belly area), whereas male hides yield tougher leather. Old age leads to a looser, somewhat thicker, leather structure.

Sheep and goat skins are heterogeneous, the main differences between the sheep skins being attributable to a number of factors, e.g.:

Woolbearing animals such as the Merino of Australia yield a large skin, often well over 7 $ft^2$, but of poor value to the tanner due to the presence of rib effects.

Woolbearing animals crossbred for meat, with a low percentage of Merino blood, yield a smaller skin, far more suitable for leather production, even though a little loose and spongy.

Hair sheep, of tropical and mountain areas, yield small skins (4 - 5 $ft^2$) but of superior quality for leather production due to their strong, compact fibre structure with concomitant high-tensile strength and good grain character.

Given the byproduct nature of hides and skins, animals are unlikely to be bred with skin quality as a major objective. Thus, no rapid improvements in this area are visualized.

Ante-mortem defects

The wide variety of these defects testify to the number of ways hide and skin quality can be downgraded by poor animal husbandry or local environmental conditions. Among the major defects are: (a) barbed-wire scratches, which result in damaged grain in the resultant leathers (a negative result produced by attempts to develop modern animal husbandry techniques); (b) fight scars or horn rake, which yield damaged leather grain, and may be caused either in the pasture or in pens at the abattoir; (c) goad marks and branding, which may render large areas of hides and skins unusable; (d) attack by parasitic insects - warbles, ticks, mite, etc. -

which results in scabs and blisters on the leather, often causing it to be seriously downgraded; (e) thorn and grass damage, which is common in tropical pastures and results in punctured grain.

It is expected, however, that most of these ante-mortem defects will be reduced or eliminated as serious, improved animal husbandry programmes are introduced.

Post-mortem defects

Defects in this category are perhaps more serious than those in the categories discussed earlier. However, there is a good possibility of effecting improvements, rapidly, in the two major problem areas of the category, as they are defects resulting from poor technology:

Flay cuts, deep cuts in the flesh of the hide or skin which reduce the utilizable area of the material, may be minimized or even eradicated by supervised slaughter and flaying at recognized abattoirs or even slaughter slabs. Material flayed by butchers, or rurally, is often greatly devalued, sometimes even made valueless, by the vast number of flay cuts it suffers; as a result it is uneconomic to process in a tannery.

Curing defects. A variety of means of preserving hides and skins exist. The function of curing is to avoid the putrefactive bacterial activity which would degrade the material in the time between slaughter and receipt at the tannery. Curing methods are selected according to the time lapse between curing and tanning, climate and storage conditions, and availability of cheap salt. The most important curing processes are discussed below.

(a) Salting. Salt is sprinkled lightly on the flesh of the raw material. This is particularly suitable for temperate climates, when storage will be only a matter of days. It is widely practised in Europe, where tanneries and abattoirs are seldom distant, thus avoiding degradation of the raw material.

(b) Wet salting. The hides or skins are immersed in saturated brine for up to 48 hours; salt is added so that the free water within the hide structure becomes nearly saturated with salt. Draining is carried out by piling or mangling, after which the material can be safely stored for months at reasonable temperatures. This is perhaps the finest method of curing, but it requires large quantities of cheap pure salt. This process,

or a similar one, is employed by the large packing plants in South America, in some new abattoirs in Africa, as well as in the long established, export-oriented packing plants of North America, Australia and New Zeland. Properly carried out, the process has no faults, other than environmental (discussed later): occasionally, however, "red heat" due to halophyllic bacterial action occurs, if no additive is used.

(c) Dry salting. Following a light surface salting, the raw material is dried naturally under light tension. This method is much employed in sub-tropical areas and, in particular, in India and southern Africa. The risk of putrefaction is high if the correct salting/drying procedure is not followed.

(d) Air drying - Suspension. Hides and skins are dried under light tension (ropes or pegs), preferably in the shade, air being allowed to circulate around them. If properly controlled, air drying yields a product that can be stored for long periods at low cost. Once a hide has been dried, however, it is somewhat reduced in grade, and will never produce top quality leather. The reason for this is that, during drying, certain interfibrillary proteins, albumins and globumins can be denatured and not restored by subsequent re-hydration in the tannery.

(e) Air drying - ground drying. Hides or skins are laid flat on the ground and allowed to dry. This, the crudest form of curing, is still employed, unfortunately - mainly in Africa and Asia - and often results in putrefaction and gelatinization of the material. It yields a much lower grade product than suspension drying.

## Current and past availability of hides and skins

### Statistical data on hides and skins

The accepted international authority responsible for the documentation and monitoring of hide and skin production is the FAO. In a working paper,[2] this organization drew attention to statistical deficiencies in the sector:

> "International production and trade statistics on hides and skins and products derived from them are notoriously deficient. There are large gaps in the data, they lack internationally-recognised common denominators or conversion factors, and contain numerous inconsistencies, depending on the source of the data. These deficiencies make it extremely difficult to take statistical account of the numerous changes in the physical appearance of hides and skins along the processing chain from the raw into the finished product."

In view of these shortcomings, it is imperative that every effort be made both at the national and international level to improve the data base of this industrial sector.

At present, recorded data in most countries are limited and unreliable. The statistics of hides and skins produced in developing countries are often based on exports, with a rough estimate of domestically tanned hides. These statistics fail to account for hides and skins that are not utilized.

FAO sources[37] because of the absence of accurate slaughter data, base their estimates on a rather static production rate composed of the following elements:

$$\text{Production rate of hides or skins} = \frac{(\text{Recorded slaughterings} + \text{estimated bush slaughterings} + \text{estimated natural deaths})\ 100}{\text{Total livestock population} + \text{live imports} - \text{exports}}$$

Until 1970, FAO statistics for raw hide and skin production in the developing countries were published in terms of number and weight for each type of cure. The number of countries thus covered, however, was limited. Although the production weight and numbers were cited for different forms of cure, the interrelationship between these forms was not clear.

At the same time, it was pointed out that number of hides and skins was not a uniform concept, since the size ( and weight) of the most common hides and skins differed considerably from country to country, and probably even varied from year to year within the same country. It was considered that the most suitable common denominator for all processing stages was weight rather than quantity. Consequently, from 1970 onwards FAO country statistics only quote hide and skin production figures in terms of fresh (green) weight. This form of reporting is none the less problematic as leather is generally sold by area in which terms it can be related to the quantity of footwear or other leather goods to be produced. Recording hide and skin production in weight terms has the added disadvantage that, in developed countries, some of the cattle hide may well be calf skins, whose weight:area relationship is greatly different.

In the present study, reference is made, wherever applicable, to the FAO Meat Production and Demand Projections to 1980.[47] This analysis of meat consumption is far deeper than any made of hide and skin production. However, it cannot be automatically assumed from meat consumption data that an animal killed results in the availability of a hide or skin as these may well not be recovered.

In other statistics relating to hide and skin production, little account seems to have been taken of live-animal imports. For example, in Lebanon and Saudi Arabia, large quantities of livestock are imported for immediate slaughter, yet previous hide and skin production statistics failed to allow for this. However, such imports are allowed for if hide and skin production are based on meat consumption and slaughter, and FAO studies of meat consumption do give full recognition to the fact that live animals are imported for both slaughter and stock purposes.

Non-recovery of hides and skins

Statistics in this sector are obviously non-existent, as "non-recovered" hides and skins are usually from animals which have not been officially slaughtered. Non-recovery estimates vary: in countries with good transport facilities, the figure may be less than 5 per cent: in countries with rural tanneries, well dispersed geographically, it may be lower still.

The bulk of "non-recovery" is from individual family slaughter. If the distance to the nearest township is too great, or the price paid not commensurate with the effort of transporting the hide or skin, it is quite possible that the material will be left to rot. However, given the current (1977) high prices of hides and skins, it seems certain that even the primary producer will benefit, and this should ensure improved recovery rates. (See price graphs, following pages).

Rain is another major cause of non-recovery. During the rainy season in Central, East and West Africa, large areas are temporarily cut off from normal transportation systems. At the same time, it is difficult to dry hides and skins without proper facilities, thus the raw material may be putrefied by the time transport is available. However, the areas involved are small and the duration of the rainy season usually only a matter of weeks; in most countries so affected the degree of non-recovery cannot exceed 10 per cent of total product.

Certain countries in West Africa indicate that they have high rates of non-recovery; for example, the Gambia[57] reports that it loses 40 per cent of available hides and skins. Mauretania, Mali, Senegal, Niger, Upper Volta, Cameroon and Chad reportedly lose over 20 per cent of their hides and skins.[67] In these areas, however, there are special circumstances to account for the losses: heavy rain, poor transport or level of hide and skin supplies too low to justify a competent commercial marketing network.

Figure 1. Market prices quoted for raw hides: 1968-1977 [67]

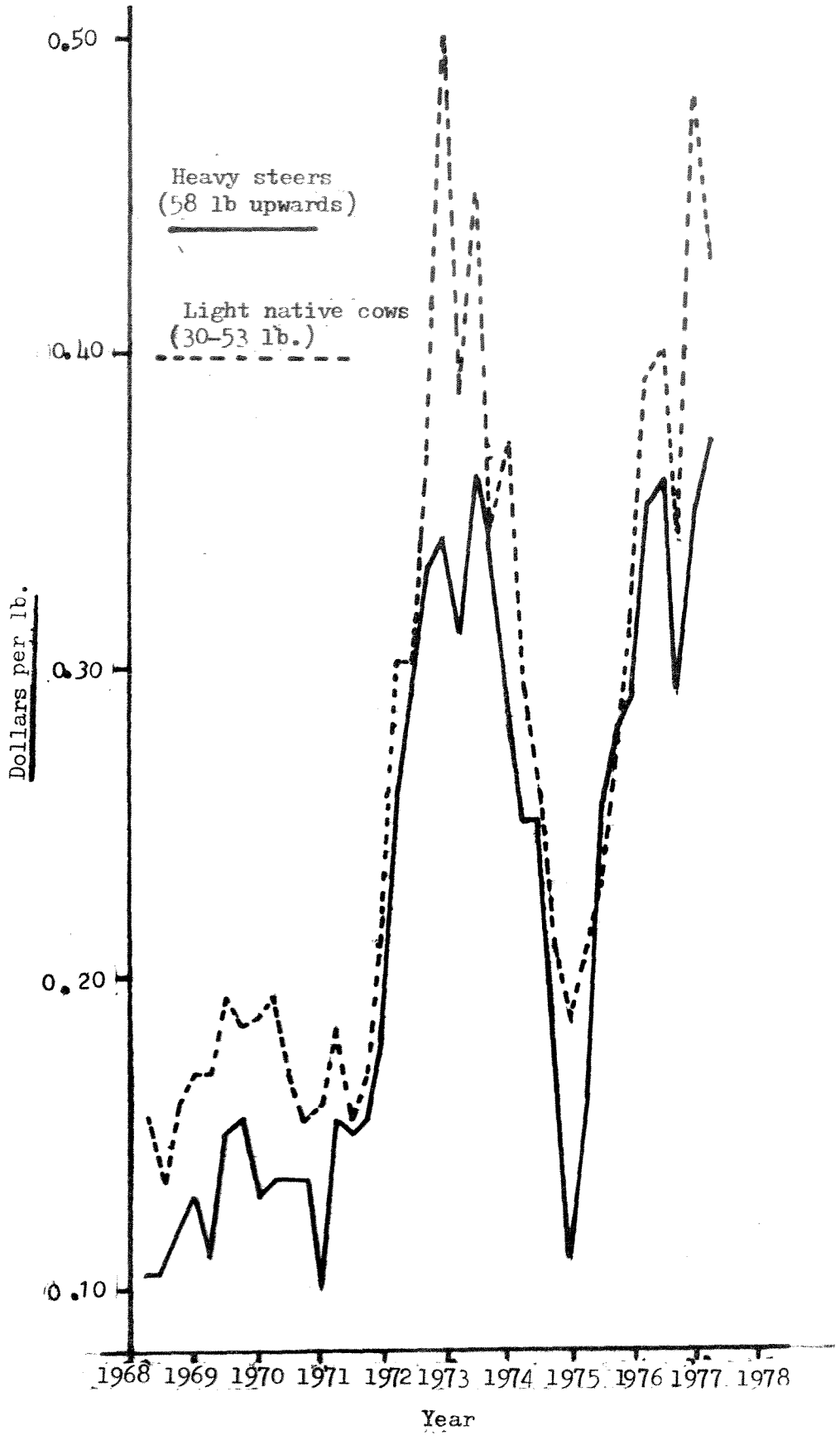
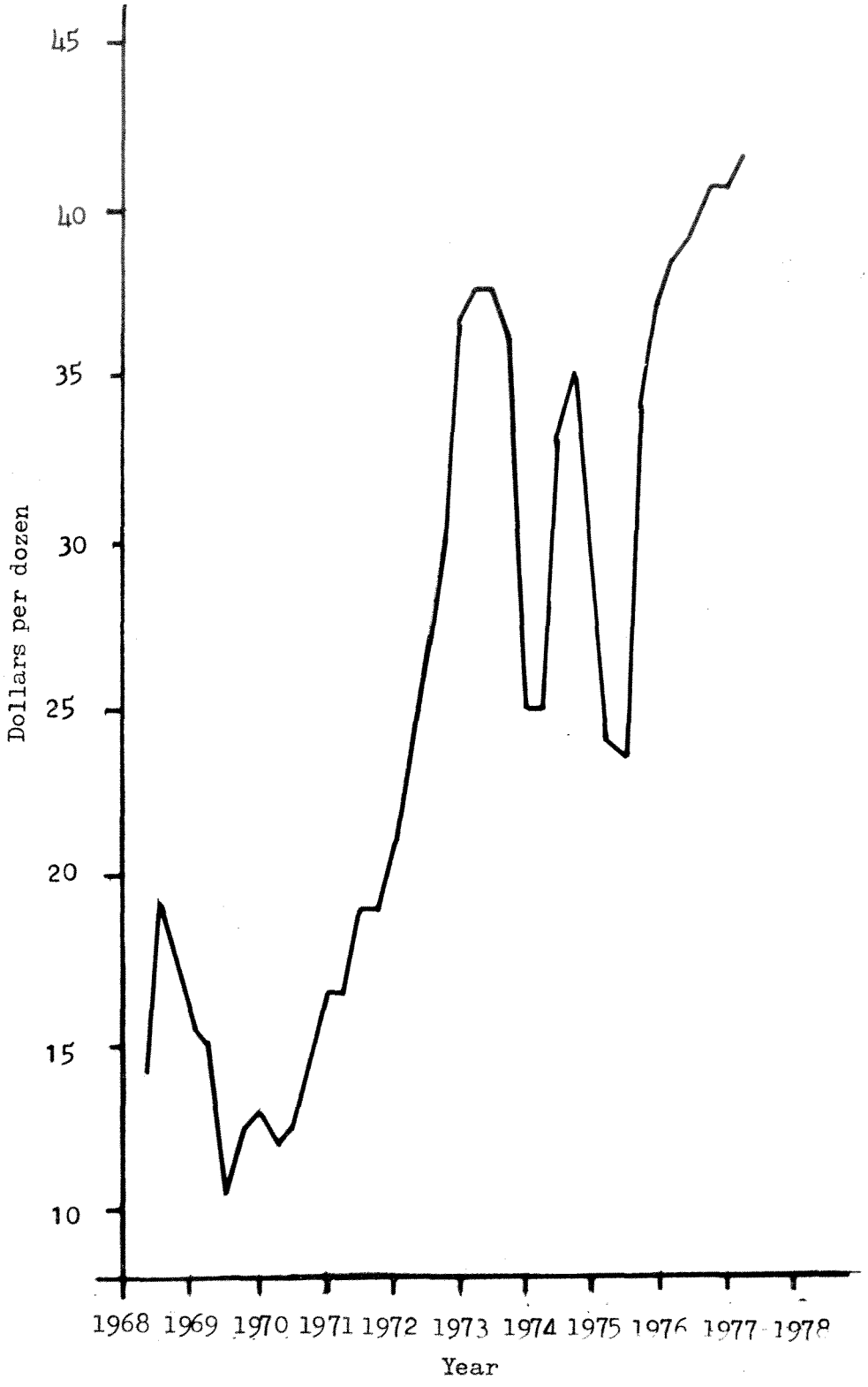


Figure 2. Market prices quoted for pickled sheep and lamb skins: 1968-1977 [6]



If the rise in hide and skin prices (Figures 1 and 2) of the last few years is reflected in prices paid to the primary producer, the financial incentive will be available for virtually full recovery of the hides and skins produced. This price graph is based on American salted hides, but similar trends are apparent for all hides.

Hides and skin data are often confused by unrecorded cross-border traffic, especially by nomadic herds. In the course of such movements, hides and skins are sold to the nearest commercial centre, which may often be in an adjacent state. This may account for up to 50 per cent of the hide and skin production of a few countries: truer statistics are obtained by looking at the regional rather than the country situation.

Past and present production of hides and skins

In view of the above factors, Tables 1 to 9 have been prepared as time series estimates of past and present raw material production.

Table 1. Distribution of sheep

| | Number of sheep | Share of world total | Number of sheep | Share of world total | Annual growth rate |
|---|---|---|---|---|---|
| | 1961-65 | | 1975 | | 1961-65 to 1975 |
| | Millions | Per cent | Millions | Per cent | Per cent |
| Developed countries | 382.6 | 37.7 | 345.5 | 33.2 | -0.8 |
| Developing countries | 389.7 | 38.4 | 430.4 | 41.3 | 0.8 |
| Centrally planned economies | 243.2 | 23.9 | 266.0 | 25.5 | 0.8 |
| | 1,015.5 | | 1,042.9 | | 0.2 |

Source: FAO, Production Yearbook, relevant years.

Table 2. Annual production of sheep skins

| | Average 1969-71 | Preliminary 1975 | Offtake 1975 | Average annual growth 1969-71 to 1975 | Average annual growth 1965 to 1975 | Share of world total |
|---|---|---|---|---|---|---|
| | Millions | | | Per cent | | |
| Developed countries | 156.4 | 147.2 | 42.5 | -1.2 | 0.7 | 38.1 |
| Developing countries | 129.7 | 133.9 | 31.1 | 0.6 | 1.6 | 34.6 |
| Centrally planned economies | 101.3 | 105.3 | 39.6 | 0.8 | -0.5 | 27.3 |
| World | 387.4 | 386.4 | 37.1 | | 0.7 | |

Source: FAO, Commodity Review and Outlook, 1971-72 and 1975-76.

Table 3. Distribution of goats

| | Number of goats 1961-65 | Share of world total 1961-65 | Number of goats 1975 | Share of world total 1975 | Annual growth rate 1961-65 to 1975 |
|---|---|---|---|---|---|
| | Millions | Per cent | Millions | Per cent | Per cent |
| Developed countries | 21.1 | 5.6 | 16.7 | 4.1 | -1.9 |
| Developing countries | 287.3 | 76.2 | 315.0 | 78.0 | 0.8 |
| Centrally planned economies | 68.5 | 18.2 | 72.2 | 17.9 | 0.4 |
| World | 376.9 | | 403.9 | | 0.6 |

Source: FAO, Production Yearbook, relevant years.

Table 4. Annual production of goat skins

| | Average 1969-71 | Preliminary 1975 | Offtake 1975 | Average annual growth 1965 to 1975 | Share of world total |
|---|---|---|---|---|---|
| Developed countries | 10.0 | 9.9 | 50.3 | -0.3 | 6.8 |
| Developing countries | 111.7 | 113.1 | 35.9 | 0.8 | 77.6 |
| Centrally planned economies | 22.2 | 22.7 | 31.4 | - | 15.6 |
| World | 143.9 | 145.8 | 36.1 | 0.6 | |

Source: FAO, Commodity Review and Outlook, 1971-72 and 1975-76.

Based on the above tables, the world production of sheep and goat skins (which are often interchangeable) in 1975 is seen to be:

| | Millions | Per cent |
|---|---|---|
| Developed countries | 157.1 | 29.5 |
| Developing countries | 247.0 | 46.4 |
| Centrally planned economies | 128.0 | 24.1 |
| World | 532.1 | |

In view of the confusion that might stem from the tripartition adopted in the tables above, the data are presented below in terms of developed and developing countries. Thus, in the totals shown, the centrally planned economies of Asia are included in the developing countries and those of Europe and the USSR in the developed countries.

Table 5. World production of sheep and goat skins, 1975

| | Live animals | Share of world total | Sheep and goat skins produced | Share of world total | Offtake |
|---|---|---|---|---|---|
| | Millions | Per cent | Millions | Per cent | |
| eveloped countries | 548.9 | 37.9 | 237.2 | 44.6 | 43.2 |
| eveloping countries | 897.9 | 62.1 | 294.9 | 55.4 | 32.8 |
| orld | 1,446.8 | | 532.1 | | |

ource: Commodity Review and Outlook, 1971-72 and 1975-76.

It may be noted from the table that, when expressed as offtake rate, the yield of sheep and goat skins in the developing countries is appreciably lower than that of the developed countries. It has been suggested that the production of goat skins will decline as animal husbandry development programmes are instituted, since these do not usually include goats. This decrease, however, should be complemented by the increased production of sheep skins, stemming from expanding sheep-farming activities in many developing countries. Past trends would support this as the production of sheep skins in the developing countries increased at 1.65 per cent per annum from 1961-65 to 1975, and that of goat skins at only 1.02 per cent per annum over the same period.[77]

Cattle hide[1/]

Table 6. Livestock holdings (cattle and buffalo)

| | Number of livestock 1961-65 | Share of world total 1961-65 | Number of livestock 1975 | Share of world total 1975 | Annual growth rate 1961-65 to 1975 |
|---|---|---|---|---|---|
| | Millions | Per cent | Millions | Per cent | Per cent |
| Developed countries | 246.3 | 22.4 | 307.0 | 23.0 | 1.85 |
| Developing countries | 648.6 | 58.9 | 783.6 | 58.8 | 1.59 |
| Centrally planned economies | 205.7 | 18.7 | 242.4 | 18.2 | 1.38 |
| World | 1,100.6 | | 1,333.0 | | 1.61 |

Source: FAO, Production Yearbook, relevant years.

1/ For many tanning purposes, bovine and buffalo hides are interchangeable and have therefore been merged in the figures quoted.

Table 7. Annual production of fresh hides (including buffalo)

| | Average 1961-65 | | Average 1975 | | Annual growth rate 1961-65 to 1975 |
|---|---|---|---|---|---|
| | Share of world total | | Share of world total | | |
| | Thousands of metric tons | Per cent | Thousands of metric tons | Per cent | Per cent |
| Developed countries | 2,033.6 | 39.5 | 2,410.8 | 38.1 | 1.43 |
| Developing countries | 2,000.9 | 38.9 | 2,616.3 | 41.3 | 2.26 |
| Centrally planned economies | 1,109.8 | 21.6 | 1,304.7 | 20.6 | 1.36 |
| World | 5,144.3 | | 6,331.8 | | 1.75 |

Source: FAO, Production Yearbook, relevant years.

On the basis of the above figures, the effective annual yield of hide per live animal can be estimated as follows:

| | Kg. | |
|---|---|---|
| | 1961-65 | 1975 |
| Developed countries | 8.3 | 7.9 |
| Developing countries | 3.1 | 3.3 |
| Centrally planned economies | 5.4 | 5.4 |
| World | 4.7 | 4.8 |

Table 8. Annual production of calf skins and cattle hides

| | Average 1969-71 | Share of world total 1969-71 | Preliminary 1975 | Share of world total 1975 | Average annual growth rate 1965-75 | Average annual growth rate 1969-71 to 1975 |
|---|---|---|---|---|---|---|
| | Millions | Per cent | Millions | Per cent | Per cent | |
| Developed countries | 90.9 | 36.1 | 102.8 | 37.6 | 0.5 | 2.5 |
| Developing countries | 101.4 | 40.3 | 108.2 | 39.6 | 2.0 | 1.3 |
| Centrally planned economies | 59.4 | 23.6 | 62.6 | 22.8 | 0.3 | 1.1 |
| World | 251.7 | | 273.6 | | 1.1 | 1.7 |

Source: FAO, Commodity Review and Outlook, 1971-72 and 1975-76.

In Table 9, the above data are presented in terms of production in developed and developing countries.

Table 9. World production of calf skins and cattle hides, 1975

| | Live animals | Share of world total | Calf skins and cattle hides produced | Share of world total | Offtake |
|---|---|---|---|---|---|
| | Millions | Per cent | Millions | Per cent | |
| Developed countries | 450.0 | 33.8 | 151.0 | 55.2 | 33.6 |
| Developing countries | 883.0 | 66.2 | 122.6 | 44.8 | 13.9 |
| World | 1,333.0 | | 273.6 | | |

It can be seen from the tables that whereas 66 per cent of the world's livestock (cattle and buffalo) was to be found in the developing countries, production of hides in those countries amounted to only 45 per cent of the world total (in quantitative terms). This apparent poor utilization of livestock is due in part to the low offtake rate in the developing countries (14 per cent compared with more than 30 per cent in the developed countries). It is also due to the fact that the animals in the developing countries are usually smaller than those in the developed countries: their hides are therefore both lighter and smaller (25-30 $ft^2$ standard as against some 44 $ft^2$ in developed countries).

Global availability of raw materials

In order to estimate the total amount of leather raw materials potentially available, it is necessary to convert the numeric data relating to the production of hides and skins into square footage of leather substance. A rough estimation is shown in Table 10.

Table 10. Estimated yield per hide or skin
($ft^2$)

| | Cattle hides (incl. calf skins) | Sheep and lamb skins | Goat and kid skins |
|---|---|---|---|
| Developed countries | 37.5 a/ | 6.5 | 5.5 |
| Developing countries | 26 | 5.25 | 4.25 |
| Centrally planned economies (European) | 30 | 5.25 | 4.25 |
| Centrally planned economies (Asian) | 26 b/ | 5.25 | 4.25 |

a/ This estimate may be considered low in view of the statement made above that standard hides in the developed countries measured 44 $ft^2$. It should be remembered, however, that the production of calf skins, which may measure only 10-12 $ft^2$, is comparatively high: some 20 per cent of total production.

b/ This figure represents an average, since hides in Argentina and Botswana measure 36 $ft^2$, in eastern Africa 24 $ft^2$, and in India some 20 $ft^2$.

From the foregoing, it is possible to estimate potential production of leather raw materials on a global basis.

Table 11. Potential production of raw material hides and skins, 1975

| | Hides | Skins | Combined | Share of world total |
|---|---|---|---|---|
| | Millions of $ft^2$ | | | Per cent |
| Developed countries | 5,301 | 1,428 | 6,729 | 59.4 |
| Developing countries | 3,187 | 1,416 | 4,603 | 40.6 |
| World | 8,488 | 2,844 | 11,332 | |

Source: Tables 5 and 9.

From the above data, it is possible to derive an estimate of per capita hide and skin production.

Table 12. Per capita production of hides and skins, 1975

| | Population | Hides and skins | Bovine hides | Sheep and goat skins |
|---|---|---|---|---|
| | (Millions) | | $ft^2$ | |
| Developed countries | 1,132 | 5.94 | 4.68 | 1.26 |
| Developing countries | 2,835 | 1.62 | 1.12 | 0.50 |
| World | 3,967 | 2.86 | 2.14 | 0.72 |

Source: World Population Prospects 1970-2000 as Assessed in 1973, ESA/P/W.P.53, prepared by the Population Division, Department of Economic and Social Affairs, United Nations, March 1975.

Since some 1.5-2.2 $ft^2$ of hide leather are needed to manufacture a pair of leather shoes with uppers, the developed countries produce raw material sufficient to manufacture 3 pairs per capita per annum, whereas the developing countries can produce only 0.5 to 1 pair on the same basis. The great regional disparities notwithstanding, it can be calculated that the annual per capita production of hides in the developed countries is 0.133,

that of the developing countries 0.43. The comparative annual per capita production of skins shows almost as large a gap: that of the developed countries is 0.210, that of the developing countries 0.103.

Regional variations in hide and skin production

Caribbean and Central America

Current annual production within this area is only 0.062 per capita, or some 60 per cent of the rate achieved by the developing countries, which average 0.103 skins per capita.

Mexico currently produces 3.5 million hides or 60 per cent of the region's yearly output and 3.7 million skins or 80 per cent of the regional output.

Haiti is the second largest producer of skins in the region, accounting for almost 0.094 skins per capita per year.

South America

This region, the largest producer of good-quality bovine hides in the developing world, produces 35 million hides. Argentina currently produces 14 million, Brazil 11.1 million, and Colombia 3.7 million. The regional level of production is 0.162 hides per capita per year, over three times the average of all developing countries. Of the countries covered in this study, Uruguay, which produced 2 million hides (6 per cent of the regional output) in 1975, has the highest yearly per capita production (0.707) of bovine hides.

Argentina not only has a high yearly per capita production of hides (0.559), but it also produces bovine hides of the best quality thanks to its well-developed animal husbandry.

In South America, the per capita production of sheep and goat skins (0.114) closely approximates the per capita offtake of all developing countries (0.103). Such a presentation, however, masks major disparities within the region. Uruguay, which produces 2 million skins per annum, has a per capita production of 0.676, whereas Argentina, which produces over 9 million skins per annum, has a per capita production of only 0.363. Brazil, which produces over 10.25 million skins per annum, has a per capita production rate of only 0.097.

Asia

In this region the effects of religious and social traditions are apparent in the low per capita production of bovine hides. In India, where

the slaughter of bovine cattle is virtually prohibited, hides are mainly obtained from fallen animals. More than 29 million hides are produced annually (some 62 per cent of the region's annual output). Other major producers are Bangladesh (over 4.5 million hides per annum or 10 per cent of the regional output) and Pakistan (3.8 million or 8 per cent of the regional output). Hide production has increased slowly owing to the traditional systems of animal husbandry. The region produces nearly 100 million sheep and goat skins per year (over 33 per cent of the output of all developing countries). Afghanistan produces 5 million skins per annum; India nearly 60 million; Iran 13 million: and Pakistan 11 million.

Great disparity within the region is shown by the fact that whereas the annual per capita production of skins in Afghanistan is 0.267, in Pakistan 0.158 and in India 0.094, the regional average is 0.086 because several smaller producers average only 0.001.

The annual per capita production of hides in the centrally planned economies of this region is low (0.016), while that of skins is higher (0.053) - none the less half the average of the developing countries. Mongolia, however, has a per capita skin production of 3.45. In fact, it has the highest per capita skin production of any country reviewed in this study - over thirty times higher than the average of the developing countries.

Middle East

The production of bovine hides in this region is comparatively small in volume (3.7 million hides per annum); the per capita figure is relatively low (0.343). Turkey, which produces some 2.8 million hides per annum or 76 per cent of the region's yearly output, has the highest per capita production of hides (0.070) in the region.

In this region some 36 million sheep and goat skins are produced each year: the per capita production of 0.432 skins per year is some three times higher than the average of the developing countries. Turkey is the major source of the region's sheep and goat skins (22 million skins or 60 per cent of the region's yearly output), other significant producers being the Yemen Arab Republic (3.9 million) and Iraq (4 million).

Northern Africa

Some 3.5 million hides are currently produced in the region, the annual per capita production being 0.036 hides. Skin production is on a much larger scale, the current annual production figure being 22.6 million skins, and the region's per capita skin production (0.231) is double the average of the developing countries. Major producers are Morocco which produces 8.5 million skins (0.486 skins per capita) and Sudan which produces 5 million (0.278 skins per capita).

Central Africa

With an annual production of 0.026 hides per capita, almost half that of the developing countries' average, this region does not feature as a major producer of hides or skins. Angola produces some 322,000 hides per annum, Cameroon some 286,000, and Chad 317,000.

The regional production of 3.4 million skins per annum cannot be considered great, and the average per capita production of skins in the region is well below the average of the developing countries (0.077). The major producers of skins within the region are Chad (1 million skins) Cameroon and Zaire (0.9 million skins each).

Eastern Africa

In this region, considerable quantities of both hides and skins are produced: 7 million bovine hides per annum (0.062 per capita) and 25 million skins (0.206). Ethiopia produces more than 2.1 million hides, Tanzania more than 1.3 million, while Kenya, Madagascar and Uganda produce some 750,000 hides a year each. Ethiopia is also the major producer of skins (9 million), followed by Somalia and Kenya (5.4 and 4.8 million per annum respectively).

Southern Africa

Although the production of the two main hide-producing developing countries in this region (Botswana and Swaziland) is small in terms of volume, the per capita production of hides in Botswana is amongst the highest in the world (0.36), representing a total production of no more than 250,000 hides a year.

Western Africa

The region is not a significant producer of bovine hides. The average per capita production of hides (0.025) in this region is only half that of the average of the developing countries. In terms of volume, Nigeria produces the most hides (1 million per annum). On a per capita basis, however, Mauritania leads (0.146) even though it produces only 180,000 hides per annum. Skins are produced on a larger scale. Nigeria produces 10 million skins per annum, Mali and Nigeria each produce 2 million skins per annum and Mauritania 1.7 million. The quality of the skins from this region is high, unlike the hides which are of a low quality.

## Future production of hides and skins: 1985 - 2000

### Historical trends and data availability

Projecting increases in hide and skin production is made difficult by the paucity and unreliability of available data. Since the basic raw material is a byproduct of another industry and the response to demand is inelastic, most authorities decline to project hide- and skin-production rates, and refer instead to projections for meat production and demand which to a certain degree run parallel.

Although some data are available from the 1960s, early data covering the production of hides and skins in the developing countries lack continuity, thus providing an inadequate base for projections of future growth as well as calculations of past growth. Officials at FAO warn that the historic data available relating to hide and skin production are insufficiently valid to serve as base material for future projections, especially with regard to the developing countries. Thus, the projections computed in this study are not firm forecasts and should be regarded only as indicative.

Forecasts of both human and animal population growths vary; some observers believe that the per capita production of hides and skins will decrease rather than increase. At a congress in Hungary,[87] it was stated that since the growth of the world's population exceeded that of the cattle population which was about 2 per cent per annum, the expected raw-hide volume per capita could only be degressive on a world level.

As part of this study, initial attempts were made to produce mathematical projections based on past trends. The limitations of recorded data, in particular data relating to the developing countries, underscored the tentativity of such projections and their incompatibility with known industrial data. It was considered more realistic to assume that the production of hides and skins will run parallel to the production and consumption of meat. Reference to FAO meat production and demand projections to 1980[47] shows that the annual rates of growth from 1970 to 1980 might be as shown in Table 13.

Table 13. Annual growth rate in meat production and demand, 1970-80

(Per cent per annum)

| | Beef and veal (=hides) | Mutton and lamb [a] (=skins) |
|---|---|---|
| World | 2.6 | 2.7 |
| Developed countries | 2.2 | 1.8 |
| Developing countries | 3.6 | 3.4 |
| Centrally planned economies (Asia) | 2.3 | 2.8 |
| Centrally planned economies (Europe and USSR) | 2.4 | 2.8 |

a/ Includes some goat meat.

Authorities at FAO are unwilling to suggest that similar rates can be employed in projections up to the turn of the century. Moreover, upon perusal, the projections shown above can be seen to diverge from other calculations. In the FAO Commodity Review and Outlook 1975, it is shown that in terms of numbers the world production of cattle meat (and hence of cattle hides) increased over the period 1965-75 at an annual rate of 1.1 per cent: the annual growth rate in the developed countries 1.9 per cent, in the developing countries 2 per cent and in the centrally planned economies, 0.3 per cent.

In terms of weight, the situation is equally confusing. In its agricultural commodity projections[97] FAO reported rapid increases in average carcase weight, with which the biological growth of hides did not keep pace. Over the period 1955-57 to 1966-68, the estimated production of hides and skins expressed as a percentage of the weight of beef and veal production fell steadily from 10.9 per cent to 9.7 per cent in all high-

income countries taken together. At present, it cannot be shown whether this trend is continuing or whether it has settled at the lower level. Furthermore, it cannot be established whether an equivalent trend exists in developing countries owing to the lack of statistical data. Whereas it can be assumed that hide-offtake projections based on weight may be subject to this variation in the developed countries, it would not be reasonable to assume any significant move along these lines in the developing countries, since the sophisticated fattening of livestock accounts for only a minute proportion of hide in these countries.

In the FAO Production Yearbook, growth rates in cattle hide production, in terms of weight, are shown to have increased in the developed countries, but decreased in the developing countries, as indicated below:

Cattle hide production, annual growth rates
(per cent per annum)

| | 1961-65[a] to 1975 | 1969-71 to 1975 |
|---|---|---|
| Developed countries | 1.3 | 2.5 |
| Developing countries | 2.2 | 1.3 |

a/ Statistics for 1961-65 are tentative. First available in 1970, they were perhaps extrapolated from data relevant to the period 1968-70.

Were a mathematical projection to be made on the basis of the above data, the outcome would be an unrealistic and socially unacceptable trend towards declining meat consumption and hide production. Given the world-wide endeavours to eliminate malnutrition and improve living standards, such an hypothesis is unacceptable and it merely underscores the minimal validity of projections based on historical data. Great socio-economic pressure will undoubtedly be applied to ensure that in the developing countries the per capita production and consumption of meat (and in turn the production of hides) will be retained. Furthermore, whereas the size of hides in the developing countries might not increase, the rate of offtake could be greatly improved. Acceptance of these facts would suggest that an empirical approach might be more realistic than any mathematical approach based on poor data.

Consequently, in this study the projections of hide production in developing countries have been based on a constant per capita consumption of meat. It should be noted, however, that in a number of Asian countries, social and religious traditions prohibit the consumption of certain meats.

The majority of hides are obtained from fallen animals, a factor that bears no direct relationship to meat consumption, Gross National Product, or growth in human population. At the same time, no social pressure is applied to increase the production of hides. Projections of hide production in these countries have, therefore, been based on a detailed study of the leather sector in the Asian region[10] commissioned by UNIDO in 1974, which contained both hide and skin projections up to 1984. The linear trend shown in those projections has been extrapolated to 1985 and 2000.

A further factor that should not be ignored is that in some countries a high proportion of hides is obtained from draught animals. This source may decline significantly by the year 2000, if agricultural techniques are updated and mechanized methods (involving tractors) introduced.

In elaborating the projections of hide production in the developing countries, the median variant shown in the World Population Prospects, 1970-2000[11] was used to obtain weighted projections for 91 developing countries (principal producers). The data were subsequently adjusted to represent all developing countries. The aggregated result is shown in Table 17 which indicates that the production of hides in the developing countries could expand at the following annual rate of growth:

| | Per cent |
|---|---|
| 1975-1985 | 2.11 |
| 1985-2000 | 1.93 |
| 1975-2000 | 2.00 |

A similar statistical disparity is to be found with respect to the production of goat skins. FAO projections of meat production and demand suggest that the production of mutton and lamb in the developing countries will increase at an annual growth rate of 3.4 per cent, and it could be assumed that the production of sheep and goat skins would behave similarly. However, if the annual growth in goat and sheep skin production, in terms of weight, is derived from the FAO Production Yearbook[7] of the Commodity Review and Outlook[12] a different growth rate is obtained as shown in Table 13.

Table 14. Production of goat and sheep skins, annual growth rates
(per cent per annum)

| | Goat | | Sheep | |
|---|---|---|---|---|
| | 1961-65 to 1975 | 1965-75[a] | 1961-65 to 1975 | 1965-75[a] |
| World | + 0.91 | + 0.6 | + 0.47 | - 0.7 |
| Developing countries | + 1.02 | + 0.8 | + 1.65 | + 1.6 |
| Developed countries | - 0.22 | - 0.3 | - 0.43 | + 0.7 |

a/ Excludes centrally planned economies.

In the absence of complete data embracing all countries and covering at least ten years, no realistic mathematical projection can be made for the production of skins in the developing and developed countries. Similarly, with the marked divergence between the meat production and demand productions for 1970-80, and the growth rates shown for the periods 1961-65 to 1975 and 1965-75, it would seem realistic to project a constant per capita consumption of sheep and goat meat with a concomitant constant production of skins in both developed and developing countries.

Although FAO projections of meat consumption and demand for 1970-80 would indicate that the annual growth rate in respect of mutton and lamb would be 1.8 per cent in the developed countries, developments in 1977 hardly bear this out, since according to the FAO Production Yearbook a decline was recorded in the slaughter of mutton and lamb in the period from 1961-65 to 1975 with a concomitant decline in the production of sheep and lamb skins as shown below:

| | Thousands of metric tons |
|---|---|
| 1961-65 | 359.5 |
| 1973 | 391.3 |
| 1975 | 344.5 |

Under such circumstances, it would be realistic to assume that the future growth rate will, at the most, be sufficient to maintain the per capita production and consumption at a level on a par with population growth.

In Table 18, aggregated results would indicate that the production of skins in the developing countries could expand at the following annual rates of growth:

| | Per cent |
|---|---|
| 1975-1985 | 2.20 |
| 1985-2000 | 2.13 |
| 1975-2000 | 2.16 |

It should be noted that the projections of hide and skin availability as presented in this study have been prepared in such a manner that estimates of the total available leather supplies may be quantified for the years 1985 and 2000. The distribution and utilization of these hides and skins are discussed later.

In certain publications the demand for leather and leather products has been projected for 1985 and 2000 on the basis of expected population growth, projected expansion and Gross Domestic Product. Such demand projections reveal much higher growth rates in the leather sectors of the developing countries than can be foreseen in the light of raw material availability. Such projections can have little validity in relation to the production of leather, as the anticipated high demand they reveal cannot be met by real leather, which will be in limited supply, and substitute materials will have to be used.

## Projected hide and skin production

### Basic projection

In the basic projection, it is assumed that, except for certain countries , per capita meat consumption, and hence per capita hide and skin consumption, will remain constant in the developing countries. In respect of the developed countries, however, hide production is projected as a linear trend on the basis of hide production data (in weight terms) for the periods 1961-65 and 1970-75.[7] The projections of skin production in the developed countries are based on the same assumptions as have been used for the developing countries.

Projected population growth has been derived from World Population Prospects 1970-2000 [11] in which it is suggested that population growth will increase annually as follows:

| | 1975-85 | 1985-2000 |
|---|---|---|
| | Per cent | |
| World | 1.96 | 1.76 |
| Developed countries | 0.84 | 0.67 |
| Developing countries | 2.37 | 2.10 |

However, owing to the large variation between countries in both projected human population growth and current production of hides and skins, individual country projections were necessary, the results of which have been presented on a regional basis. Basic projections of hide and skin production for the years 1985 and 2000 are shown in Tables 15 and 16.

Table 15. Projected hide and skin production, 1985

| | Hides | | | Skins | | |
|---|---|---|---|---|---|---|
| | Production (Millions) | Area (Million $ft^2$) | Annual growth rate 1975-85 (Per cent) | Production (Millions) | Area (Million $ft^2$) | Annual growth rate 1975-85 (Per cent) |
| Developed countries | 161.2 | 5,650 | 0.66 | 258.0 | 1,553 | 0.84 |
| Developing countries | 151.1 | 3,929 | 2.11 | 366.7 | 1,760 | 2.20 |
| World | 312.3 | 9,579 | | 624.7 | 3,313 | |

Of the 12,892 million $ft^2$ of hides and skins projected for the world in 1985, it is estimated that the developed countries will produce 55.9 per cent (7,203 million $ft^2$), and the developing countries 44.1 per cent (5,689 million $ft^2$). The increase in total leather area over the period 1975-1985 is estimated to be 13.6 per cent (an annual growth rate of 1.28 per cent).

Table 16. Projected hide and skin production, 2000

| | Hides | | | Skins | | |
|---|---|---|---|---|---|---|
| | Production (Millions) | Area (Million $ft^2$) | Annual growth rate 1985-2000 (Per cent) | Production (Millions) | Area (Million $ft^2$) | Annual growth rate 1985-2000 (Per cent) |
| Developed countries | 185.5 | 6,492 | 0.94 | 285.2 | 1,717 | 0.67 |
| Developing countries | 201.3 | 5,234 | 1.93 | 503.3 | 2,416 | 2.13 |
| World | 386.8 | 11,726 | | 788.5 | 4,133 | |

Of the 15,859 million $ft^2$ of hides and skins projected for the world in 2000, it is estimated that the developed countries will produce 51.8 per cent (8,209 million $ft^2$), and the developing countries 48.2 per cent (7,650 million $ft^2$). The increase in total leather area over the period 1985-2000 is estimated to be 39.7 per cent (an annual growth rate of 1.35 per cent).

Tables 17 and 18 present a regional summary of hide and skin production in the developing countries. These calculations are based in the main on FAO statistics with supplementary data derived from a study commissioned by UNIDO on the leather sector in 1975.[13]

In Table 17 (bovine hides), the data contained in the UNIDO study were updated, using live animal population figures as presented in the FAO Production Yearbook[7] and the offtake rates for 1970 as quoted in the FAO Meat Production and Demand Projections to 1980.[4]

In Table 18 (sheep and goat skins), the individual country estimates of skin production up to 1974 contained in the UNIDO study were adapted to 1975 using the methods applied for the projections: 1975-85 and 1985-2000. In both tables, the data obtained which related to 97 per cent (in Table 17) and 98 per cent (in Table 18) of the developing countries were subsequently pro-rated so as to give a global figure applicable to all developing countries.

Table 17. Developing countries: current and projected hide production, 1975-2000 (including cattle, calf and buffalo). Summary by region, covering the 91 principal producer countries

| Region | Human population | | | Thousands | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Growth per | | Live | Estimated | Hide | | Projections | |
| | Millions | cent per annum | | animals | average | production | 1975 | 1985 | 2000 |
| | 1975 | 1975-2000 | 1985-2000 | | offtake rates 1975 | per capita 1975 | | | |
| Caribbean and Central America | 91.1 | 3.26 | 3.05 | 41,287 | 13.7 | 0.062 | 5,669 | 7,815 | 12,273 |
| South America | 217.1 | 2.05 | 1.82 | 212,281 | 16.6 | 0.162 | 35,140 | 43,331 | 57,424 |
| Asia | 1,147.6 | 1.83 | 1.59 | 360,150 | 12.9 | 0.040 | 46,414 | 55,658 | 70,500 |
| Asian centrally planned economies | 899.7 | 1.57 | 1.19 | 100,961 | 14.2 | 0.016 | 14,369 | 16,793 | 20,064 |
| Middle East | 85.4 | 2.78 | 2.44 | 19,324 | 19.2 | 0.043 | 3,705 | 4,874 | 6,993 |
| Northern Africa | 98.1 | 2.84 | 2.58 | 24,802 | 14.1 | 0.036 | 3,495 | 4,624 | 6,780 |
| Central Africa | 44.9 | 2.39 | 2.60 | 10,374 | 11.1 | 0.026 | 1,152 | 1,459 | 2,143 |
| Eastern Africa | 110.0 | 2.94 | 3.08 | 67,233 | 10.1 | 0.062 | 6,780 | 9,063 | 14,278 |
| Southern Africa | 1.2 | 2.96 | 2.90 | 2,923 | 11.0 | 0.268 | 322 | 431 | 662 |
| Western Africa | 114.7 | 2.82 | 2.85 | 28,000 | 10.4 | 0.025 | 2,906 | 3,838 | 5,851 |
| Total | 2809.9 | | | 867,335 | 13.8 | | 119,952 | 147,886 | 196,969 |

The above totals may be pro rata adjusted to represent all developing countries; the following figures would thus be obtained (in millions):

| | | | |
|---|---|---|---|
| | 122.6 | 151.1 | 201.3 |

Projected growth in hide production (per cent per annum):

| 1975-85 | 1985-2000 |
|---|---|
| 2.11 | 1.93 |

1975-2000

2 (= 64.2 per cent increase)

Table 18. Developing countries: current and projected skin production, 1975-2000 (sheep and goat combined). Summary by region, covering the 91 principal producer countries

| | Thousands | | | | | |
|---|---|---|---|---|---|---|
| | Live animals | Sheep and goat skins | | | | Skins per capita |
| | 1974 | 1974 | 1975 | 1985 | 2000 | 1975 |
| Caribbean and Central America | 17,425 | 4,489 | 4,630 | 6,313 | 9,799 | 0.051 |
| South America | 146,369 | 29,385 | 30,548 | 38,055 | 51,661 | 0.140 |
| Asia | 243,226 | 97,411 | 98,978 | 116,420 | 148,938 | 0.086 |
| Asian centrally planned economies | 152,075 | 47,138 | 47,924 | 56,477 | 68,267 | 0.053 |
| Middle East | 99,374 | 35,961 | 36,956 | 48,653 | 70,540 | 0.432 |
| Northern Africa | 70,127 | 21,033 | 22,616 | 30,745 | 46,542 | 0.231 |
| Central Africa | 12,463 | 3,373 | 3,453 | 4,372 | 6,398 | 0.077 |
| Eastern Africa | 86,409 | 24,036 | 24,728 | 32,888 | 51,341 | 0.225 |
| Southern Africa | 1,780 | 265 | 273 | 367 | 559 | 0.228 |
| Western Africa | 64,027 | 19,846 | 20,403 | 26,901 | 41,787 | 0.178 |
| Total | 893,275 | 284,337 | 290,509 | 361,191 | 495,832 | 0.103 |

The above totals may be pro rata adjusted to represent all developing countries: the following figures would thus be obtained (in millions):

294.9 366.7 503.3

Projected growth in skin production (per cent per annum):

| 1975-85 | 1985-2000 |
|---|---|
| 2.20 | 2.13 |

1975-2000

2.16 (= 70.7 per cent increase)

Trends in animal husbandry and their impact on the production of hides and skins

Stock raising (predominantly bovine) has been greatly accelerated by the increased use of fattering and other schemes, and by the concomitant reduction in nomadic and pastoral herds. This trend should lead to a rapid increase in offtake rates. Were all the cattle in the developing countries to be husbanded, using such modern techniques, offtake could increase by 100 per cent and hide quality would improve. However, only in the large producer countries can it be expected that 20-50 per cent of the herds will be so raised within the next two decades.

During the past ten years the rate of offtake does not seem to have increased appreciably: some regions and countries would appear to have reduced their offtake rate (possibly a statistical error), while others record a significant increase, presaging the improvements that must ensue from FAO and governmental development programmes in this sector.

Most of the sheep in the developing countries are not woolbearing (with the exception of Latin America), and there is little incentive to organize this sector of livestock management. Several developing countries are experimenting with woolbearing sheep. If these experiments prove successful sheep-farming may develop on a serious scale in place of the more traditional sheepherding. However, it should not be forgotten that the skins of woolbearing sheep are of a lower quality than those of hair sheep, and the raising of woolbearing sheep would not necessarily be of advantage to the leather industry.

If farmed under modern management, hair sheep could yield greater offtake rates. However, more important would be the introduction of new crossbreeds as a means of increasing current skin sizes. At present, the majority of African sheep skins which measure only some 5 - 5.5 $ft^2$ present some difficulties in garment manufacture. Were skins measuring 7 $ft^2$ available, a size better suited to garment manufacture, demand would increase appreciably.

Trade in raw hides and skins

Statistics relating to trade in hides and skins are not without their problems. This is clearly pointed out in an analysis[37] prepared by FAO, in which it was indicated that an element of confusion was introduced into the statistical data available by the existence, as a trade item, of hides

and skins which, though tanned, had to be tanned again, or at least finished, in the purchasing country. This type of leather is known under a variety of names: pre-tanned, semi-tanned, simply tanned or rough tanned. This category also includes crust leather and wet blue or chrome-in-the-blue hides and skins. The confusion is exacerbated by the fact that any of the above categories might be included in the statistics of either finished leather or raw hides and skins.

Bearing this in mind, the volumes and values quoted for hide and skin imports and exports must be treated with caution. The following tables, however, show the major categories as derived from data published by FAO. The changing role of the developing countries is

Table 19. Trade in cattle hides and calf skins

(Thousands of tons)

| | | 1966-70 | 1969-71 | 1973 | 1975 |
|---|---|---|---|---|---|
| Developed countries | Imports | 843.6 | 891.5 | 843.6 | 992.9 |
| | Exports | 850.4 | 895.7 | 1,036.2 | 1,377.3 |
| | Net trade | - 6.8 | - 4.2 | - 192.6 | - 384.4 |
| Developing countries | Imports | 104.3 | 118.9 | 166.5 | 230.3 |
| | Exports | 303.5 | 257.5 | 95.0 | 90.9 |
| | Net trade | - 199.2 | - 138.6 | + 71.5 | + 139.4 |
| Centrally planned economies | Imports | 250.3 | 198.3 | 164.4 | 227.9 |
| | Exports | 9.7 | 10.5 | 2.9 | 3.5 |
| | Net trade | + 240.6 | + 187.8 | + 161.5 | + 224.4 |

+ = net importers - = net exporters

evident in Table 19. Originally net exporters of hides, these countries have become significant net importers, a trend that reveals appreciable growth in the development of the leather sector in those countries.

Table 20. Trade in sheep skins

(Thousands of tons)

| | | 1966-70 | 1969-71 | 1973 | 1975 |
|---|---|---|---|---|---|
| Developed countries | Imports | 199.3 | 202.7 | 179.0 | 167.5 |
| | Exports | 121.4 | 133.0 | 119.4 | 117.5 |
| | Net trade | + 77.9 | + 69.7 | + 59.6 | + 50.0 |
| Developing countries | Imports | 4.3 | 1.2 | 4.0 | 3.0 |
| | Exports | 77.6 | 69.5 | 57.5 | 55.3 |
| | Net trade | - 73.3 | - 68.3 | - 53.5 | - 52.3 |

+ = net importers - = net exporters

Table 21. Trade in goat skins

(Thousands of tons)

| | | 1966-70 | 1969-71 | 1973 | 1975 |
|---|---|---|---|---|---|
| Developed countries | Imports | 28.7 | 28.5 | 27.8 | 21.4 |
| | Exports | 4.7 | 5.2 | 5.3 | 7.0 |
| | Net trade | + 24.0 | + 23.3 | + 22.5 | + 14.4 |
| Developing countries | Imports | 0.7 | 0.7 | 1.0 | 1.1 |
| | Exports | 26.4 | 25.8 | 21.1 | 19.1 |
| | Net trade | - 25.7 | - 25.1 | - 20.1 | - 18.0 |

+ = net importers - = net exporters

It should be appreciated that the net trade balances as calculated in the above categories may contain some degree of error for want of a common cure or standardizedweight basis for all of the countries. In the FAO Commodity Review and Outlook, 1975-76 it is remarked that the import/export data are based on the following criteria: (a)cattle hides and calf skins on a wet-salted basis except for a few countries where the type of curing was not stated;

(b) sheep skins: for major exporting and importing countries a dry, de-woolled equivalent, for others product weight as the wool content could not be established; and (c) goat skins: chiefly dry basis.

It might well be that an appreciable proportion of the developing countries' exports are in the dried state, where weight per unit area is only some 50 per cent or less than the wet-salted base of the developed countries' exports. On the basis of potential leather area, however, it may be assumed that a balanced trade situation exists, although data supporting this assumption are not available.

Developing country imports of raw hides and skins in 2000

Earlier in this chapter, it was suggested that the development of the leather sector in the developing countries would be limited by the local availability of raw materials. Consequently, the hide and skin production projected for 1985 and 2000 reflects the sum total of raw materials that the developing countries could process.

Should current (linear) trade flow trends continue until 2000, the developing countries will enjoy greater access to raw material, as shown in the tentative figures below:

**Net trade in cattle hides (including calf), developing countries**
(Thousands of metric tons/wet-salted)

| | |
|---|---|
| 1966/70 | - 199.2 |
| 1975 | + 139.4 |
| 1985 | + 666.7 |
| 2000 | + 1,442 |

+ = net imports - = net exports

Source: FAO, Commodity Review and Outlook, 1971/72 and 1975/76

As a result of this trend, the developing countries may need to import from the developed countries around 28.7 million hides in 1985 and 62.1 million hides in 2000. Whether such a situation will actually come about

is debatable, but viewed against the current and projected production of cattle hides in the developed countries, this import potential assumes significant proportions.

Whereas in 1975 the developing countries imported some 139 thousand metric tons (wet-salted) or 6 million hides from the developed countries (some 4 per cent of the latter's production of 151 million hides), by 1985 they will be importing some 666 thousand metric tons or 28 million hides (17.8 per cent of the developed countries' production forecast in the basic projection.

Similarly, in 2000 the developing countries will import 1,442 thousand metric tons or 62 million hides from the developed countries (33.5 per cent of the production projected for the developed countries in the basic projection.)

A similar trend from net exporter to net importer can be seen for the developing countries in respect of skins:

| | Sheep | Goat |
|---|---|---|
| | (Thousands of metric tons) | |
| 1966/70 | - 73.3 | - 25.7 |
| 1975 | - 52.3 | - 18.1 |
| 1985 | - 17.3 | - 6.4 |
| 2000 | + 32.2 | + 11.3 |

+ = net imports - = net exports

It can be seen from the above that whereas in 1985 the developing countries will still be net exporters, by 2000 they will be importing 43.5 million skins (or 15.25 per cent of the production forecast for the developed countries in that year).

The developed countries may well not be prepared to accept such a large percentage of their hides and skins being exported to the developing countries, since it would suggest that the leather sector in those countries will stagnate. Much depends on the global economic situation. This notwithstanding, the raw material availability for leather production in the developing countries can be tentatively estimated.

If the trade flows maintain their linear trend, the developing countries would have at their disposal a further 2,329 million $ft^2$ of hides in the year 2000. As for skins, the developing countries could be importing some 270 million $ft^2$ in the same year.

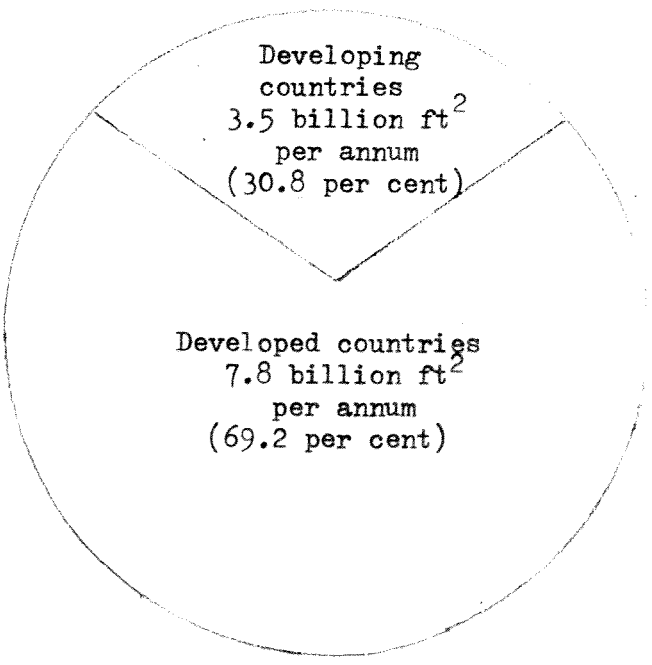
Basic projection, global availability of hides and skins, 2000

| | Potential leather area (Millions of $ft^2$) | Share of world total (Per cent) |
|---|---|---|
| Developed countries | 5,609 | 35.4 |
| Developing countries | 10,250 | 64.6 |
| World | 15,859 | |

**Figure 3 below shows the relative global distribution of production** and utilization of traditional leather-making raw materials, e.g. bovine hides and sheep and goat skins.

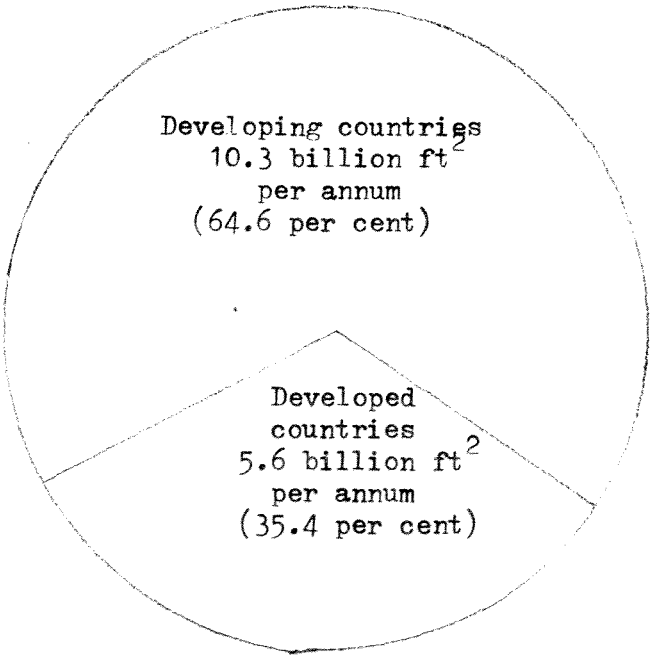
**Figure 3**

1975: Global shares of tanning activity




Total: 11.3 billion $ft^2$ per annum

2000: Projected global shares of tanning activity




Total: 15.9 billion $ft^2$ per annum

Pigskin as an alternative raw material

With population growth outstripping traditional sources of leather, interest has been mounting in the greater use of pigskin as a raw material for the industry. Pigskin has always been used in certain countries of Asia and Eastern Europe, but it is only in the past five years that its potential has real y begun to be appreciated in Western Europe and North America. This appreciation has been brought about mainly by the diminishing supplies of light skins available from the developing countries, many of which are now prohibiting the export of such skins in favour of their own leather industries.

The feasibility of large-scale pigskin production has been enhanced by the introduction of special skinning machinery [6 (6/75)] and the development of specialized technology for dealing with the skin which, by its unique nature, fibre structure and wide variations in substance between different parts, differs greatly from other raw materials. This technology has succeeded in making pigskins a most suitable raw material for use not only in good-quality leather goods, their traditional area of use in Western Europe and North America, but in garment and footwear manufacture, where their use in potentially large volume may be envisaged.

High world prices for hides and skins have also caused attention to focus on pigskin. The meat-consuming public in Western Europe and North America is accustomed to buying pork and bacon with a covering of skin. Thus, even if the meat industry is attracted by the possible high returns from the sale of the skins to the leather industry, the problem remains of convincing the public to accept a higher proportion of rindless meat.

Numerous new exigencies, however, suggest that the scalding of pig carcasses as a means of removing the bristles (during the Wiltshire cure process) be abandoned in favour of skinning immediately after killing (pigs are most effectively flayed when the carcass is warm), using mechanical flaying machinery on a line production basis. These skinning systems operate at the same labour costs as scalding, but have lower capital requirements, lower effluent costs, and lower labour costs in the subsequent butchering operations. Any future food or hygiene regulations (such as rules prohibiting the presence of skin protein in sausages and pies) will necessitate prior skinning, leaving skin problems to the tanners.

It is possible that pork butchers may move closer to the by-product market. In some developed countries, pigs are prepared for slaughter at about six months of age, and many of the pork butcheries (especially in North America) are of sufficient size to operate on a multi-line basis, a situation which is ideal for mechanical flaying. Skins from regions where the pigs live for two years or so before slaughter have badly damaged grains and are only fit for use as suedes or linings. The skin from a six-month old pig has excellent qualities, which it will keep provided it is subjected to the curing process within an hour of flaying. Positive moves are being made to market these skins in some cases.

Pork butchers, as they begin to realize the potential returns available from the marketing of well cured pigskins, will devote more capital to developing this sub-sector. The example of a pig slaughterer who uses a modern hide processor to salt his skins is illustrative of this. The factory kills about 1,000 meat pigs (no old sows or boars) a day, each averaging 240 lbs live-weight. The mechanical flayer placed on line removes the skins from 115 animals per hour. These skins average 8.5 $ft^2$, weigh 14.5 lbs with less than 1 lb of fat adhering, and are said to yield 95 per cent first grade.

A pigskin marketing and promotion organization is currently preparing a broad campaign which will feature the production and marketing of top-quality leathers by tanners who receive regular supplies of standard raw material and who are assisted by technical service from the organization. It is also preparing to introduce finished goods in pigskin to the consumer market and to convince the public of the desirability of this highly versatile and aesthetically pleasing material. A marketing exercise to bring pig suede footwear to the world market (based on the undamaged flesh side of heavy scalding skin) has already had years of consistent success and augurs well for the promotion of superior quality pigskin in full grain and suede.

If demand is sufficiently strong, the value of the skin to the butcher will be increased and a higher level of offtake should result. Offtake is gradually increasing in North America as large-scale pork butchers begin to see skinning as a means not only of avoiding the offensive scalding process, but also as a means of increasing their by-product returns.

In Eastern Europe, pigskins are absorbed by the domestic leather industries. The USSR, which at one time supplied skins to other East European countries, now uses most of its skins and, like many other countries, is seeking new sources of supply. It would be necessary to study in depth the production of pigskin on a global level in order to understand its potential effect on the overall leather supply situation.

A typical pigskin yields, with its split, 10 $ft^2$, and it is possible, using modern factory farming techniques, to obtain 150 per cent annual offtake rates; thus, one pig can yield 15 $ft^2$ of leather-making material a year. In 1975, the world pig population was 674.2 million, giving a theoretical maximum yield of 1,011 skins or 10,110 million $ft^2$. If the live-pig population growth rate continues to increase at the level of 2.01 per cent per annum, as it did from 1961-5 to 1975, the following yields could be obtained:

| Year | Pigs (millions) | Skins (millions) | Raw material for leather (million $ft^2$) |
|---|---|---|---|
| 1985 | 822.7 | 1,234.0 | 12,340 |
| 2000 | 1,108.8 | 1,663.0 | 16,632 |

In 1974, however, the principal pigskin producing countries - China, the USSR, Japan, Brazil, the United States, Poland, Rumania and Yugoslavia - which accounted for about 68 per cent of the world's live pig production, produced only about 271 million skins (2,710 million $ft^2$).[3(9/74)] Divided into developed and developing country groups, this broke down as follows:

| | Pigs (millions) | Skins (millions) | Offtake rate per cent |
|---|---|---|---|
| Developing | 280.4 | 206.3 | 73.6 |
| Developed | 177.4 | 64.7 | 36.5 |
| | 457.8 | 271.0 | 59.2 |

If, however, the rest of the world's live pigs produce skins pro rata, and if offtake rates increase as more modern farming practices are introduced, then by the year 2000, the developing countries, with an annual pig population growth rate of 2.09 per cent should have a holding of 622.1 million pigs, yielding, at an offtake rate of 90 per cent, 559.9 million skins. The developed countries, whose pig population has been increasing by 1.91 per

cent a year, by 2000 should have 486.2 million pigs which, at an offtake rate of 75 per cent, will yield 365 million skins (3,650 million $ft^2$).

A global offtake rate of 83.4 per cent would yield a possible 9,249 million $ft^2$ in the year 2000. If only as much as 75 per cent were suitable for upper leather, this volume of 6,937 million $ft^2$ would augment the bovine hides available by the end of the century (estimated at 12,000 million $ft^2$) by more than 50 per cent.

## Chapter III

# PRODUCTION AND PROCESSING OF LEATHER; MAIN ASPECTS; TECHNICAL DEVELOPMENT

## Process outline and sequence

Hides and skins are generally cured at the abattoir or by independent operators who collect them fresh and cure, trim, and grade them before selling them to tanners (by private negotiation or auction, or through an independent merchant). Tanners, however, are tending more and more to buy their hides direct from the abattoirs; this is particularly convenient where tanneries are located near meat industry centres.

The most common curing method is wet salting, by either stack salting or brining. Some curers engage in machine fleshing, before or after brining, to remove excess flesh and fat. Alternatively, the tanner may do this after an initial soaking to remove blood and dirt and loosen dung. Termed "green" fleshing, this initial treatment permits a more even penetration of subsequent process chemicals. Fleshing machines often incorporate a demanuring cylinder which removes dung adhering to the hair and facilitates even fleshing.

Processes vary with different types of leather, but in batch production of the principal types, the process sequences are broadly similar. For certain leathers, e.g. woolskin, full-oil chamois, or sole and industrial leathers, different sequences are employed, but there are still similarities in certain processes.

In modern practice, the chrome-tan process is the one most used. The hides and skins destined for chrome tanning and vegetable tanning pass through the sequences shown on the following page and briefly described below. The processes, which are generalized, may be combined, omitted, or repeated according to the quality requirements of the final product and the facilities available. Machine or hand methods may be used at most stages.

The hides are soaked to remove blood, dirt, salt and dung, often with the assistance of wetting agents and alkaline chemicals, the latter bringing the stock towards the alkalinity required in liming. The liming chemicals, calcium hydroxide and sodium sulphide, plump the hide and loosen or destroy the hair.

## Process sequences [a]

| Materials | Chrome-tanned hides | Chrome-tanned skins | Vegetable-tanned hides |
|---|---|---|---|
| Raw material: hide or skin | Soaking | Soaking | Soaking |
| | Liming | Paste liming (hair saving) | Liming |
| | | Dehairing | |
| | | Liming | |
| | Fleshing | Fleshing | Fleshing |
| | Sorting | Sorting | Sorting |
| | Deliming | Deliming | Deliming |
| | Splitting [b] | Scudding | |
| | Bating | Bating | |
| Pelt | Pickling | Pickling | Tanning (in modern process drums, earlier pits) |
| | Splitting [b] | | |
| | Tanning | Tanning | |
| Tanned material | Sammying | Sammying | Sammying |
| | Splitting [b] | | |
| | Shaving | Shaving | |
| | Neutralization | Neutralization | |
| | Retannage | Retannage | Retannage |
| | Dyeing | Dyeing | |
| | Fatliquoring | Fatliquoring | |
| | Sammying | Sammying | |
| | Setting out | Setting out | Setting out |
| | Drying | Drying | Drying (suspended) |
| | Sawdust | Sawdust | |
| | Staking | Softening | Setting out |
| | Vacuum dyring | Toggle on frames | Drying (suspended) |
| | Buffing and brushing | | |
| Leather finishing | Impregnation | | |
| | Coating | Coating | In modern process often finishing |
| | Plating | Plating | |
| | Spraying | Spraying | |
| Leather (finished) | Measuring | Measuring | Measuring |

[a] Earlier, there were great differences between the processes hides/skins and also chrome/vegetable. In the modern vegetable processes, they are not so great and a continual approach is to be observed.

[b] Material may be split at any of the three stages, depending upon process and end use.

The type of equipment used is determined by the size and nature of the tannery. As a rule, large hide tanneries use large-capacity hardwood rotating drums or inclined processors (based on the cement-mixer principle) for the wet processes, i.e. from soak to completion of chrome tanning.

After liming, the stock can be removed from the drum for unhairing or scudding to remove epidermal debris (depending on whether the tanner wants to save the hair as a by-product) and fleshing. If the hair has been dissolved in the liming (often called a "hairburn" process), the scudding and fleshing can be accomplished simultaneously on the fleshing machine. Some tanners consider "green" fleshing an adequate flesh cleaning process, and wet process from soak to end of chrome tanning in one sequence.

Splitting may be made in limed, pickled or tanned stages. Some tanners, albeit a minority, prefer to split their hides in the limed condition. After fleshing, such hides are usually relimed to give them further plumping, and then split layerwise. This permits a greater variety of uses for the split as it can be either vegetable or chrome tanned. The area yield on the grain is better than that obtained on "blue" (chrome tanned) split stock and the pre-tanning and tanning processes can be completed more rapidly and evenly owing to the reduced substance after lime splitting.

Deliming follows liming or the interposed machine operations. The chemicals employed begin the removal of the residual liming chemicals and bring the stock towards the acid state necessary for chrome tanning. Bating, which may be carried out simultaneously or consecutively, is a process in which enzymatic products are applied to loosen and soften the fibre structure of the hide and to strip out any remaining epidermal debris.

By the time the pickling chemicals are added, the stock should be clean and flaccid. Pickling is a preparation for the chrome tanning in which the acid condition of the stock is adjusted to obtain rapid and even penetration of the basic chrome tanning agent; inorganic and organic acids and salt are the chemicals most commonly used.

The removal of natural greases from the hides should be completed in the pickling process. The soaking agents and liming and pickling chemicals should have the effect of emulsifying the natural fats; however, special degreasing agents can be added at all these stages.

The chrome chemicals are added to the pickle liquor, and following penetration they are basified; organic and inorganic salts can be used. Basification brings the liquor back towards neutrality while strengthening the fixation of the chrome to the pelt. This process is central to the whole sequence as it constitutes the conversion of a putrescible to a non-putrescible material through the formation of a stable compound between the chrome and the reactive groups in the hide protein. Both liming and pickling are temporary preservation processes and goods can be marketed at these stages.

After basification, the wet leather is piled to allow the chrome to fix and superficial moisture to drain away. The hide is then passed through a sammying machine in which felt-sleeved rollers (or felt bands, if it is a throughfeed machine) squeeze out, under pressure, excess moisture held within the voids of the fibre structure. The hide is then sorted for end use suitability. At the same time, it may be measured electronically so that yields from raw stock and the basis for finished area yields can be determined.

After sorting, if the hide has not already been split or cut into sides, this may be carried out according to the finished leather requirements. Siding can also be done in the raw state or after liming.

After splitting, the stock is shaved to a more precise finished thickness on a sharp-bladed rapidly rotating cylinder machine. Both splitting and shaving have the additional effect of stretching the leather, thus contributing to the area yield.

Still in a damp condition, the goods return to be wet processed through the neutralisation, retanning, dyeing and fatliquoring processes, and the final character of the leather is more closely determined. Syntans, resins and vegetable tans are the most common used for retannage.

Dye technology has advanced to the stage where, in addition to the old established acid dyes, pre-metallized, direct and reactive dyes are now in general use. Fat liquors usually comprise oils specially prepared by sulphating or sulphiting using marine, vegetable and animal sources, such as cod, castor and neatsfoot.

After dye and fat liquor fixation, the leather is sammyed by machine and then set out, also by machine. This machine has a blunt-bladed cylinder which flattens and stretches the leather and compacts the grain surface (setting) to bring out its natural pattern.

Drying follows, but this process varies according to the end-use of the finished product. Full grain leathers can be toggled out on honeycomb frames, hung to dry naturally or in a heated tunnel dryer, or dried partially on a vacuum dryer and then hung. Corrected grain leathers are often paste-dried on individual drying plates to which the leathers are attached and stretched out, using a starch paste.

After complete drying, which stabilizes its composition, the leather is conditioned to give it sufficient moisture regain to prepare it for staking. This is a machine softening process which imparts to the leather some of its final feel, and increases the area.

The finishing sequence follows. If the grain is to be corrected, the staked leather goes forward for buffing on machines furnished with rotating abrasive cylinders.

Depending on the type of leather being produced, up to six coats of resin finish may be applied, either clear or pigmented, and either from an aqueous or solvent phase. The former, preferable for environmental and hazard reasons, is based on a variety of finish binder. The most common resins are acrylic and polyurethane. Rotary or reciprocating spray machines with drying tunnels are the most widely used. These usually carry finish metering and photo-electric devices which limit the finish spray to the outline of the leather passing beneath on the cord conveyor. Curtain coating, transfer finishing (where a finish film is transferred from a paper backing) and roller coating are also practiced.

The processing sequence closes with ironing on a rotary, heated cylinder machine which causes the finish to flow and enhances the flexibility of the leather, or embossing on a hydraulic ram press to impress a leather-like grain pattern to corrected grain leather. After airing-off, the leather is measured, either on a pin-wheel or electronic machine, so that the dispatched areas by which the leather is sold can be recorded and the yields calculated from the **blue sort stage.**

Hide splits taken off at the limed stage can be vegetable or chrome-tanned for a variety of uses. Vegetable tanned splits can be used for insoles. Chrome splits, either chromed prior to splitting with the main portion or tanned after lime splitting can be processed as suedes for footwear or clothing use, with the lower quality finding a market in industrial gloving. When hide prices are high, upgrading splits can form a useful means of increasing the returns on leather-making material.

Yields of split material from animal hides are much lower in the tropics, however, than in more temperate zones. Hides from the temperate zone generally have a heavier and more even substance, allowing on occasion a middle split to be taken, as well as grain and flesh splits.

The other raw material subject to splitting is dewooled sheepskin; the grain, after splitting, is used in fancy leather goods and bookbinding, and the flesh is oil tanned for conversion to chamois leather.

Tanning units

Unlike high-level-technology industries, the leather industry can thrive at many different levels of development; thus, rural, artisanal, semi-mechanized and fully industrialized tanneries often co-exist within the same region or country.

Rural tanning industries

In many countries where tanning has been carried on over thousands of years, a number of the rural tanneries have been adapted to modern conditions and are now classified as semi-mechanized artisanal industries. In other parts of the world, however (e.g. India and Nigeria), large numbers of rural tanneries with no mechanization at all are still to be found operating on a "family back-yard" basis. While these generally exist as small independent units, and in some areas have formed themselves into co-operatives,[2/] they still operate on a non-mechanized basis.

The basic deficiency of the rural tannery is that the low quality of the product does not allow it to be used in the manufacture of high-grade leather goods or garments. Thus, with the exception of rural areas, where the consumer is not fully quality conscious, rural tanning is generally concentrated on the production of semi-tanned materials for export or for further processing at mechanized units within the country. The domestic urban, quality-conscious markets for finished leathers and leather products are satisfied by the mechanized tanneries.

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2/ In some areas of the Sudan, for example, rural tanning operations are concentrated in compounds of 20 tanneries.

Arguments advanced in favour of rural tanneries are their economic self-sufficiency (they use indigenous materials and know-how for all processes and thus do not require foreign currency for the import of machinery or technical expertise) and their high labour content. However, this apparent economy and assistance to an individual country's balance-of-payments position may be false: if the original raw hide or skin had been well processed in an industrial tannery, it might have yielded a far greater product value, that would have more than covered the cost of importing machinery and chemicals. Further, the product of the rural artisanal leather goods sector can be subject to stiff competition from plastic and simulated leather (poromerics), which are available in some areas at prices lower than those possible with leather products.

Rural artisanal leather production, with respect to sanitary rules, also must be improved.

Many authorities in the developed world feel that rural artisanal leather production, from the global industry viewpoint, is to be deprecated. In an era when raw materials are in short supply, it seems wasteful to produce low-quality finished products whose value added is negligible and whose durability and aesthetic appeal does not conform to the high standards to which most leather industries are geared.

Rural tanneries generally process 1 - 20 hides (or skin equivalent) per day.

Small mechanized tanneries

Small mechanized tanneries, which exist in many areas, are often expanded artisanal units, producing leathers of mediocre quality with medium added values. While they do serve local demand, they are seldom able to enter the international trade owing to their indifferent quality and limited production rates. They require high labour inputs, and while this, from the point of view of many developing countries is admirable, due to less efficient use of labour, they cannot compete with large modern mechanized units in terms of quality and direct costs.

Logically, by the 1970s, the small mechanized tanneries should have been forced out of existence by the larger more modern units. However, in most cases their plant and fixed capital has been written off over the years, and their overheads are consequently low; thus, these businesses carry on even when trade conditions are poor and output is low. Thanks to their longer period of existence, they may have the advantages of a pool of experienced labour and experience in the grading and use of all types of raw material. In addition,

due to their lower throughput, they can afford to select individual skins for specific end products, thus enjoying more profitable skin utilization than the mass production operations.

These small mechanized units usually have close contacts with shoe and other leather goods producers and are willing to tailor their products or runs to the individual demands of their customers. They generally use medium- to low-grade raw material which they buy through old established trade networks.

Small mechanized tanneries generally process 20-100 hides (or skin equivalent) per day.

Modern industrial fully mechanized units

Most modern industrial fully mechanized units in the developing countries have been established within the last 10-15 years. They produce good, regular-quality products, but need long production runs to obtain reasonable efficiency. Thus they are likely to seek outlets in the international market, unless there exist large-volume domestic shoe producers. They suffer from several drawbacks, most of which will be overcome in time. The main one is the level of capitalization which in a highly competitive industry means that unless their capacity is used at the 70-80 per cent level they cannot compete economically with smaller units in some areas. Many of these plants have been financed by government development agencies, but unfortunately a number of them have taken long periods to reach production levels approaching economic viability. This may be due to lack of managerial expertise, underestimation of the competitive nature of the leather trade, inefficient supervision coupled with poorly trained labour, or overestimation of raw material availability.

Large units installed as joint ventures with expatriate entrepreneurs - or indeed any project enjoying genuine long-term external assistance in marketing and technology - have tended to yield results, both technical (quality) and financial, far superior to those obtained from units set up in a vacuum. It seems to be difficult for Governments and non-leather-oriented managements to appreciate the fact that a tanning unit, no matter how mechanized, must still adjust its processes continually to obtain optimum results, and equally, that each hide or skin should be sorted at various stages of the process to ensure its correct utilization. In this respect, the leather industry is quite different from industries such as steel or rubber where as long as the correct ingredients are used and the correct machine controls set, a good end product will likely be obtained. Even a modern, fully mechanized tanning unit is at best a "craft process assisted by science, technology and machinery".

Modern industrial fully mechanized units generally process 400-1,200 hides (or skin equivalent) per day, with a few giant units processing up to 3,000 hides daily.

## Main aspects

### Locational and infrastructural requirements

The major specific requirements of tanneries employing sound current technologies are summarized below.

#### General location

Abundance of raw material and a plentiful supply of water are prime essentials. It is economically sound to locate tanneries adjacent to raw material supplies, even if this implies that the finished product must be transported elsewhere. Closeness to raw material supplies ensures that hides and skins are received in prime condition and minimizes transportation in the uneconomic bulky, raw condition.

Optimum location would be close proximity to an abattoir, which would guarantee receipt of hides and skins in a fresh green state. In many areas, it should be possible to integrate abattoir and tannery operations so that fleshing can be carried out in the abattoir and the raw fleshings and trimmings then passed on to the abattoir's rendering unit, thus avoiding the environmental problem these solid wastes normally cause. In some countries, however, veterinarian and health regulations prohibit the operation of noxious-effluent-emitting industries, such as tanning, in close proximity to abattoirs. In a modern, well-run tannery it should be possible virtually to eradicate tannery odour; nevertheless, tanning operations should be kept at some distance from residential areas.

#### Water requirement

For traditional non-recycling technologies, water consumption may vary from 15 to 60 litres per Kg wet salted hide, i.e. 10 - 40 litres per square foot of leather.

However, recycling of process liquors and effluent, as practised by some recently installed tanneries, may drastically reduce this requirement. The use of high-grade water is not imperative for many stages of tannery processing.

#### Effluent treatment

Effluent treatment is discussed later in this study; from the locational viewpoint, however, sufficient area should be available to treat all expected volumes of water to the required purity levels. The area will vary according to the method of treatment. High-cost chemical engineered techniques require

little ground, whereas low-cost treatment systems (in lagoons etc.) require more extensive areas.[47] The method of effluent treatment may also have a bearing on proximity to residential areas.

Site

The land requirement for a hide tannery with an annual throughput of 10 million $ft^2$ of finished leather is:[13]

| | Hectares | | |
|---|---|---|---|
| | Buildings | Open space | Total |
| Production plant | 1.0 | 1.0 | 2.0 |
| Laboratory, stores, etc. | 0.5 | 0.5 | 1.0 |
| Effluent treatment | 4.0 | 2.0 | 6.0 |
| | | | 9.0 |

For new plants, the above area should be doubled to allow for expansion. Economies of scale apply, and it is suggested that:

10 million $ft^2$ finished leather per annum requires minimum 10 hectares
5 million $ft^2$ finished leather per annum requires minimum 8 hectares
2.5 million $ft^2$ finished leather per annum requires minimum 6 hectares

Building

Tannery structural requirements depend upon climatic conditions. The essential thing is to protect the machinery and goods and to provide a healthy working environment. In some areas, a light steel structure with cladding will prove sufficient. Foundations must be strong enough to support process vessels and machinery. Floors must be impervious, resistant to tanning chemicals and have efficient means of drainage. Tanneries are usually built with the roof some 6 to 7 metres above the floor to allow access to drums and machines.

For large hides, the building area requirement is:[13],[48]

$$\frac{ft^2 \text{ tanned leather per annum}}{\text{Floor space in } m^2} = 900$$

Thus, 10 million $ft^2$ finished leather per annum requires 11,111 $m^2$ building area, allocated as follows, in percentages:[48]

68 for production; 14 for stores, sorting and shipping; 8 for offices, laboratory, and staff facilities; and 10 for general services.

Energy requirements [13], [48]

The leather industry is not energy-intensive. For example, the energy requirements of the industry in 1965 were 0.2 per cent for Italy, 0.78 per cent for France, and for some developing countries 1.7 per cent of the total energy used for industry.

Nevertheless, it should be noted that for developing countries expanding their industry, energy requirements could be a more important part of total usage. The total energy consumption of the world leather industry will increase from 3.3 million t.c.e. (ton coal equivalent) in 1975 to 4.4 million by 2000 (i.e. for the developing countries from 1 million to 1.8-2.7 million) (see Annex I).

The energy parameters of the leather industry are the following: fuel (fuel oil) needed for boiler and heat generation is 0.1455 Kg. fuel/$ft^2$ leather. Thus, a tannery with 10 million $ft^2$ per annum throughput would employ 1,466 M.T. fuel. Electricity consumption is approximately 0.194 kWh/$ft^2$ leather.

Production of tanning chemicals, auxiliaries and machinery

In addition to raw material, hides and skins, the major requirements of the tanning sector are labour, machinery and chemicals. While labour is certainly available in the majority of developing countries, many authorities suggest that until these countries can produce the necessary machines and major chemicals themselves, they will not be able to reap the full benefits of this sector. Although no statistical data are available, it is suggested that for the domestic production of such machinery and chemicals to be economically feasible, a minimum market of some 15 - 20 tanneries (4.5 million hides per annum) would be desirable. This suggests that, on this basis, only four or five developing countries may expect to develop such industries successfully.

It must be further noted that the production of chemicals and machinery in desired quantities and qualities is directly connected to highly developed supporting industries. For example, the majority of chemicals (resins, dyes, etc.) are co- or by-products of the most sophisticated chemical processes, and their development as chief or separate products is unrealistic and wasteful.

It would seem logical for developing countries to co-operate on a regional or sub-regional basis in order to develop these subsectors.

Manpower requirements: tanning

Estimates of management and labour requirements for tanning operations vary widely, as may be seen from Table 22.

Table 22. Manning requirements for hide tannery with 9-10 million $ft^2$ throughput of finished (corrected grain upper) leather per annum

| Labour force | South America [13] | Africa [40,41] | Mean |
|---|---|---|---|
| Senior management | | | |
| Managers | 4 | 2 | 3 |
| Technologists | 6 | 3 | 4 |
| Middle management | | | |
| Foremen | 6 | 6 | 6 |
| Chargehands | | 16 | 8 |
| Labour | | | |
| Skilled | 60 | 62 | 61 |
| Semi-skilled | 85 | 251 | 195 |
| Unskilled | 55 | | |
| Total labour force | 216 | 340 | 277 |

For medium- and small-scale units (5 and 2.5 million $ft^2$ per annum respectively), the figures for senior and middle management might not be much lower, but labour would be pro rata reduced. Thus:

| Size of unit (million $ft^2$ per annum) | Senior management | Middle management | Labour | Total |
|---|---|---|---|---|
| 10 | 7 | 14 | 256 | 277 |
| 5 | 5 | 8 | 128 | 141 |
| 2.5 | 3 | 6 | 64 | 73 |

New tanning operations may not always require such labour inputs; a tannery, for example, may avoid hide curing and exporting, both of which are labour-intensive.

A recent study showed that a modern abattoir unit, with a throughput of some 7 million $ft^2$ raw material per annum, employed 75 employees to produce top-grade salted hide. A finished leather tannery, if it were to take the fresh hides direct from the abattoir, would employ some 195 persons - but the 75 hide-worker jobs would be lost. Only 120 new jobs would be created. If a wet blue tannery were associated with the abattoir, job opportunities would actually decline, as hide salting and preparation for export consumes more labour than the wet blue operation.

In some new tanning units in Africa, the manning levels are appreciably higher than those suggested above. However, while the importance of providing gainful employment in the developing countries is recognized, it should also be recognized that gross overmanning without adequate industrial discipline often leads to poor technical control and low-grade finished products. The various levels of expertise necessary are discussed below.[3/]

Senior management

Managers are persons with professional qualifications in the field of business management or accountancy; or experienced leather technologists.

Technologists require 3-4 years professional training and hold degrees or diplomas in either leather technology or chemistry, followed by practical on-the-job training.

Middle management

Foremen should preferably have 6-9 months academic training, but practical experience could be counted of equal value. If no formal training facilities are available, 6-9 months' practical training in another tannery (perhaps as part of a joint venture scheme) should be arranged. Newly qualified technologists might serve an "apprenticeship" at this level.

Chargehands should have the same qualifications as foremen, but with the accent on practical experience rather than academic training.

Labour

Skilled workers, with the exception of machine fitters and splitting specialists, may acquire most of their skills through in-plant training. Fitters

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3/ For a detailed review of labour requirements in the leather sector, see ILO report "Effects of technological developments on the occupational structure and level of employment in the leather and footwear industry". /49/

and splitting specialists may require 2-6 months' training from a manufacturer of tanning machinery or at an operational tannery.

Semi-skilled workers need no particular requirements other than a sense of industrial discipline.

Capital cost per job

The only advantage in the tanning sector for countries which must import chemicals, machinery and expertise, is in the employment of labour. The capital cost per job (in a finished leather tannery) in foreign and domestic terms, may be of interest to such countries:

| | $ |
|---|---|
| Total capital required per job | 24,292 |
| of which foreign currency | 12,535 |
| domestic currency | 11,757 |

The leather industry and the environment

Each developing country working towards the Lima target can expect to have environmental problems. As yet, only a few are approaching the degree of industrial activity found in the developed countries. In many developing countries, most tanners still work in small-scale village tanneries or tanning centres. Organized tanneries, using modern methods and materials, are few in number. They are far from insignificant, however, in terms of the proportion of a country's output they provide.

The pollution problems of the leather industry must be viewed in the context of the overall expansion of industrial activity, but the tendency of tanneries to group in centres, their dependence on water, and the potentially toxic nature of the chemicals emitted in their liquid, solid and gaseous wastes, places the leather industry high on the list of environmentally hazardous industries. However, groupings with a common effluent treatment system can be economically advantageous.

Liquid wastes

The bulk of tannery waste is water-borne and contains high amounts of putrefactive organic material, as well as potentially toxic inorganic substances, both in the dissolved and suspended states. The impact of this waste on the environment depends on the type of tannery, the degree of treatment if any, and whether the tannery discharges into a watercourse or sewer or onto land.

The most common method of effluent disposal in developing countries is into surface water. The water becomes turbid, coloured and noxious due to the infusion of suspended organic matter and the presence of vegetable tannins and dyes. The decomposition of organic matter may deplete the dissolved oxygen in the water that is vital for aquatic life. Inorganic salts may make the water saline and hard, and the presence of ammonia, sulphides and chromium may introduce a measure of toxicity. The turbidity and colour can interfere with the photosynthesis process, and thus effect the primary link in the food chain. Sludge deposition also depletes the dissolved oxygen and contributes to the general deterioration in the physical, chemical and biological nature of water that would otherwise support fish and plant life and would provide valuable potable water supplies for communities and industrial and agricultural use.

The effects of emissions depend upon the size of the industry and the size and the ability of the watercourse to assimilate the effluent. If a river is already heavily polluted by a different industry upstream, further pollution may not seem critical, but the results of reactions with chemicals already in the river must be studied.

Disposal of liquid and solid wastes on land may seem the obvious alternative to watercourse disposal, and this too has been in common practise in developing countries. Tannery wastes, because of their high content of dissolved solids, may affect soil fertility either beneficially or adversely. The potentially toxic chemicals could contaminate ground water, and decomposing organic matter is usually a pungent nuisance to the public.

In New Zealand,[20] land has been irrigated with tannery effluent for years without deleterious effect, but according to studies carried out in India and elsewhere, effluents have retarded the germination of certain plants,[21] and accumulations of sodium and chlorides in the soil have led to the destruction of its structure, the formation of clay, and consequent reduction in porosity and aeration. Opinions are divided regarding the toxicity of trivalent chromium to plant life; there is general agreement, however, on the toxicity of hexavalent chromium. Usually, only trivalent chromium is emitted from a tannery, but if this waste is incinerated, it is converted to hexavalent chromium.

Where municipal sewerage systems exist, the responsible authorities usually require that the effluent be treated prior to emission, in order to safeguard the sewers against damage from corrosive chemicals, and against encrustation. Tanners are usually required to control the pH, sulphide, grease and suspended solids content of their effluents. Insoluble calcium carbonate

combined with hair and grease can quickly encrust the walls of a sewer. Sulphide can endanger the health of sewer workers, especially when mixed with acidic waste from another source releases gaseous hydrogen sulphide. Hydrogen sulphide, in turn, can be converted into sulphuric acid by contact with dissolved oxygen, and attack the structure of the sewer.

It is necessary to study the effects on the municipal sewage plant of tannery effluent mixed with municipal waste. As these effects depend on the balance between the two sources, tolerances must be worked out. It should be noted, however, that excessive acidity or alkalinity interferes with the activated sludge treatment; hair and fleshings can clog sludge-removal equipment; excessive organic loads can overload a plant, and lime sludges can interfere with sedimentation. At normal levels of emission, however, sulphide and chromium should not prove troublesome.

Solid wastes

The chart on the following page shows the most common means - both correct and incorrect - of disposing of solid wastes. The information it contains is particularly relevant to developing countries.

The working environment

The tanning industry in developing countries is largely lacking in legislation controlling the working environment. Health hazards are many and include the possibility of contracting anthrax from infected skins, dermatitis, ulcers from handling chemicals, and respiratory ailments caused by gaseous conditions and dust-laden atmospheres. The fact that in several countries tannery workers are regarded as socially inferior, inhibits progress towards their relief.

Minimizing adverse environmental impact

Tanners in developed countries have long been obliged to conform to government and local environmental regulations: either they treat their effluents to meet certain standards or they are penalized, and possibly even closed down. As tanners in the developing countries will eventually be faced with the same situation they should prepare themselves now to meet the challenge. Changes in process technology can greatly reduce pollution loads, and indeed new tanneries can be built which are environmentally sound. It is always cheaper to include treatment schemes in new plant than to install them at a later date.

Solid waste disposal

| Waste | Environmentally unsound | Environmentally sound |
|---|---|---|
| Salt dust | Storing in heaps and allowing to be washed away by rain | Solar evaporation after dissolving in minimum amount of water and re-using in pickling etc. |
| Raw, green fleshings | Piling in tannery yards and allowing to putrefy | Immediate disposal for glue manufacture, animal feed etc. |
| Hair | Allowing to choke effluent drains | Washing, drying and utilization for carpet, drugget industry etc. |
| Lime sludge | Allowing to be disposed of into sewers or rivers, thereby choking them | Utilization for building construction, soil conditioning etc. |
| Limed fleshings splits and trimmings | Piling in tannery yards and allowing to putrefy | Utilization for glue and gelatine manufacture, animal feed, etc. |
| Vegetable tan bark | Dumping inside tanneries | Use as fuel and stable ground cover |
| Vegetable tan sludge | Allowing entry into effluent flow | Fertilizer, soil conditioner |
| Vegetable and chrome tanned shavings and splits | Using for agriculture | Manufacture of leather boards, reducing chrome liquors etc. incineration along with sludge [a] |
| Effluent sludges | Drying in open yards, disposal into water course, lagooning indefinitely | Dewatering and incinerating along with other solid wastes |

[a] The most relevant utilization today is leatherboard production. (See Annex II).

Used liquors can, after analysis and recharging with chemicals, be used again. Lime and chrome liquors are particularly suitable for recycling: maximum use is made of chemicals, and the most polluting liquors are withheld from effluents. Modern process vessels lend themselves well to recycling as the liquors can be readily isolated in separate tanks for recharging. The solution for the cottage sector of the industry in the developing countries, which may remain large, may be communal waste treatment for groups of tanners.

As industrial, environmental and regulationary factors vary tremendously - from tannery to tannery, from region to region and from country to country - the successful implementation of low-cost effluent treatment schemes may depend on the availability of expert consultancy services; these, however, are not always available in the developing countries at this time. The capital costs of effluent treatment plants for chrome and vegetable tanneries, their relationship to plant replacement, and their financial effects have to be clearly understood.

According to a study conducted in the United States, [22] some 30 per cent of the tanneries processing less that 300 hides a day in that country may have to close down in face of the high cost of treating effluent to the standard required by the authorities. In the developing countries, the cost burdens would be lower in keeping with the low-cost technologies generally used.

In the United States, tanners are obliged to provide complete effluent treatment, including screening, equalization, settling, biological treatment, chlorination and sludge handling - to which might be added nitrification and denitrification. In India, by contrast, a low-cost technology would involve a three-stage treatment of mixing and settling and treatment in anaerobic and aeration lagoons, or in oxidation ditches. The capital cost of treating effluent to roughly equal compositions from a 500 hides/day tannery would be $550,000 in the United States compared to $32,650 in India. [14] This implies a distinct incentive for the shifting of leather production facilities to the developing countries.

As urban areas expand, they often encompass long established tanneries. Governments in several countries are actively encouraging such tanneries to move to new areas in order to relieve the cities of the effluent problems and malodorous aura of the tanneries. Nevertheless, the tanners prefer to remain near their customers, suppliers and banks and can only be induced to move through official industry development plans, or when legislation is passed denying industrial licensing to polluting industries. An ideal solution might

be the establishment of well planned industrial estates on the periphery of major cities, devoted mainly to the meat industry and its by-products, of which leather is the most important. The Korangi estate near Karachi, Pakistan, is an example of such a relocation of industry.

The factors involved in minimizing adverse impact on the environment in the achievement of the Lima target are legion. The level of technology implemented will depend on the availability of low-cost construction materials, the economy of scale achievable from the number of participating tanneries and their volume of production and related effluent emissions. The type of plant constructed will depend on the availability of land, the climatic conditions, the situation of the site, and the availability of water for dilution. The industry must be willing to move to low-float processing, recycling and even reuse of water. It is quite conceivable that the industry could use good-quality sewage works effluent.

Governments have a valuable role to play other than the imposition of regulations to protect the environment; positive assistance can be given to the leather industry through fostering improvements in the collection and preservation of raw materials; through the granting of loans, grants and subsidies to speed industry towards its goal; and through the provision of reputable consultancy services to evaluate the needs of individual tanneries or groups and to design appropriate effluent treatment schemes.

## Capital and production costs

### Capital costs: hide

The capital costs of tanneries can vary greatly. Some variations are due to local circumstances, but others can only be ascribed to the over-specification of prestige projects. Major variations resulting from the availability or otherwise of local tanning machinery and expertise, coupled with local building regulations and costs, are justifiable.

As part of the present study, UNIDO commissioned a desk survey in Argentina on hide tannery capital costs, at three levels of throughput. However, as Argentina has both the capacity to produce, and the expertise to install, most of the tanning machinery it needs, data given for these items, in that study, may be well below levels applicable in many other parts of the developing world. Alternative capital cost data (for a similar production level) is given in a paper prepared for UNIDO in 1973[17] relating to capital requirements in an

African country which imported all plant, machinery and drums (with large stocks of spares) and which, due to lack of local expertise, had to have the machinery installed by expatriate personnel at great cost.

Finished leather: hide, upper leather

Table 23 shows the two sets of capital costs as they relate to finished leather, with the 1973 study figures adjusted for inflation to 1977 levels and a mean capital cost derived from the two sets of data (which may be more universally realistic).

It should be noted that while there is little variation in the total capital requirements, there is some in the total fixed capital. Of more importance, however, may be the relative costs of machinery, spares, machinery installation and service, effluent treatment and the boiler. In the Argentinian survey, these items account for 41 per cent of the fixed capital, whereas in the African one (the items being imported) they could account for some 66 per cent of the fixed capital.

In the table, a difference in volume throughput between the two sets of capital costs given may be noticed. However, in African data, where reference is made to 9 million $ft^2$ per annum, the raw material in question would be air dried hides necessitating more processing than the Argentinian wet salted ones. Further, as African hides are generally inferior in quality on the grain than their Argentinian counterparts, necessitating additional processing - the two units may reasonably be averaged. The two sets of capital costs for crust leather (semi terminado) and wet blue hide are quoted in Tables 24 and 25, and new "mean capital" figures obtained.

Thus, the "average" capital costs for a new tannery with a throughput of 9 - 10 million $ft^2$ of upper leather per annum can be summarized. As the majority of developing countries are obliged to import most of their plant, machinery and expertise, however, it is also necessary to note the amounts of capital that will be required to purchase and install the plant, machinery and services (see tables), as these will require foreign currency.

Hide: sole leather

Few capital estimates have been published recently for vegetable tanned hide units. A paper prepared for UNIDO in 1973 [23] quoted fixed capital costs for a modern, rapid sole leather unit. This paper suggested that plant and machinery costs for a throughput of 200 hides/day (8/10 kg dried hide) would

Table 23. Comparison of capital costs for hide tannery producing finished leather

| | 1,200 wet salted Argentinian hides/day [13] (10.08 million sq. ft. per annum with local machinery and expertise available) | | 1,200 dried African hides/day [40] (9.0 million sq.ft. per annum using imported machinery and expertise) | | Mean capital | |
|---|---|---|---|---|---|---|
| | $ | per cent of fixed capital | $ | per cent of fixed capital | $ | per cent of fixed capital |
| **A. Fixed capital** | | | | | | |
| Site | 17,648 | 0.5 | 120,000 | 2.9 | 68,824 | 1.8 |
| Building | 1,478,381 | 45.3 | 810,000 | 19.3 | 1,144,190 | 30.6 |
| Machines | 945,382 | 28.9 | 1,575,000 | 37.5 | 1,260,191 | 33.8 |
| Spares | 48,949 | 1.5 | 157,500 | 3.7 | 103,224 | 2.8 |
| Installation of machinery | 13,529 | 0.4 | 315,000 | 7.5 | 164,264 | 4.4 |
| Installation of services | 82,241 | 2.5 | 510,000 | 12.1 | 396,120 | 10.6 |
| Effluent treatment | 200,000 | 6.1 | | | | |
| Boiler | 52,941 | 1.6 | 216,000 | 5.1 | 134,470 | 3.6 |
| Laboratory | 20,588 | 0.6 | 15,000 | 0.4 | 17,794 | 0.5 |
| Maintenance workshop | 73,529 | 2.3 | 60,000 | 1.4 | 66,764 | 1.8 |
| Vehicles | 26,764 | 0.8 | 40,500 | 1.0 | 33,632 | 0.9 |
| Other | 10,000 | 0.3 | - | | 5,000 | 0.1 |
| Contingencies (10 per cent on above) | 296,995 | 9.1 | 381,900 | 9.1 | 339,447 | 9.1 |
| Total fixed capital | 3,266,947 | | 4,200,900 | | 3,733,923 | |
| **B. Working capital** | | | | | | |
| Raw hides | 889,412 | | 631,800 | | | |
| Chemicals | 281,686 | | 233,234 | | | |
| Work in progress | 590,118 | | 891,939 | | | |
| Finished goods | 1,552,941 | | | | | |
| Other | - | | 792,127 | | | |
| Total working capital | 3,314,157 | | 2,549,100 | | 2,931,628 | |
| **C. Start-up capital** | | | | | | |
| Feasibility studies consultancy etc. | 126,621 | | Bought with machinery | | | |
| Total start-up capital | 126,621 | | | | 63,311 | |
| Total capital (A + B + C) | 6,707,725 | | 6,750,000 | | 6,728,862 | |

Table 24. Comparison of capital costs for hide tannery producing crust leather (semi-terminado

| | 1,200 wet salted Argentinian hides/day [13] (10.08 million sq. ft. per annum with local machinery and expertise available) | | 1,200 dried African hides/day [40] (9.0 million sq.ft. per annum using imported machinery and expertise) | | Mean capital | |
|---|---|---|---|---|---|---|
| | $ | per cent of fixed capital | $ | per cent of fixed capital | $ | per cent of fixed capital |
| Machinery, spares, installation of machinery and services. Effluent treatment and boiler | 1,062,909 | 39.8 | 2,121,000 | 67.4 | 1,591,955 | 54.7 |
| Capital | | | | | | |
| Total fixed | 2,667,721 | | 3,149,025 | | 2,908,373 | |
| Total working | 2,678,545 | | 2,100,975 | | 2,389,760 | |
| Total start-up | 105,069 | | Bought with fixed capital | | 52,534 | |
| Total capital requirement | 5,451,335 | | 5,250,000 | | 5,350,667 | |

Table 25. Comparison of capital costs for hide tannery producing wet blue

| | 1,200 wet salted Argentinian hides/day [13] (10.08 million sq. ft. per annum with local machinery and expertise available) | | 1,200 dried African hides/day [40] (9.0 million sq.ft. per annum using imported machinery and expertise) | | | |
|---|---|---|---|---|---|---|
| | $ | per cent of fixed capital | $ | per cent of fixed capital | $ | per cent of fixed capital |
| Machinery, spares installation of machinery and services. Effluent treatment and boiler | 504,933 | 40.4 | 954,000 | 63.9 | 729,466 | 53.2 |
| Capital | | | | | | |
| Total fixed | 1,248,491 | | 1,493,250 | | 1,370,870 | |
| Total working | 1,952,986 | | 1,506,750 | | 1,729,868 | |
| Total start-up | 54,444 | | Bought with fixed capital | | 27,222 | |
| Total capital requirement | 3,255,921 | | 3,000,000 | | 3,127,960 | |

Table 26. Average capital costs for hide tanneries

(Thousands of dollars)

| | To finished state | To crust (Semi terminado) | To wet blue |
|---|---|---|---|
| Plant, machinery and services installed | 2,058 | 1,592 | 729 |
| Fixed capital | 3,734 | 2,908 | 1,371 |
| Total capital | 6,729 | 5,351 | 3,128 |

vary from $188,089 to $448,076. Similarly, total fixed capital costs would vary from $231,452 to $534,902, depending upon whether new or reconditioned machinery was employed. Some 200 hides would provide soles for 4,000 - 5,000 pairs of shoes.

Capital costs: skins

The number of end products from tanned skin may be greater than those from hide leather. Some skin tanneries specialize in particular items, whereas others produce a full range of products. The capital estimates prepared for this study apply to a skin tannery producing sheep and goat leathers for lining, garments, gloving and glacé. The outline data for a tannery geared to produce 4,000 - 5,000 pieces daily (or 6 million $ft^2$ per annum), using imported machinery and expertise are given in Table 27.

Table 27. Capital costs: skin tannery

| | | Dollars | Per cent of fixed capital | |
|---|---|---|---|---|
| (A) | Fixed capital | | | |
| | Site | 72,000 | 2.0 | |
| | Building | 1,248,660 | 35.4 | |
| | Machinery | 979,430 | 27.8 | ) |
| | Spares | 74,822 | 2.1 | ) |
| | Installation of machinery | 193,955 | 5.5 | ) 55.3 |
| | Transformer and installation of services | 512,617 | 14.5 | ) |
| | Effluent treatment | 36,000 | 1.0 | ) |
| | Boiler | 156,139 | 4.4 | ) |
| | Laboratory | 7,200 | 0.2 | |
| | Maintenance workshop | 32,029 | 0.9 | |
| | Vehicles | 27,600 | 0.8 | |
| | Other | 20,000 | 0.6 | |
| | Contingencies (5 per cent on above) | 168,023 | 4.8 | |
| | Total fixed capital | 3,528,475 | | |
| (B) | Working capital | | | |
| | Raw skins | 533,056 | | |
| | Chemicals | 187,074 | | |
| | Work in progress ) Finished goods ) | 900,000 | | |
| | Other | 179,870 | | |
| | Total working capital | 1,800,000 | | |
| | Total capital requirement (A + B) | 5,328,475 | | |

Economies of scale

Capital costs for units producing 10 million, 5 million and 2.5 million $ft^2$ per annum of hide leather (finished, crust and wet blue) have been prepared elsewhere[15] The advantages derived from economies of scale may be seen in Tables 28 and 29, and in Figure 4.

Table 28. Fixed capital for a hide tannery with varying throughput and at various stages of processing

(Thousands of dollars)

| Million $ft^2$ per annum | Finished | | Crust | | Wet blue | |
|---|---|---|---|---|---|---|
| | Fixed capital | Per million $ft^2$ per annum | Fixed capital | Per million $ft^2$ per annum | Fixed capital | Per million $ft^2$ per annum |
| 10 | 3,267 | 327 | 2,668 | 267 | 1,248 | 120 |
| 5 | 2,058 | 412 | 1,683 | 337 | 760 | 152 |
| 2.5 | 1,298 | 519 | 1,105 | 442 | 501 | 200 |

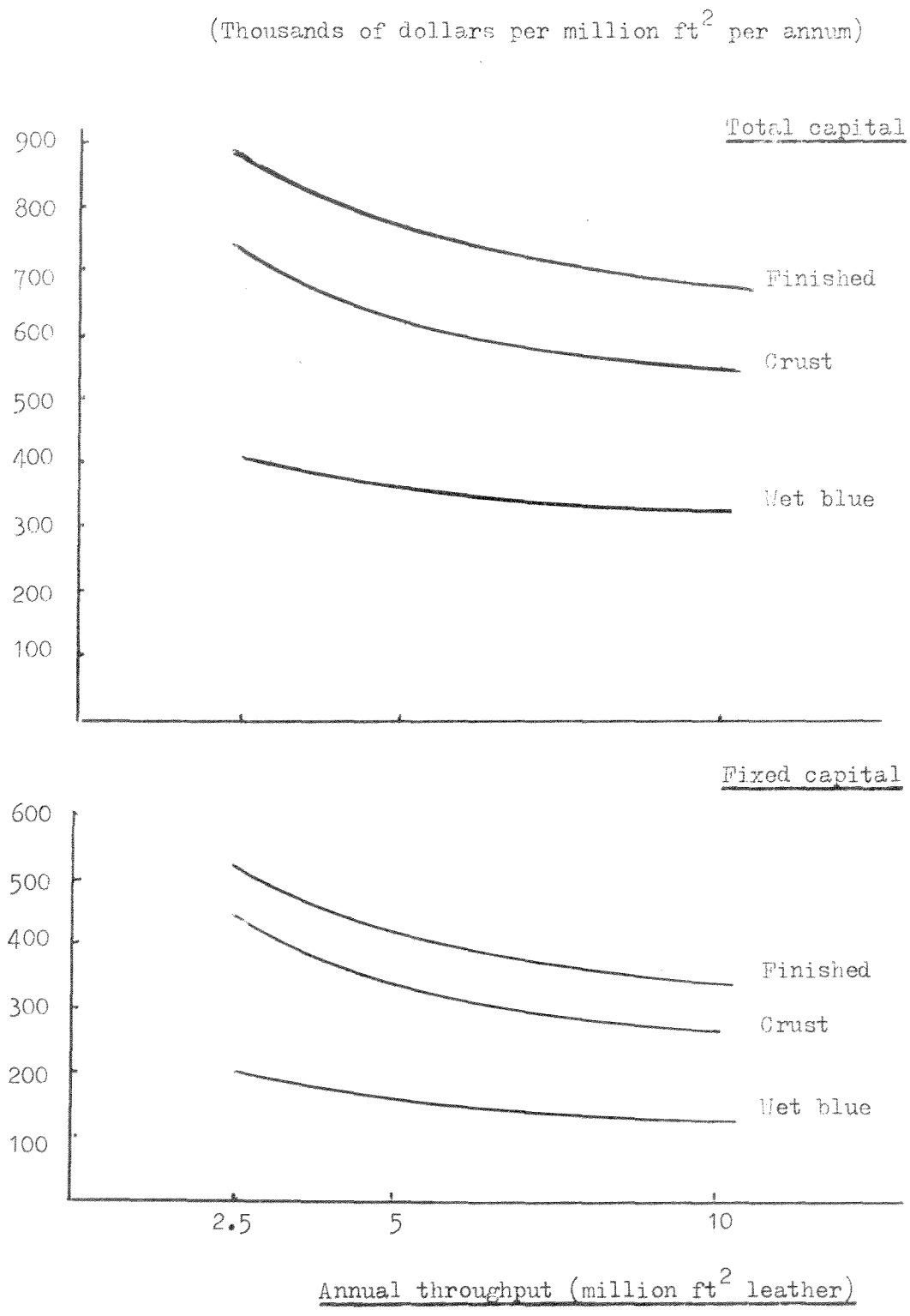
Table 29. Total capital for a hide tannery with varying throughput and at various stages of processing

(Thousands of dollars)

| Million $ft^2$ per annum | Finished | | Crust | | Wet blue | |
|---|---|---|---|---|---|---|
| | Fixed capital | Per million $ft^2$ per annum | Fixed capital | Per million $ft^2$ per annum | Fixed capital | Per million $ft^2$ per annum |
| 10 | 6,708 | 671 | 5,451 | 545 | 3,256 | 326 |
| 5 | 3,800 | 760 | 3,091 | 618 | 1,772 | 354 |
| 2.5 | 2,189 | 876 | 1,824 | 730 | 1,015 | 406 |

However, although economies of scale obviously bring capital and production cost advantages, certain technical authorities suggest that very large (many new units have throughputs of over 10 million $ft^2$ per annum) units are not always economically advantageous.

Figure 4. Economies of scale for hide tanneries. Fixed and total capital requirements for varying throughputs/process stages



In areas where hides and skins are relatively homogeneous (e.g. Argentina and Australia) there appears to be no impediment to large production units. In countries, however, where hides and skins can only be described as "mixed", hides and skins in large, new projects may not be selected with sufficient care and supervision to obtain the maximum economic use from them. In such circumstances, the apparent economic capital disadvantage of the small or medium production units (2.5 - 5 million $ft^2$ hides per annum), is outweighed by the higher sales price per unit of production which the keen selection and supervision in smaller production units allow.

Thus, while on capital cost considerations alone hide tanning units with a throughput of 10 million $ft^2$ per annum might be the minimum economical size, from an overall economic and financial efficiency viewpoint, 5 million $ft^2$ per annum might well be a more advantageous figure in many situations.

Reconditioned machinery

As discussed elsewhere in this study, tanning machinery is robust and durable and not subject either to rapid obsolescence or to radical changes in design. There is scope, therefore, for the initiation of new projects in the developing countries, using secondhand machines.

Manufacturers nowadays offer reconditioned machines that are almost as good, technically, as new plant, at a saving of some 40-50 per cent on new prices (or an overall saving of 10 per cent or so on foreign currency requirement).

Many successful commercial projects have been initiated using reconditioned machines, yet the governments of many developing countries continue to view them with scepticism. Given the number of tannery closures in the industrialized countries, and the availability of a large pool of good secondhand machines, developing countries should give serious thought to the possibilities offered, rather than rejecting the notion out of hand.

Sources of capital

In Argentina, Brazil, India and other developing countries which produce domestically tanning machinery and many of the chemicals required, virtually no foreign currency inputs are needed. In most developing countries, however, a large percentage of the total capital is required as foreign currency. It has been reckoned [17] that the currency requirements for a finished leather project using imported machinery and expertise break down as follows:

| | Per cent | |
|---|---|---|
| | Foreign | Domestic |
| Fixed capital | 70.3 | 29.7 |
| Working capital | 20.8 | 79.2 |
| Total capital | 51.6 | 48.4 |

It may be noted that the two independent sets of capital cost data quoted earlier for the hide tannery are relatively close. However, it should not be assumed that all new tannery projects have been financed at such levels. Again, many "prestige" projects launched recently in Africa and Asia appear to have absorbed two or three times more capital than was necessary.

The percentage of leather-soled and -uppered shoes currently produced and traded varies greatly; it is expected, however, that in the developing countries the proportion will reach some 25 per cent. To achieve this figure, the following mix is suggested:

| | | | |
|---|---|---|---|
| One upper leather unit | at 10 million $ft^2$ per annum | = | 6.25 million pairs of shoes per annum |
| One small sole unit | at 200 hides per day | = | soles for 1.5 million pairs of shoes per annum |

Production costs

Production costs vary greatly according to the type of raw material being used, the efficiency and location of the tannery, and the processing of the end product.

In many of the large "prestige" units that have been initiated with high capital inputs in certain developing countries, the production costs bear no relationship to international cost levels. Many of these over-capitalized units are run inefficiently, have low capacity utilization, and are able to exist only by virtue of government subsidy, or by keeping the domestic price of raw hides and skins depressed - a harmful practice which lessens the primary producers' incentive to bring the raw material to market.

With recent rapid fluctuations in hide prices (see Chapter II), the relationship of raw material to total production cost has varied greatly. This can be seen from Table 30, which gives a breakdown of production costs in Argentina/[15]/

Table 30. Annual production costs (corrected grain upper leather)

| | Dollars | Percentage of total production costs |
|---|---|---|
| Rent | 10,558 | 0.1 |
| Building maintenance | 31,213 | 0.4 |
| Machine and plant maintenance | 58,141 | 0.7 |
| Depreciation | 248,035 | 3.1 |
| Interest on capital | 670,772 | 8.5 |
| Chemicals | 1,126,743 | 14.3 |
| Management | 354,353 | 4.5 |
| Labour | 322,200 | 4.1 |
| Fuel | 120,782 | 1.5 |
| Electricity | 86,273 | 1.1 |
| Water | 70,588 | 0.9 |
| Effluent treatment | 23,529 | 0.3 |
| Office expenses | 88,094 | 1.1 |
| Sales expenses | 20,329 | 0.3 |
| Packing | 14,706 | 0.2 |
| Freight | 11,765 | 0.1 |
| Sales commission | 121,976 | 1.6 |
| Other expenses | 64,147 | 0.8 |
| Raw hides | 4,447,060 | 56.4 |
| Annual production costs | 7,891,264 | |
| Taxes | 551,073 | |
| Total production costs | 8,442,337 | |
| Estimated sales revenue | 10,049,083 | |
| Profit | 1,606,746 | |
| Profit as percentage of total production costs | 19 | |

These desk study production costs are summarized below for comparison with recent data received (private communication to the authors) on the production costs of corrected grain leather in Europe.

Table 31. Comparative breakdown of production costs

| | Per cent | |
|---|---|---|
| | Argentina | Europe |
| Raw hides | 56.4 | 55 |
| Chemicals and water | 15.2 | 16 |
| Energy | 2.6 | n.a. |
| Management and labour | 8.6 | 18 |
| Fixed costs and overheads | 17.2 | 11 |
| Total production costs | 100 | 100 |
| Value added to raw hides | 77.3 | 81.8 |

While labour costs are appreciably lower in Argentina, fixed costs are higher in that country due to the greater cost of new, undepreciated, production plant. Argentina produces much of its own chemicals, which explains the close measure of agreement in that item. In many other developing countries, chemical costs may be expected to be somewhat higher due to freight charges, and these costs are often further inflated by local import duties and handling charges. In many developing countries, chemicals appear to represent a higher percentage of total production costs than in the example above as a result of efforts to protect inefficient industry by keeping hide and skin prices at artificially low levels.

It will be appreciated from the foregoing that in many countries which import chemicals, and in which much of the depreciation and interest payments relate to foreign currency, the economic advantages of tanning may be minimal.

The Argentinian data, as tabulated, show a much higher profit than is usually obtained in developing countries (owing in part to the inflationary situation in Argentina, and in part to efficiency and competition in the sector). In many developing countries, profits are either non-existent or at single figure levels in private enterprises.

## Technical developments and trends

Although no radical changes have taken place in chemical tanning technology since the introduction of one-bath chrome tannage at the end of the last century, there have been a multitude of new developments as well as improvements to existing products and processes.

Developments in technology have often resulted from constraints placed upon the industry. Increased labour costs in the developed countries have hastened the design of labour-saving methods and machinery, composite wet processing in semi-automated equipment, and mechanical throughfeed processing. The efficiency of throughfeed mechanical processing has in turn directed research attention to throughfeed wet processing, and several systems have been introduced on a pilot scale. This trend means that leather manufacture will eventually change almost entirely from batch to continuous production.

The high cost of labour has not been the only constraint: the cost of financing stock in process has encouraged the development of rapid processing, and effluent emission regulations and treatment costs have motivated continuing work on low-float wet processes and recycling liquors. The cost of energy is a more recent problem, but one which has grown significantly since the major oil price rise early in the decade. Major developments in the industry took place at a time when fuel was relatively cheap. This mechanization, although requiring increased energy, greatly improved the efficiency of output. Today, however, energy economy and optimum utilization is a serious criterion to be added to the overall tannery efficiency equation.[27] Engineers and technologists have introduced such energy-saving equipment as turbine-type drums which use only a fraction of the power required for normal drums, leather drying chambers wherein the air is dehumidified using a heat pump, semi-automated systems with precise controls, and various means of collecting and recycling waste heat from dryers and boilers.

The demands of the market have also initiated developments. The threat of severe competition from synthetic alternatives put some impetus into the development of leathers which displayed to best advantage their natural properties and appearance. The oil price rise and the consumer trend to "things natural" also acted in the industry's favour in this respect.

The chemical industry has developed a wide range of chemicals, auxiliaries, dyes, finishes etc. which enable tanners to produce leathers to precise requirements. It has been possible to offer softer and lighter leathers for fashion footwear, bags, clothing and upholstery. It has also been possible to produce clothing leathers with high levels of fastness to drycleaning, and shoe and upholstery leathers with high resistance to scuffing. The use of modern technology in leather processing, especially the use of polymers, has given leather the capacity to meet the physical performance demanded of it while at the same time retaining and improving its unique aesthetic qualities.

In general, developments will keep pace with the needs of business and the demands of the market. Constraints upon the industry vary from region to region, however: labour and effluent treatment costs are usually lower in the developing countries than in the developed, while capital costs and costs of chemicals and machinery are higher. Such drawbacks in the developing countries are often offset by state incentives to exporting industries. Nevertheless, these countries often remain at a disadvantage because they do not always have the technical ability to use sophisticated technologies in a consistent manner. It behoves them to gradually acquire these abilities, not necessarily in the interest of labour efficiency, as it may be socially desirable to have high levels of employment in the industry, but for the sake of producing leathers with consistency in properties and aesthetic qualities. No major breakthroughs in processing technology have been made for many years, but should they occur in the developed countries before the industry in the developing countries has had the opportunity to improve its chemical engineering abilities, it could swing any production advantage gained back to the developed world.

Salt does not constitute a serious effluent problem at present, but in many countries control regulations which will restrict its use are imminent. This will accelerate a trend towards the greater use of fresh hides where possible, and the use of alternative methods of short-term preservation. Several biocide and chemical systems have been tried, but they have been no match for the preservation results obtained using salt. The most hopeful prospect is chilling and freezing,/6 (9/74)/ the former for transport within a country, the latter for export. It is entirely feasible that the meat industry could co-operate by using part of its refrigeration systems to operate hide-chilling rooms. For preservation beyond three weeks, in temperate climates, however, tanners would need to re-chill the hides.

Equipment for wet processing is likely to remain similar to that currently used - large drums, mixers, or Y-compartment drums - but more precise means will no doubt be developed for controlling the internal conditions, the injection of chemicals, the recirculation of liquor, the isolation of used liquor for re-charging prior to reuse, and the loading and unloading of stock. There is a possibility the oscillating tunnel processors will prove successful, which would mean a move towards continuous wet work. They have proven feasible at pilot scale, not only for soaking through to chrome tanning, using a continuous spray and squeeze principle,/27/ but also for the post tanning processes using a foulard system whereby leathers are carried between porous belts through

successive squeeze rollers and neutralization, retanning, dye and fat liquor baths.

What of solvent processing? It has been postulated that acetone dehydrated pelt in the bated condition could be used commercially. At least one American tannery runs a solvent tanning system, and a patented process has recently been introduced for pickling, tanning and fat liquoring furskins, woolskins and light skin grain and suede leathers in a solvent medium. /6 (6/77)/ Technology exists for adding solvent dyeing to this sequence, and all that prevents hide leathers from being included in the list is the absence of machinery of the right size. From a time and effluent viewpoint, solvent processing is attractive; it remains to be seen, however, whether it is economically viable in its entirety.

Stringent effluent regulations have brought about the closure of many tanneries in the developed countries. Other tanneries have switched to the use of wet blue material, either domestic or imported. Centralized plants for taking hides to the wet blue state are few in number, but such economies of scale could make large investments in effluent treatment plant more attractive, and the reclamation and processing of trimmings and fleshings for glue and gelatine manufacture more feasible. Even the precipitation of proteins from effluent could be contemplated. High hide prices focus attention on better returns, not only from splits but also from protein and fat by-products.

By segregation of the tanning and finishing processes, a greater degree of specialization could be developed. The wet blue processor would concentrate on maximum commercialization of hide material, and the dresser would refine dressing and finishing techniques for use on an expertly tanned material. The situation could develop wherein a primary tanner would regard himself as a hide processor in the broadest sense. In an improved market situation, he could divert low-grade hide and untanned splits into edible collagen; for which there is a growing demand, for use in sausage casings, as a meat extender, and in other applications.

Methods of drying will progress concomitant with efforts to save on energy; the French air dehumidification system is of particular significance in this respect. /6 (6/76)/

In the post-tanning wet processes, the criterion will be the precise modification of leathers to market needs. Speed, substance and fastness to various physical and chemical conditions will be required to meet this challenge. Graft polymerisation of acrylic and vinyl monomers onto chrome leather, coupled with the use of polymerisable dyestuffs has proved successful in instituting a

system whereby soft and drycleanable leathers can be produced. The development of substantive synthetic fat liquors, some of them replacing rapidly diminishing resources of sperm oil, promise also to enhance the utility of a whole range of leathers.

In finishing, the introduction of polyurethane systems has brought in its train the probability of the use of polyamide, epoxy and other polymeric systems. Application will probably tend more toward aqueous spraying, and there is the likelihood of increased roll coating and transfer finishing.

Modern tanneries are moving towards continuous processing and many have installed the latest throughfeed equipment. Machine operations successfully accomplished on fullscale throughfeed equipment include splitting (this has to be throughfeed), sammying, drying, staking, buffing, finishing, ironing and measuring. No truly successful throughfeed machines for fleshing and setting out have yet appeared. By the year 2000, however, modern tanneries should be working on continuous rather than on batch production, the whole operation, from production and stock control to sales and salaries being monitored by computers [6 (12/73)]. It is not likely that batch production will disappear, as from time to time in the sequence the stock will have to be sorted and graded for most suitable use, according to each unit's inherent substance and qualities.

Although some of the processes described here may appear to herald radical changes, they are merely the fruits of continued improvements on basic chemical and engineering technologies. Perhaps the developed world is in a better position at present to take advantage of them, but as the overall industrial picture improves in the developing countries over the next two decades, the leather industry in these countries should progress to a position where it too can share fully the benefits of this sophisticated technology.

## Trends and factors influencing production of and demand for leather

The most marked developments in the leather industry in the past two decades have been the introduction of substitute materials into traditional markets, and the boom in leather garments and accessories as a result of which the material has taken on an unprecedented fashion appeal, but which is subject to sudden changes in consumer preference.

Substitute materials

With the advent of substitute shoe-soling material, plastic sheet material together with plastics suitable for injection moulding and the more sophisticated poromerics, the leather industry has undergone a certain readjustment.

Substitute soling materials have greatly reduced the amount of leather (generally vegetable-tanned) used in shoe manufacture. The pattern to be observed in Europe is being repeated throughout the world: even in leather-rich Latin America, less than 50 per cent of leather-uppered shoes are reported to have leather soles.[25]

Proportion of shoes with leather soles in total production of men's leather-uppered footwear, 1960-74

(Per cent)

| | 1960 | 1966 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| Italy | 80 | 69 | | 70 | |
| Portugal | 60 | 40 | 40 | | |
| Sweden | 42 | 17 | 3 | 2 | |
| Spain | 65 | 47 | 42 | 39 | 32 |

Source: Organisation for Economic Co-operation and Development, The Hides and Skins Industry: 1962 Statistics; The Hides, Skins and Footwear Industry in OECD Countries 1963/64; The Footwear, Rawhides and Skins and Leather Industry in OECD Countries 1973/74, Paris, relevant years.

Plastic sheet and injected plastic footwear have made major inroads into the low-price footwear markets, where they have met the need for footwear in the less affluent areas of the world, without competing directly with leather footwear. The ease and economy of production have made it possible to bring shoes to millions who would have gone without. The low level of foot comfort and aesthetic appeal offered by these synthetic products might in the long term prove advantageous, since leather can be directed towards the manufacture of products with a higher value added.

Despite their reduced comfort to the wearer, poromeric shoe-upper materials have made inroads into the leather-uppered footwear markets since they are both cheap and suitable for mass production. At the same time, however, competitive poromerics have helped to reduce the demand for leather and thus limit increases

in hide and leather prices, which in the absence of alternative material would have reached astronomical heights.

Sheet plastics have largely replaced leather in the manufacture of leather goods, as evidenced in Latin America where despite the abundance of raw materials over 80 per cent of handbags and travel goods are reported to be made of substitute materials.[25]

New leather garments and accessories

In the developed countries, consumer acceptance of leather clothing and of fashion accessories such as belts has increased the demand for softer leathers. As the supply of suitable skins is limited, tanning techniques have been modified to allow production of clothing leathers from bovine hides. More stable dyes and finishes are called for and a growing use of nitro-cellulose and urethane-type finishes is to be observed.

Leather usage in developed countries. Selected years

| | Per cent | |
|---|---|---|
| | 1968 | 1977 |
| For use in: | | |
| Shoes | 60-70 | 50-60 |
| Leather goods and accessories | 15-20 | 20 |
| Clothing | 3-5 | 20-30 |
| Gloves | 3-5 | |
| Upholstery and other uses | - | - |

Hides previously used for soling are now used for leather uppers, or are often split for uppers and clothing. In many developing countries, the production of leather sandals has dropped appreciably as the price advantages of PVC-injected slipper-type products become apparent, regardless of consumer preference.

Reorganization of production in developing countries

In recent years, the leather industry has been reorganized on a major scale as the developing countries endeavour to obtain increased value added from the raw material available to them. In 1960, many developing countries produced limited quantities of finished leather for domestic usage and exported the surplus raw material, for which they received a comparatively low return. Today, however, it is accepted that the developing countries export leathers with higher value added in the semi-processed form, such as pickled, semi-tanned (wet blue or vegetable), crust or ready-to-finish, or even as finished leathers.

This increased production and export of semi-processed material have incurred new market developments, as traditional raw importers find themselves with no option but to accept semi-processed materials. Consequently, wet blue and lightly vegetable-tanned leathers are currently in greatest demand, since they can be reprocessed in the importing country and invested with the properties required of the finished product.

The market for ready-to-finish or crust leathers is more limited, since the feel and character of these leathers cannot be adjusted to any great extent. They are purchased only from tanners with established reputations for regularity of processing, which is often best achieved by large mechanized units. Nevertheless, it is generally agreed that ready-to-finish or crust represent the most logical states in which leathers will be traded in the future.

Finished leather is still only traded on a small scale, as the quality standards required are high, and possibly beyond the technical resources of some producers in the developing countries. The most successful trading in this branch emanates from joint-venture projects where the importer establishes a partnership with the tannery and thus assists in obtaining the requisite technical standards.

Regional variations in the tanning industry

In some countries (Chad and Ethiopia for example), large modern, fully mechanized tanneries have been installed despite the absence of any initial long-term external technical and marketing assistance or locally available expertise. In other countries (such as Brazil) where large units have also been installed, long-term technical assistance has been ensured through joint venture contracts, or sufficient expertise has been available. In still other countries (such as India) the main development thrust has been directed towards the extension and modernization of existing tanneries. The course adopted in each case is dependent upon the country's initial capacity and its level of technical skills, as well as on the availability of funds.

Quantitative and qualitative data on a country and regional basis are scant, sparse and unreliable. Many estimates of tanning activity over the past decade are calculated on the assumption that tanning output is equivalent to the domestic consumption of hides and skins, a figure that is obtained by deducting hide and skin exports from the quantities of hides and skins produced domestically. Since the basic figure is frequently known to be a rough estimate, the validity of any figures derived therefrom is debatable.

Caribbean and Central America

With the exception of Mexico, where several mechanized tanneries have been recently established, this region is reported to have made only limited progress in the tanning sector, where operations are generally at the artisan or small-mechanized level.

Data published in the Yearbook of Industrial Statistics[25] in respect of leather and leather products (ISIC 323) show that from 1964 to 1973 the leather sector in Mexico expanded at a rate of 4.4 per cent per annum and that of the Dominican Republic at 7.6 per cent per annum, whereas growth in most of the other countries in the region was either steady or negative.

Latin America

The major tanning centres in the region, whose finished leathers of high quality bear comparison with those of established producers in Europe, are[25]: Greater Buenos Aires in Argentina (35 per cent of regional output); the Rio Grande de Sol, Sao Paulo, and Rio de Janeiro in Brazil (25 per cent) and Montevideo in Uruguay (11 per cent). The balance (29 per cent) is well distributed throughout the region, but the quality of finishing is not as good as in the three areas listed above.

Whereas Brazil and Argentina produce most of their leather processing chemicals (with the exception of aniline dyes and bottom coat resins) and auxiliaries as well as some leather-processing machinery, most of the other countries import the bulk of their chemical and machinery requirements. Most of the leather produced in this region is chrome tanned, although appreciable quantities of sole leather are produced, using locally available materials, such as quebracho in Argentina and Paraguay, and mimosa in Brazil.

The tanning sector has developed significantly in the region, particularly in Argentina, Brazil and Uruguay. In 1960 the region exported 20 million raw hides, but few dressed hides; by 1970, it was exporting only 10 million raw hides and some 8-10 million dressed leathers. In the early 1960s, Uruguay adopted the wet blue process for the export of semi-processed hides. This process was accepted on the international markets, whereupon it was adopted by other developing countries. It was reported[27] that in 1976 Argentina exported 1.2 million raw hides; fully finished and domestically used 4.2 million hides; and exported a further 6.9 million in a tanned or semi-processed condition.

Within the region, the pattern of the industry is varied: Argentina has a large number of medium-sized to large mechanized units, most of which maintain close ties with tanners or merchant houses in the developed countries. Other countries in the region have either small artisan units or large modern tanneries - or some of both. Whereas development in Argentina has been achieved by expanding existing facilities and installing new large-scale units, in most other countries development is contingent upon the establishment of large-scale plants.

The region's rapid advance in the leather sector may be due in part to the fact that, unencumbered by an inordinately large, century-old artisan industry, the sector was able to launch mechanization rapidly on a sound supporting industry base and has since proved most efficient.

Asia

This region, which is a major producer of leather, has extensive traditional tanning capacity and expertise. During the past decade most of the countries in the region have improved their leather sectors. In general, regional exports of raw hides and skins are banned or subject to quotas and export taxes in an endeavour to minimize the export of raw hides. The exports of wet blue and partially finished leathers have therefore greatly increased, and the export of processed leathers has been promoted by Governments within the region through incentives of various kinds. With the exception of India, the countries within the region have to import their tanning machinery and most of the chemicals they require.

The major tanning centres of the region are the Madras area, Bombay, Kanpur and Calcutta in India; Karachi and Lahore in Pakistan; and Dacca in Bangladesh.

India is said to have over 50 large-scale units, 400 medium-scale units and up to 300,000 household units in the leather and leather products sector.[10] This broad variety of units may account for the fact that the growth rate of the tanning sector in India, unlike that of Latin America, has been gradual: Indian leather exports reportedly increased from $57 million in 1964 to $184 million in 1974,[28] which, however, when compared with increases in unit value is not particularly encouraging.

In Iran the situation differs somewhat: during the past few years Iran has set up three large modern tanneries (two for finished bovine hides with a daily output of 1,000 hides and one for finished skins with a daily output of

4,500). Iran has to import 250,000 hides a year, as well as a limited quantity of speciality leathers. At the same time it exports some 20 million raw and pickled skins. It is planned to erect six further large tanneries (five for skins and one for hides) in the hope that Iran will become self-sufficient in shoe leathers and be able to finish the 10 million skins which are currently exported pickled.

The Indian sub-continent has a large domestic market for chappals and other traditional footwear which call for lower qualities of leather than apply to international markets. This sub-region may thus be forced to continue operating a two-tier industry, in which cheap vegetable- and chrome-tanned leathers of a low quality are processed for domestic use and the more sophisticated chrome leathers are reserved for export markets. Maintenance of such an approach, however, may well prove detrimental to rapid sectoral development.

The region has abundant supplies of indigenous vegetable tannins as a result of which an extensive export trade in vegetable-tanned leather, known as East Indian (E.I.) leather, grew up early in this century. Government development plans, directed towards increasing the value added of exports, have in general moved away from the export of E.I. leathers towards mineral tannages, such as chrome leathers in the form of wet blue, ready-to-finish or finished. The outcome of this policy is still open to debate. Data are inconclusive on this subject, and some evidence[29] suggests a decline in the value per kilogramme of finished leathers from 1966 to 1973, a period in which the opposite would have been expected owing to major increases in raw-material values.

Trade sources in India suggest that the transition period from the production of E.I. leathers to that of chrome (semi-finished and finished) leathers has been too brief and adequate equipment is lacking in many units. Although some difficulties may have arisen at present in reaching international quality standards and obtaining higher financial returns, the countries of the region, in particular India, Pakistan and Bangladesh, have a wealth of technical experience. In due course, more satisfactory results will be obtained. The region currently exports wet blue leather of an acceptable standard, although perhaps of lesser value added than the E.I. leathers previously traded.

In addition to the long-established tanning tradition, the region can also call upon the assistance of one of the world's largest leather research institutes, the Central Leather Research Institute (CLRI) at Madras, as well

as upon the support of several universities and schools offering courses, at all levels, in leather technology and science.

The comparatively low rate of development in the leather sector overall may be due to the fact that in many areas the industry is a rural activity carried out at the level of individual households. Moreover, the Government appears reluctant to promote the rapid modernization of the sector in view of the undesirable social effects this might have on present structures.

No reports have been published recently on the leather industry in the centrally planned economies of Asia.

Middle East

Most countries in this region have long-established leather and leather products industries at both the artisan and mechanized level. Many of the countries, generally those with low per capita supply of livestock, utilize their raw material resources to the full, some import raw hides and skins to augment indigenous supplies. Some countries, on the other hand, are unable to process their abundant raw material, and the Yemen Arab Republic, for example, exports a large percentage of its available resources in the raw state.

Turkey has the largest tanning industry within the region. It is reported[30] that the Turkish tanning industry comprised:

| | 1957 | 1964 | 1971 |
|---|---|---|---|
| Mechanized tanneries | 434 | 500 | 677 |
| Non-mechanized tanneries | 1,572 | 1,000 | 500 |
| Labour force | 6,618 | 5,000 | 3,000 |

Rationalization within the industry is to be observed with the increase in mechanized units and closure of non-mechanized tanneries. This notwithstanding - and even if the new units are more efficient than the old - the dwindling labour force would not suggest appreciable growth in tanning capacity. During the past five years, however, more sophisticated operations have been introduced, and products of a higher quality obtained, particularly in the processing of skins for leather garments.

Northern Africa

This region enjoys a long tradition of tanning and leather goods production. With the exception of the Sudan, the countries within the region fully utilize their raw hides and skins, which are processed at least to the tanned, finished leather state. The leather products industry is also well established in most of the countries in this region. Scope for development exists, as some products still originate from rural and artisan industries, where quality standards are not as high as those obtained in more modern production plants. Thus, although the countries within the region make full use of their raw material, they fail to obtain the highest possible value added. Much of the leather and many of the leather goods produced in the area are consumed internally, footwear being the major item. Northern Africa exports some leather products, the most famous of which are decorated leather handbags and pouffes which are also popular tourist purchases.

Statistical data on the value and output of the industry are scant. It can be concluded that the leather industry does not feature prominently in the economies of the various countries since, in general, hide and skin availability within the region is low. Tunisia may be cited as a typical example of the tanning and leather products industry in northern Africa. It has eight industrial tanneries to process 1.2 million sheep skins and 75,000 bovine hides, as well as lesser amounts of goat and camel skins. One tannery is reported to process some 50 per cent of the country's total production, whereupon it must be assumed that the other seven units are relatively small, and perhaps less efficient. It is also reported that some ten rural/artisan tanning units exist, but are not thriving.[5]

At present, the Sudan does not process the majority of its hides and skins. However, a number of large tanning units have been established in the past decade to augment the artisan/rural base of the tanning sector. Recent reports[6] would suggest that the capacity utilization factor within these tanneries is low:

Total annual capacity of tanneries in the Sudan

| | Capacity | Production | Utilization |
|---|---|---|---|
| | pieces | | per cent |
| Hides | 1,205,000 | 629,000 | 52.2 |
| Skins | 4,445,000 | 1,718,750 | 38.7 |

Of the countries within the region, Egypt has perhaps the most modern mechanized tanning sector. It is reported[26] that between 1964 and 1973 the production of leather and leather products (ISIC 323) increased at an annual rate of 12.2 per cent.

Central Africa

In this area, tanning and the manufacture of leather products have been limited due perhaps to the low quality of raw material and the lack of tradition in tanning techniques. Hides and skins are generally exported in the raw state. One major exception is Chad where indigenous vegetable tannins such as Acacia nilotica have been used in the small rural tanning industry to process the ample supply of hides and skins. A modern tannery was also recently erected, but has not yet started operations.

Zaire is the only other country in the region reported to have a mechanized tanning unit in which some 50 per cent of the country's bovine hides are processed, the balance being exported in wet blue form[31] Processed hides are used for local shoe production by an associate company.

Eastern Africa

The leather industry in this region cannot be easily classified. Some countries within the region (such as Ethiopia) have century-old artisan tanneries and leather-product industries, despite which less than 20 per cent of the available raw material is processed. Other countries (such as Malawi) are devoid of any tanning tradition and have no tanning capacity at any level. Moreover, it has been claimed that in certain countries within the region tribal taboos have prohibited the tanning of hides and skins, a constraint that might be overcome by means of mechanization and new processing techniques.

In Kenya, the tanning industry is modern and comparatively well developed. At present, almost 50 per cent of the country's bovine hides are tanned to a finished or semi-processed state, and it is planned to tan all locally produced hides. Some 80 per cent of the goat skins are tanned to wet blue or crust states and 100 per cent utilization is expected within a few years. However, the bulk of sheep skins is still exported raw. From 1964 to 1973, the annual growth rate in the leather and leather-products sector (ISIC 323)[26] was 13.3 per cent, one of the highest growth rates in the world.

Madagascar is said[32] to have one large mechanized tannery which processes some 25 per cent of the country's bovine hides.

By contrast, it is reported[5] that in 1970 Ethiopia, the largest hide and skin producer in the region, industrially processed only 10 per cent of its hides, and exported almost 100 per cent of its sheep and goat skins in the raw state. In the past few years, a shift is to be observed, albeit at a low level, as a limited quantity of Ethiopian sheep and goat skins are now being semi-processed (pickled and crust) for export, and a large modern tanning unit with a daily capacity of more than 1,000 hides and 4,000 skins has commenced production within the past two years.

Southern Africa

This region has no tanning tradition. Swaziland has no tanning capacity and hides are exported raw. Of the recent developments within the region, Lesotho has set up a modern artisan unit to process woolled shearlings for use in craft products. Botswana, the largest hide and skin producer in the region, has one rural tannery, but it plans to initiate wet-blue tanning operations in 1977.

Western Africa

In this region, as in others, the leather industry is at various stages of development. Nigeria and Niger, for example, are countries with established traditions of rural tanning. In Nigeria, this expertise is being rapidly diverted to the industrialized production of finished leather for domestic use and export to both neighbouring and developed countries. This development notwithstanding, in Nigeria tanning to the finished state accounts for only a small proportion of the raw material available, and even with the production of crust leathers, does not account for as much as 50 per cent of the raw material available.

Since 1970, Nigeria has set up three large mechanized tanneries. Tanning capacity for both semi-processed and finished leathers is reported[6] to have increased to the following extent, but no data are available to confirm the degree of utilization.

| | Per cent | |
|---|---|---|
| | 1970 | 1975 |
| Bovine | 32 | 100 |
| Sheep | 25 | 70 |
| Goat | 50 | 100 |

available). It is realised that in some countries significant extra capacities have been installed since 1975, which could not be quantified. Most countries produce at 80-90 per cent of their capacity (one shift), and a number of countries with tanning capacity that is not utilized to average levels were not assessed.

This method of assessment may be open to criticism, since countries could, for example, be observed to obtain 50 per cent of the potential value added of their raw materials by one of two completely different ways:

Country A

50 per cent of raw material completely finished
at a value added ratio of 100 per cent

50 per cent of raw material exported raw
at zero value added

Country B

50 per cent of raw material processed to wet blue
at a value added ratio of 30 per cent

50 per cent of raw material processed to crust
at a value added ratio of 70 per cent

The development base of the two countries concerned may differ widely, as can the capital required to ensure full utilization of the raw material. However, in the absence of reliable statistics, no other treatment was deemed possible.

In several countries, capacity and production exceed the available local hides, and this demand is frequently met by imports of high-quality hides. This fact has been duly noted in Table 30, but for want of data on the volume and end product, it has not been treated further.

In summary, it would appear from the assessments that the developing countries obtain 80.3 per cent of the value added available from the hides produced, and 65.8 per cent of the value added available from the skins produced. It is thus estimated that the utilization of raw material available in 1975 was of the following order:

Table 30. Estimated utilization of hides and skins in selected developing countries, 1974-76

| | Hides | | | Skins | | |
|---|---|---|---|---|---|---|
| | Produced | Utilized | Processed | Produced | Utilized | Processed |
| | thousands | per cent | thousands | thousands | per cent | thousands |
| Caribbean and Central America | | | | | | |
| Costa Rica | 272 | 80 | 218 | 1 | 100 | 1 |
| El Salvador | 149 | 100 | 149 | 5 | 100 | 5 |
| Mexico[a] | 3,483 | 100 | 3,483 | 3,673 | 100 | 3,673 |
| Latin America | | | | | | |
| Argentina[b] | 14,210 | 68.3 | 9,705 | 9,232 | 53.4 | 4,930 |
| Brazil | 11,143 | 100 | 11,143 | 10,600 | 53.3 | 5,650 |
| Chile[a] | 649 | 100 | 649 | 1,207 | 80 | 966 |
| Colombia | 3,716 | 100 | 3,716 | 423 | 100 | 423 |
| Peru[a] | 714 | 100 | 714 | 3,626 | 80 | 2,900 |
| Asia | | | | | | |
| Bangladesh[b] | 4,499 | 67 | 3,014 | 4,561 | 40 | 1,824 |
| India[b] | 29,165 | 80 | 23,332 | 57,917 | 70 | 40,542 |
| Indonesia | 1,522 | 60 | 913 | 3,838 | 80 | 3,070 |
| Iran[a] [b] | 1,439 | 100 | 1,439 | 13,110 | 40 | 5,244 |
| Pakistan | 3,832 | 70 | 2,682 | 11,139 | 70 | 7,797 |
| Philippines | 730 | 100 | 730 | 481 | 90 | 433 |
| Asian centrally planned economies | | | | | | |
| China[a] | 13,476 | 100 | 13,476 | 42,581 | 90 | 38,323 |
| Middle East | | | | | | |
| Turkey[a] | 2,809 | 100 | 2,809 | 22,271 | 80 | 17,817 |

(Cont'd)

Table 30 (cont.)

| | Hides | | | Skins | | |
|---|---|---|---|---|---|---|
| | Produced thousands | Utilized per cent | Processed thousands | Produced thousands | Utilized per cent | Processed thousands |
| **Northern Africa** | | | | | | |
| Algeria | 275 | 100 | 275 | 4,344 | 100 | 4,344 |
| Egypt | 1,393 | 100 | 1,393 | 2,130 | 100 | 2,130 |
| Morocco | 660 | 100 | 660 | | | |
| Tunisia | 234 | 100 | 234 | 1,221 | 90 | 1,099 |
| **Central Africa** | | | | | | |
| Central African Empire | 56 | nil | nil | 166 | nil | nil |
| Chad | 317 | 5 | 16 | 1,062 | 5 | 53 |
| Congo | 13 | nil | nil | 51 | nil | nil |
| Gabon | 2 | nil | nil | 30 | nil | nil |
| Zaire | 156 | 60 | 94 | | | |
| **Eastern Africa** | | | | | | |
| Burundi | 111 | nil | nil | 497 | nil | nil |
| Ethiopia | 2,101 | 15 | 315 | 9,223 | 20 | 1,845 |
| Madagascar | 795 | 25 | 199 | 432 | nil | nil |
| Malawi | 60 | nil | nil | 228 | nil | nil |
| Rwanda | 89 | 10 | 9 | 305 | 10 | 30 |
| Somalia | 275 | 10 | 28 | 5,408 | 10 | 541 |
| Tanzania [b] | 1,320 | 30 | 396 | 2,124 | 30 | 637 |
| Uganda | 840 | 10 | 84 | 1,340 | nil | nil |
| **Southern Africa** | | | | | | |
| Botswana | 253 | nil | nil | 175 | nil | nil |
| Swaziland | 69 | nil | nil | 98 | 15 | 15 |
| **Western Africa** | | | | | | |
| Benin | 90 | nil | nil | 454 | nil | nil |
| Gambia | 30 | nil | nil | 43 | nil | nil |
| Ivory Coast | 60 | nil | nil | 491 | nil | nil |
| Mali | 388 | 10 | 39 | 2,078 | 15 | 312 |
| Niger | 263 | nil | nil | 2,240 | 25 | 560 |
| Nigeria [b] | 1,100 | 80 | 880 | nil | nil | nil |
| Senegal | 282 | 30 | 85 | 820 | nil | nil |
| Togo | 30 | nil | nil | 273 | nil | nil |
| Upper Volta | 170 | nil | nil | 860 | 10 | 86 |
| **Total** | 103,240 | | 82,879 | 220,758 | | 145,250 |
| Over-all utilization factor | | 80.27% | | | 65.80% | |

[a] Import significant amounts of raw and other leathers.

[b] Although less than 100% utilization is reported in 1975 it is understood that since that time increased production facilities are available.

By way of contrast, other countries in the region, such as Gambia, Togo and Upper Volta, lack tanning facilities or process only minimal quantities, most hides and skins being exported raw. Senegal and Mauritania have the capacity to process 100 per cent and 55 per cent of their bovine hides; yet in 1972 they processed only 40 per cent and 3 per cent respectively.[32]

## Leather production and leather processing capacities in the developing countries

In the past five years, production has advanced appreciably and new processing capacities have been installed in many developing countries, with the result that the pattern observed in 1975 may well have changed significantly in some countries, although the over-all global trend may still be applicable. In this study an assessment has been made of the utilization of hides and skins in more than 40 countries. The degree of utilization has been calculated on the basis of the percentage of potential value added achieved, the following value added ratios having been applied:

| Processing stage | Value added per cent |
|---|---|
| Leather completely finished | 100 |
| Semi-finished/buffed crust/ready-to-finish | 70 |
| Wet-blue/vegetable primary crust | 30 |
| Pickled | 20 |

In the absence of uniform global or national statistics, it was necessary to compile country performance assessments from a miscellany of sources. Data were accepted, where applicable, from UNIDO expert reports, governmental or quasi-governmental studies, recognized journals,[6] presentations to United Nations meetings and private country studies. Wherever possible, the assessments made were carefully checked against a variety of sources, including import/export data from official sources. Owing to the latitude in the majority of assessments, it was felt expedient to round off the percentage utilization figure to the nearest 10. Where data were felt to be fully reconcilable, the percentage utilization figure was cited to the nearest 1.0.

The countries assessed produce some 84.2 per cent of the hides originating from the developing countries and 74.9 per cent of the skins. The countries are reasonably representative of all regions and their assessment might well be indicative of global trends. Wherever possible, assessment was made on the basis of 1975 figures (earlier years were accepted when recent data were not

Estimated effective utilization of hides and skins, developing countries, 1975

| | | millions of $ft^2$ |
|---|---|---|
| Raw hides | produced | 3,187 |
| | utilized | 2,559 |
| Skins | produced | 1,416 |
| | utilized | 932 |

Of the total raw material available in the developing countries 75.8 per cent was effectively utilized in 1975.

Distribution of tanning activity in hides and skins in 1975 is shown in Figures 5 and 6 below:

Figure 5. Global distribution of skin tanning activity in 1975 (billion $ft^2$)

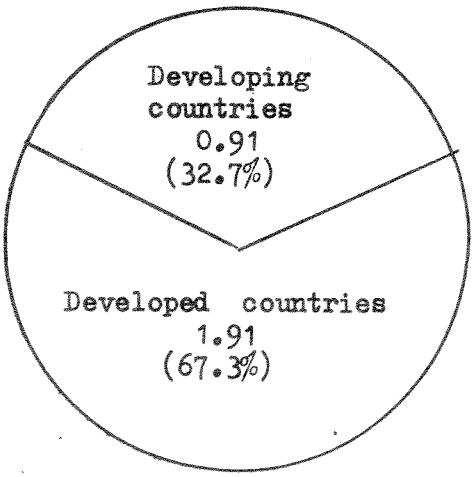
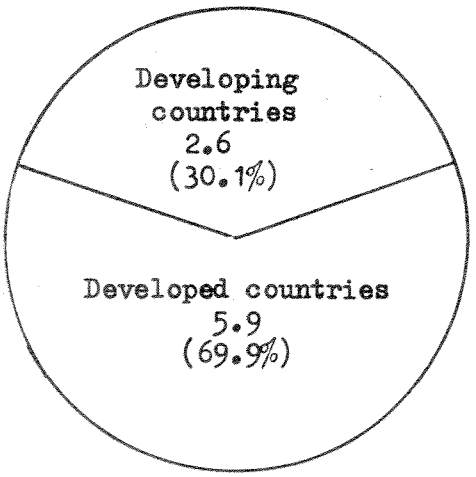
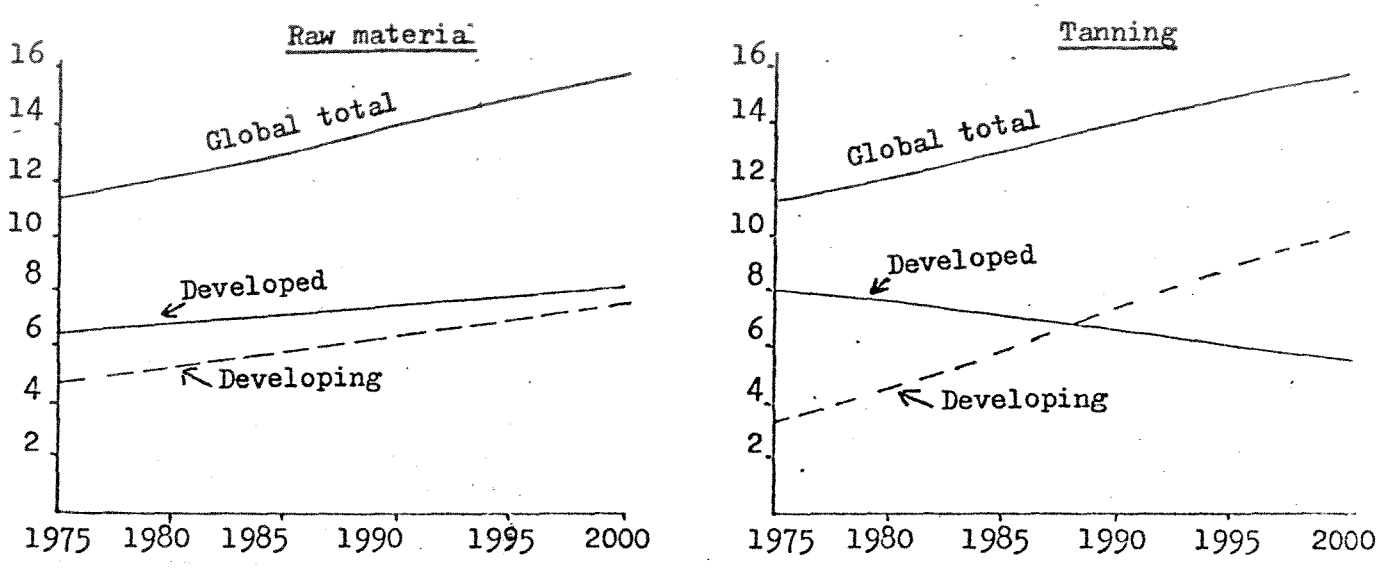



Figure 6. Global distribution of hide tanning activity in 1975 (billion $ft^2$)




The distribution between developed and developing countries of raw materials and tanning activity to the year 2000 are shown in Figure 7. The projections are based on the growth rates evolved earlier in the study.

Figure 7. Projections of global production of raw material of tanning activity (bovine, sheep and goat combined)
(billion $ft^2$ per annum)



## Trade

### Consumption and production of leather in the OECD countries

Tables 31 and 32 outline the statistics on the consumption and production of leather in some of the developed countries.

Table 31. Apparent consumption[a] of leather in some OECD countries, 1963 and 1973

| | Sole and industrial leathers | | | Upper leather | | | Sheep and goat leathers | | |
|---|---|---|---|---|---|---|---|---|---|
| | thousands of metric tons | | | millions of $ft^2$ | | | | | |
| | 1963 | 1973 | + or -% | 1963 | 1973 | + or -% | 1963 | 1973 | + or -% |
| European OECD | 112.1 | 113.4 | + 1.2 | 1,393.9 | 1,264.1 | - 9.3 | 893.0 | 1,251.9 | + 40.2 |
| United States | 81.2 | 38.9 | - 52.1 | 686.2 | 709.1 | + 3.3 | 185.9 | 52.3 | - 71.9 |
| Japan | 13.9 | 1.7 | - 87.8 | 186.5 | 130.0 | - 30.3 | 65.2 | 39.2 | - 39.9 |
| Total | 207.2 | 154.0 | - 25.7 | 2,266.6 | 2,103.2 | - 7.2 | 1,144.1 | 1,343.4 | + 17.4 |

[a] Apparent consumption = production + imports - exports.

Table 32. Production of leathers in some OECD countries, 1967 and 1973

| | Sole and industrial leathers | | | Upper leather | | | Sheep and goat leathers | | |
|---|---|---|---|---|---|---|---|---|---|
| | thousands of metric tons | | | millions of $ft^2$ | | | | | |
| | 1963 | 1973 | + or -% | 1963 | 1973 | + or -% | 1963 | 1973 | + or -% |
| European OECD | 120.4 | 74.6 | 38.0 | 1,418.6 | 1,327.9 | - 6.4 | 884.4 | 1,179.0 | + 33.3 |
| United States | 80.0 | 44.3 | - 44.6 | 755.9 | 622.3 | - 17.7 | 228.6 | 72.7 | - 67.7 |
| Japan | 13.9 | 13.1 | - 5.8 | 186.5 | 129.0 | - 30.8 | 65.2 | 4.8 | - 92.6 |
| Total | 214.3 | 132.0 | - 38.4 | 2,361.0 | 2,079.2 | - 11.9 | 1,178.2 | 1,256.5 | 6.6 |

Sole and industrial leathers. This category consists generally of vegetable-tanned leather, but definitions of the leathers included may vary slightly from country to country.

Table 33. Imports and exports of sole and industrial leathers and balance of trade in some OECD countries expressed as a percentage of apparent consumption, 1963 and 1973 (in metric tons)

| | Trading partner | 1963 Imports | 1963 Exports | 1963 Balance | 1963 Balance per cent | 1973 Imports | 1973 Exports | 1973 Balance | 1973 Balance per cent |
|---|---|---|---|---|---|---|---|---|---|
| European OECD | CPE[a] | 2,022 | 2,367 | + 345 | 0.31 | 381 | 1,527 | - 40,408 | 35.63 |
| | Others[b] | | | | | 42,801 | 1,247 | | |
| United States | CPE | 997 | 322 | - 675 | 0.88 | | 292 | + 4,560 | 11.72 |
| | Others | | | | | 130 | 4,398 | | |
| Japan | CPE | | | | | | | + 11,007 | 647.47 |
| | Others | | | | | 68 | 11,075 | | |
| Total | | 3,019 | 2,689 | - 330 | 0.16 | 43,380 | 18,539 | - 24,841 | 16.13 |

a/ Centrally planned economies.

b/ Countries outside the OECD.

Note: This table is not fully reconcilable with Tables 31 and 32: in 1963, the average value of imports into OECD countries from other countries was $1.45/Kg, and in 1973, $1.85/Kg.

As mentioned earlier, there has been a decline from the 1960s to the 1970s in the percentage of leather-uppered shoes which have leather soles. This, however, has been partially mitigated by a slight increase in the number of leather-uppered shoes produced and consumed over the same period, and sole and industrial leather consumption in the OECD countries of Europe has marginally increased over the 10 years 1963 to 1973. In the United States, conversely, where leather-uppered shoe production decreased, there was a concomitant marked drop in the consumption of sole leather.

Even though European consumption of sole leather was virtually constant, it is noteworthy that whereas in 1963 Europe was a net exporter, by 1973 it was importing over 35 per cent of its consumption requirements owing to a 38 per cent decline in European production. It is significant that Italy, which showed a rapid rise in shoe production, accounts for most of the sole-leather imports in the region (over 30,000 metric tons). Japan, and to a lesser extent the United States, has compensated the decrease in their consumption of and demand for sole leather by exporting a surplus and not reducing their production as rapidly as consumption fell.

A sizeable market would appear to exist in OECD countries for supplies of sole leather from the developing countries. As yet most of the trade in this sector has come from Latin America, but other developing countries are not restrained from entering this sector provided their hides are of suitable substance, and the leather is processed to the standards expected in the developed countries.

Upper leather. This category is of the most interest to developing countries since upper leather may be produced in standard colours.

In Table 34, it may be seen that imports of upper leather to the OECD countries increased rapidly between 1963 and 1973 - by some 400 per cent. The most significant imports are those to the United States which in 1973 were equivalent to some 8.3 per cent of United States consumption, in contrast to the fact that in 1963 the United States had been a net exporter. The OECD countries of Europe increased both imports and exports, and the balance, although favourable to the centrally planned economies and other countries, does not yet equal 2 per cent of consumption within this category.

The economic effect of the OECD countries' growing imports of upper leather may be outlined as follows: in 1963, the total value of OECD imports from the centrally planned economies and other countries was $14.4 million, and the total value of exports to the centrally planned economies and other countries was $25.8 million, i.e. + $11.4 million; in 1973, the total value of OECD imports was $113.6 million, and of exports $95.9 million, i.e. - $17.7 million.

Table 34. Imports and exports of leather for uppers and other purposes (bovine, calf and equine) and balance of trade in some OECD countries shown as a percentage of apparent consumption, 1963 and 1973 (in thousands of $ft^2$)

| | Trading partner | 1963 Imports | 1963 Exports | 1963 Balance | 1963 Balance per cent | 1973 Imports | 1973 Exports | 1973 Balance | 1973 Balance per cent |
|---|---|---|---|---|---|---|---|---|---|
| European OECD | CPE [c] | 43,812[a] | 33,921[a] | - 9,891 | 0.7 | 8,332 | 77,932 | - 23,415 | 1.9 |
| | Others | | | | | 118,690[b] | 25,675 | | |
| United States | CPE [c] | 11,065 | 11,124 | + 59 | 0.0 | 69 | 5,147 | | |
| | Others | | | | | 93,200 | 29,514 | - 58,608 | 8.3 |
| Japan | CPE [c] | 8 | 119 | + 119 | 0.1 | 0 | | - 334 | 0.3 |
| | Others | | | | | 510 | 176 | | |
| Total | | 54,885 | 45,164 | - 9,721 | 0.4 | 220,801 | 138,444 | - 82,357 | 3.9 |

a/ Data for Greece and Turkey are unavailable and therefore not included.

b/ Data for Turkey are unavailable and therefore not included.

c/ Centrally planned economies.

Thus, it would appear that the OECD countries have, in the past ten years, greatly increased their imports of upper leather. As current production and market conditions will continue, it can be reasonably assumed that OECD demand for imports of upper leather will keep pace with the expansion of production facilities in the developing countries. There is, however, a need for improving the quality of finished leathers, as large volumes of sub-standard leather from new exporting sources have in the past had the effect of depressing prices.

Sheep and goat leathers. Table 35 shows the balance of trade in sheep and goat leathers. In 1963 the OECD countries were net exporters in this sector, but by 1973 imports had reached the high level of 19.2 per cent of consumption. It is uncertain how much sheep and goat leather is fully finished and how much is semi-processed, but none the less a large increase in both volume and value can be perceived. The unit values for sheep and goat leathers imported and exported from OECD countries in 1963 and 1973 were:

| | US cents per $ft^2$ | |
|---|---|---|
| | Imports | Exports |
| 1963 | 23 | 29 |
| 1973 | 60 | 71 |

These figures reflect the increasing value of skin leathers, which is due in large part to the greater demand for clothing leathers since the late 1960s when such garments became popular. Data regarding the utilization of garment leathers are unfortunately unavailable on any organized basis, but certainly data relating to the consumption of sheep and goat leathers in OECD countries, showing an increase of 40 per cent between 1963 and 1973, can only be ascribed to their use in garment leathers (the other major usages, such as shoe-linings, having diminished, although no statistical data are available to show this).

There is no explanation of the statistical data relating to Japan, where consumption of sheep and goat leathers apparently fell from 65 million $ft^2$ in 1963 to 39 million $ft^2$ in 1973. At the same time production appears to have dropped from 65 million $ft^2$ in 1963 to 4.8 million $ft^2$ in 1973, the difference being made up by imports of 33 million $ft^2$. Possibly, the statistical data are in this case at fault.

Table 35. Imports and exports of sheep and goat leathers and balance of trade in some OECD countries expressed as a percentage of apparent consumption, 1963 and 1973 (in thousands of $ft^2$)

| | Trading partner | 1963 Imports | 1963 Exports | 1963 Balance | 1963 per cent | 1973 Imports | 1973 Exports | 1973 Balance | 1973 per cent |
|---|---|---|---|---|---|---|---|---|---|
| European OECD | CPE[b] | 17,649[a] | 20,902[a] | + 3,253 | 0.4 | 4,833 | 20,331 | - 92,096 | 7.4 |
| | Others | | | | | 124,292 | 16,698 | | |
| United States | CPE[b] | 5,665 | 5,142 | - 523 | 0.3 | 529 | 289 | + 2,211 | 4.2 |
| | Others | | | | | 7,400 | 9,851 | | |
| Japan | CPE[b] | 3 | | 3 | 0.0 | 570 | | - 33,470 | 85.4 |
| | Others | | | | | 33,230 | 330 | | |
| Total | | 23,317 | 26,044 | + 2,727 | 0.2 | 170,854 | 47,499 | - 123,355 | 9.2 |

a/ Data for Greece are not included.

b/ Centrally planned economies.

Given the high demand in the OECD countries for finished and semi-finished sheep and goat leathers, the market appears to be receptive to any developing country which can produce consistently high-quality products.

Raw hides and skins

As may be expected, the OECD countries, with their decreased production and stable consumption of most leathers, reduced their imports of raw hides and skins in the period 1963-73. These imports are shown in the following table. An appreciable drop in the import of bovine hides and calf skins may be noted, but that in the import of sheep and goat skins is less significant and is related to the increased consumption and production of sheep and goat leathers for use mainly in the clothing industry.

| Imports from countries outside the OECD | Bovine hides (wet-salted) | Calf skins (wet-salted) | Sheep and goat (dry state) |
|---|---|---|---|
| | Thousands of metric tons | | |
| 1963 | 228 | 24 | 96 |
| 1973 | 162 | 12 | 86 |

Footwear and leather production in centrally planned economies

As has been discussed earlier, the two major markets for developing countries in the leather and leather-products sector are the developed countries of the OECD and of the centrally planned economies.

Full data are not available for the centrally planned economies, which have, over the past decade, greatly expanded their production of leather and leather footwear. The combined light-leather production of Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, and the USSR amounted to 145,345 thousand metres$^2$ in 1963, and 195,291 thousand metres$^2$ in 1973, an increase of 34 per cent[25]. The combined production of women's leather footwear of Bulgaria, Poland (both including men's and children's footwear), Hungary, and the USSR (including sports and other types of footwear) over the 10-year period amounted to 202 million pairs in 1963, and 346 million pairs in 1973, an increase of 71 per cent[25].

The growth in leather production in the centrally planned economies would indicate an increasing demand for raw hides and skins, and the more rapid increase in footwear production, a ready market for finished leather of all types suitable for footwear manufacture. It is interesting to note, furthermore, that in spite of the increase in leather-footwear production in the centrally planned economies, they are still prepared to import leather

shoes from the developing countries. A report in Leather[5] of March 1976 suggests that India has won from the USSR an order for leather shoes valued at 45 million rupees.

# Chapter IV

# LEATHER PRODUCTS PRODUCTION, TECHNOLOGY AND CAPITAL REQUIREMENTS

## Technology and main aspects

### Footwear technology

The methods of footwear manufacture described below are those generally used in mechanized shoe factories and, when adequate minimum machinery is available, in artisan operations.

#### Hand-sewn or Goodyear welted

Traditionally the techniques of developed countries, these are finding favour in developing countries wishing to produce top-quality products. The methods are similar, but the hand-sewn method is being superseded by the Goodyear welt which offers increased rates of production. Both processes entail high material and labour content and yield top-quality durable products. But the necessity of maintaining such quality standards, involving numerous specialized operations, makes machinery and equipment costs for Goodyear welted footwear high. By contrast, hand-sewn welted footwear requires only investment in sole-attaching and finishing machines; high degrees of labour skill and supervision are required, however.

Hand-sewn and Goodyear welted footwear have great export potential because of their prestige value and durability derived from their leather and labour content. The unit sales price is the highest of all shoes with the exception of ladies' high-grade fashion shoes.

#### Cement-lasted

In developed countries, most footwear with leather uppers is mass produced by cement lasting. The quality of products thus obtained ranges from medium to high grade, depending on the quality of leather or synthetic material used. The process is exceptionally versatile, since a variety of sole-material, such as leather, rubber, PVC or other synthetics may be bonded by adhesives. However, if direct moulded or PVC injection soles are used rather than leather, rubber or synthetic soles, investment costs are greater but safer bonding of sole to upper is obtained.

The cement-lasted process with stuck-on soles gives maximum adaptability to style, and entails far less capital investment than Goodyear welted, injected or vulcanized production. The same process with direct sole injection instead of stuck-on soles incurs lower labour and material costs, but is less adaptable to changes in style on account of the injection moulds.

Modern footwear factories in developing countries are currently utilizing this process, although the obsolescent method of tack lasting is still employed mainly owing to lack of finance to buy more modern lasting machines.

Veldtschoens or stitch-downs

This process can be amalgamated with Goodyear welting by using an extra layer of leather on the upper; the product is then classed as waterproof. It is used mainly for casual footwear, in heavy suede leather for men and printed grain leather for children, the soles being made of leather, crepe or synthetic.

Force-lasted

In this process, the shoe last or form is forced into the stitched upper which is made separately. The upper is heat-set by alternately applying moisture and heat to the leather. The last is then removed and the sole bottom is stitched on, re-lasted and finished to give moccasin and Californian footwear. As no firm insole is used, such slip-lasted footwear is very comfortable and therefore in constant demand.

Value added

In developing countries where medium-to high-quality leather is available and footwear production is export-oriented, the greatest value added may be obtained by the following methods of production:

(a) Hand-sewn welted footwear with machinery to stitch uppers, to stitch and channel soles, and to finish edges and bottoms;

(b) Force-lasted moccasins with hand-sewn vamp plug, with machinery to stitch uppers, to stitch and groove soles, and to finish edges and bottoms;

(c) Veldtschoen or stitch-downs using manual methods of lasting to sole, with machinery to stitch uppers, to stitch soles, and to finish edges;

(d) All-leather sandals, particularly men's, with handicraft motifs.

For greater labour efficiency, the trend is towards increased production of cemented footwear. For instance, Vermes [8], states that whereas in Hungary in 1955 the cement process was used in 23.6 per cent of footwear production, by 1970 this figure had increased to 73 per cent. However, in many developing countries labour-intensive industries are encouraged. Mechanized production offers a much higher output (8-10 pairs per day per worker) than manual operations (1 pair every two days per worker). However, the latter, or an intermediate process, may yield a superior product.

Leather goods technology

In this study, the term leather goods is applied only to products containing a high percentage of real leather such as clothing, handbags, wallets, travel goods, and fashion accesories, although these articles may also be manufactured from other materials. The term fancy leather goods is applied to these articles when made from exotic materials such as the skins of reptiles, rare birds, frogs, tortoise feet or fur.

In most areas of the world the production of leather goods is still a non-mechanized industry at the artisan level. Rant [33] states that in a factory of 350-700 $m^2$, some 70 employees (54 of whom are involved in actual production) can produce 5,750 handbags, 700 document cases, 20,000 wallets and 14,750 belts a year using crocodile, lizard and snake skins. He shows that in 1971 the value added by manufacturing fancy leather goods was some 50 per cent of the value of the leather imput. However, the value added may be significantly higher when using lower quality leathers (bovine, sheep and goat), as these cost only 10-20 per cent of the price of more exotic leathers. According to other reports, the value added in leather goods production may be some 150 per cent of the value of the leather input.

Production costs in the developing countries are increased by the need to import accessories and fittings (frames, zippers, buckles etc.). Rant estimates costs of accessories and labour inputs for the following articles in 1971 as:

| | Total accessory cost (dollars) | Total labour cost (hours per piece) |
|---|---|---|
| Handbag | 4.49 | 10 |
| Document case | 2.68 | 2 |
| Wallet | 0.44 | 1.5 |
| Belt | 0.19 | 2 |

Both these factors have to be taken into account when estimating the value added. Because of variation in labour cost from country to country and even locality to locality, comparison in value added must be made on a case by case basis.

## Location and infrastructure

The major requirements are the availability of leather and labour and, equally important, an assured supply of accessories. Since neither the footwear nor the leather goods industry has any appreciable environmental effects, there are few constraints regarding the location of production units. Power requirements are negligible: a factory producing 2,000 pairs of leather-uppered shoes per day consumes 250 kWh per day. Adhesives used in footwear manufacture are inflammable and fire precautions are imperative.

## Capital and production costs (1977 prices)

Direct comparison of capital and production costs for different products is difficult as quality standards and value-added increments vary. Building requirements for footwear production need not be sophisticated; it is often possible to lease facilities. In many areas of the world, it is also possible to lease production machinery thus greatly reducing capital requirements. Reconditioned machinery can be used since, as Auberry[34] points out, it can be purchased at half the price of new equipment and the output of each is comparable.

Care must be taken to select a reputable dealer. However, in recognition of this increasingly important second-hand market, many of the major manufacturers are establishing separate branches for the sale of their own used machinery.

Plant and machinery costs, Goodyear welted production

The cost of new machinery required to produce men's Oxford or Gibson shoes is:

| Output (pairs/day) | Costs (dollars) |
|---|---|
| 500-750 | 400,000 |
| 1,000 | 550,000 |

The minimum daily output should be 500 - 1,000 pairs, as at this level of production the majority of economies of scale are realized. The following sample calculation is based on this production level.

Working capital (major items)

| | Estimated output (pairs/day) | Estimated costs (dollars) |
|---|---|---|
| Material for 60 days | 500 | 270,000 |
| Finished stock and other items | | 230,000 |
| Sub-total | | 500,000 |

Fixed capital

| | Estimated costs (dollars) |
|---|---|
| Plant and machinery | 400,000 |
| Factory building[4/], 10,000 $ft^2$ at \$ 8/$ft^2$ | 80,000 |
| Office and staff facilities (35 per cent of factory building) | 28,000 |
| Subtotal | 508,000 |
| Pre-investment studies and start-up costs | 50,000 |
| Total capital costs | 1,058,000 |

4/ The cost of a light steel-structured building in a developing country is subject to change.

Thus, the fixed capital required to produce 500 pairs of Goodyear welted shoes a day is $2,116 per pair, from which $800 is required to cover plant and machinery costs.

Production costs

Materials used for a high quality welted shoe are governed by leather quality, availability of accessories and local taxes. Therefore,local production costs may vary from those shown below.

| Materials | | | Costs ($) |
|---|---|---|---|
| Leather upper | 2 $ft^2$ | at $1.25/$ft^2$ | 2.50 |
| Lining leather | 1.5 $ft^2$ | at $0.70/$ft^2$ | 1.05 |
| Sole leather (actual 3/4 lb) | 1 lb | at $1.75/lb | 1.75 |
| Insole leather | 8-10 oz | at $0.80/lb | 0.50 |
| Welt leather | 1.33 yd | at $0.80/yd | 1.06 |
| Heel lifts (built) | | | 0.50 |
| Mid-sole leather (split) | | | 0.10 |
| Top piece (leather or rubber) | | | 0.40 |
| Eyelet stays leather | | | 0.05 |
| Upper thread, cement, counters (moulded), toe puffs, waxed sewing machine thread, filling, shanks (wood), heel-sock lining, tacks, wire, laces, box, carton, tissue paper | | | 0.97 |
| Total | | | 8.88 |

| Total manufacturing costs | ($) |
|---|---|
| Materials (as above) | 9.00 (rounded) |
| Direct labour (varies from country to country) | 1.00 - 3.40 |
| Overhead | 1.49 |
| (i) Subtotal | 13.80 |
| Servicing of capital, Administration } (20 per cent of subtotal (i)) | 2.76 |
| Profit (12½ per cent of subtotal (i)) | 1.73 |
| (ii) Subtotal | 4.49 |
| Selling expenses (4 per cent of subtotal (ii)) | 0.73 |
| Ex-factory sales price | 19.02 |

It should be noted, however, that the bulk of international trade in leather footwear is of a much lower valued product with typical costings being:

| | Estimated costs ($) |
|---|---|
| Leather | 2.07 |
| Other materials | 1.00 |
| Labour | 1.00 |
| Overheads/profits | 1.43 |
| Ex-factory sales price | 5.50 |

In the first example of total manufacturing costs, value added is 137.5 per cent, in the second 165 per cent.

Plant and machinery costs, cemented production

The cost of machinery required to produce 500-600 pairs of shoes, using the cemented production method, would be $140,000.

Working capital

| | Estimated costs ($) |
|---|---|
| This would be the same as for Goodyear welted shoes | 500,000 |
| **Fixed capital** | |
| Plant and machinery | 140,000 |
| Factory building, 10,000 $ft^2$ at $8/$ft^2$ | 80,000 |
| Office and staff facilities | 28,000 |
| Subtotal | 248,000 |
| Pre-investment studies and start-up costs | 25,000 |
| Total capital costs | 773,000 |

The capital required to produce 500-600 pairs of shoes a day is $1,546 per pair, from which $280 is required to cover plant and machinery costs.

Low technology production

Plant and machinery

The estimates quoted above relate to fully mechanized industrial production. However, a new low technology range of machinery has been introduced which should help to partly mechanize artisanal production. The cost of this machinery is only some $ 20,000 for a daily output of 200 pairs of shoes ( $100 per pair per day).

Working capital

Working capital for low-technology production is less than for the two methods previously costed, as shown below.

| | Estimated costs (dollars) |
|---|---|
| Material and work for a maximum of 15 days | 50,000 |
| Fixed capital | |
| Plant and machinery | 20,000 |
| Factory building 3,00 $ft^2$ 5/ | 24,000 |
| Office and staff facilities 6/ | 5,000 |
| Pre-investment studies 7/ and start-up costs | 5,000 |
| Total capital | 104,000 |

The capital required to produce 200 pairs of shoes a day using low technology methods is $520 per pair, of which $100 is required to cover plant and machinery costs.

The above estimates, which are based on 500-600 pairs daily production capacity, illustrate that total capital requirements can vary according to production method between $520, $1,546 and $2,116, and plant and machinery costs between $100, $280 and $800 per pair per day capacity.

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5/ Estimate based on a new shell building at $8/$ft^2$. This figure could be reduced by using existing buildings or warehouses.

6/ These facilities are not always provided.

7/ At this level of production, a formal study may not be expected. The entrepreneur would make his own inquiries and convince himself (and his bank) of the project's viability.

These wide variations must be considered by developing countries when deciding the amount of mechanization and capital necessary for future expansion of leather footwear capacity. One view is that leather footwear production units should be fully mechanized and produce at least 1,000 pairs of shoes per day. At this level of production, optimum economies of scale may be obtained, leading to the volume necessary for an export-oriented industry.

A contrary view is that production capacities of 400-500 pairs per day may be more suitable for developing countries and that such units should not be fully mechanized for socio-economic reasons. Small production units may allow more effective production and quality control, equalizing any possible advantages to be derived from economies of scale.

In this connexion, it might be recalled that in certain European countries and in the United States where the tendency is for large-capacity, fully mechanized leather footwear production units, manufacture slumped in the last decade owing to their inability to their inability to meet competition. In Italy, however, where production capacity exists at all levels, with a multitude of small semi-mechanized production units, industry was sufficiently flexible to meet competition.

The choice of size of unit and technology must be governed by the availability of disciplined labour and skilled personnel. For instance, cutting out the component parts of the shoe upper, clicking, is an important operation in footwear production. As there is a wide variation in the quality within a single hide and a need to ensure that the most suitable materials are selected, operations such as clicking can be mechanized only when sufficient skills are available.

Whereas in most developing countries building and working capital may usually be funded by way of local bank-loans and overdrafts, the foreign currency required for plant and machinery is not so readily obtainable.

Leather goods production

In this sector the major requirement is working capital; plant and machinery investment is minimal.

Rant[33] states that fixed capital for a unit to produce the volume of goods outlined earlier in this chapter would be:

| | Estimated costs ($) |
|---|---|
| Buildings 700 $m^2$ at $86/$m^2$ [8] | 60,286 |
| Furniture, machinery and tools [9] | 28,500 |
| Total | 88,786 |

When this total amount is viewed against a potential annual revenue of $771,895 it may be deemed insignificant and could be recovered in one year's profit. It should be noted that Rant's study dealt with products of the most exotic raw material (crocodile, lizard and snake). Similar capital requirements would be needed for the production of bovine and sheep skin leather, and whereas the sales turnover would be less than 50 per cent of that obtained from the production of fancy leather goods the value added, as shown earlier, would be greater.

## Production, consumption and marketing of leather products, footwear and goods

As in the case of the tanning sector, the character of the leather products sector and the production methods used vary greatly both within and between regions. Assessment of the sector is made difficult by the fact that data relating to the production of leather goods in the developing countries are virtually non-existent, and are in some statistics included with footwear under the item "leather products". In the case of footwear production, many developing countries lack accurate production and consumption data and estimates are often calculated from apparent internal consumption of raw hides and skins with allowances made for trade. In some countries, furthermore, taxes are levied on footwear manufacture, which tends to favour under-reporting of actual production or even clandestine operations for which no production data are reported. To confuse the situation even more, many countries do not distinguish between the production of mainly leather footwear and that of types made mainly from substitute materials. As stated earlier in this

8/ Such a building would be double the actual requirements, allowing for further expansion.

9/ Inflation factor of 50 per cent over 1971.

study, leather footwear is defined as footwear in which the greater part of the upper is made of real leather.

The amount of leather used in a pair of shoes varies greatly according to size and style. Some 1.1 $ft^2$ - 2 $ft^2$ of bovine leather may be needed for a leather-uppered shoe, and it has been assumed in this study that 1.6 $ft^2$ of bovine hide is needed for a leather-uppered shoe. Lesser quantities of skin leathers may be used to line the shoe, but today most shoes have non-leather linings.

A recent estimate[8] suggests a world shoe production in 1974 of 4.5 billion pairs (1.2 pairs per capita), with consumption expected to rise to 7 billion pairs per annum by 1985 (a 4 per cent per annum increase). Footwear consumption in developing countries with large urban population is, in general, between 0.5 and 1 pairs per capita per annum (though certain developing countries, usually those where leather is a traditional product, already have a consumption of leather footwear exceeding 1 pair per capita per annum). Thus, if 1.6 $ft^2$ of hide is needed per pair, one typical hide of 26 $ft^2$ will be needed for 16.25 pairs. Therefore, 0.5 pairs = 0.03 hides, and 1 pair = 0.062 hides. In this calculation no account is taken of splits as it is assumed that, in the footwear sector, these will not be used for shoe uppers but only for socking, packing and other miscellaneous purposes.

The question whether countries will consume their leather as leather footwear, or will tend to satisfy their domestic needs with cheaper non-leather footwear, exporting the higher-valued leather footwear, is discussed more fully elsewhere in this study. Here, however, it may be noted that countries with less than 30 hides per 1000 capita per annum will be likely to utilize their hides for domestic needs. Some 30 - 60 hides per 1000 capital per annum could yield sufficient material for domestic needs, with some surplus for export. Over 60 hides per 1000 capita per annum could be expected to yield a definite surplus of leather footwear which, assuming that domestic consumption did not increase, could be exported.

## Factors influencing the demand for leather products

In any study of the possibilities for development of the leather sector in the developing countries, the production and consumption of leather and leather products in the developed countries must be evaluated, and potential market openings for the developing countries be ascertained.

Consideration also has to be given to whether production will be oriented towards domestic or export markets, and if the latter are selected, to which. Since little statistical data are available showing the breakdown of imports to and exports from the centrally planned economies, the markets of which are apparently growing rapidly, the following analysis must of necessity concentrate on the OECD countries. While it is assumed that these will provide a large proportion of the markets available to the developing countries, it must be recognized that others exist.

Although it is apparent from the statistics covering the past 10 years that within the OECD countries consumption has increased, with a concomitant decrease in production, it should be noted that a large proportion of this expanding market is currently being filled by exports from the highly developed leather industries of the centrally planned economies of Europe. This market penetration by the centrally planned economies will have to be tackled by the developing countries if they are to gain access to the large OECD markets. It should be noted, however, that many sources suggest that the exports of the centrally planned economies to the OECD countries are at less than full economic cost, and it may be that these hidden subsidies rather than the traditional trade barriers will form the major hurdle to be surmounted by the developing countries. This position may be mitigated in the future because while the centrally planned economies today import large quantities of raw material from the developing countries, this material will not be available when the developing countries are able to process all their indigenous hides and skins.

No global or regional statistics on production, imports or exports are available for leather goods. The International Trade Centre UNCTAD/GATT has published two major studies[35,36] on these sectors, but restricted to the United States and selected western European countries; and they are therefore of limited value in the global context.

Over the past ten years the tanning and footwear sectors in the OECD countries have been marked by two major trends. In most of these high-income countries tanning and leather-products manufacture have declined, while imports of both leather and leather products have increased. Wages and other costs have been rising rapidly in these countries and difficulties have been experienced with effluent disposal,

and in finding labour prepared to work in the somewhat obnoxious conditions found in tanneries. At the same time, the OECD countries have imported developing country products at low tariffs, this being a major factor in the decline of their domestic industries.

Italy and Spain have overcome the problems of wage and cost increases by augmenting their production of leather and leather goods and concentrating heavily on the export of finished products. Their success has been attributed to the structure of their leather industries: a few large production units balanced by hundreds of small, mechanized artisan units provide the flexibility required to cope with rapid change. Certainly, these two countries are established fashion leaders, and have been able to co-ordinate their entrepreneurial acumen and flair for design to the benefit of the industry by this means.

These two conflicting trends have, to some extent, neutralized each other, and it is the final balance of the leather sector in the OECD countries that is of interest to the developing world.

## Consumption and production of leather products and footwear in the OECD countries

Production and consumption of leather footwear have traditionally been cyclic, but it is expedient to compare data for the years 1962, 1973 and 1974 in order to indicate the trends over the past decade (see Table 36 [10]).

The fall in the per capita consumption of leather-uppered footwear throughout the OECD countries is most striking, but the over-all picture is not consistent: while per capita consumption in some European OECD countries rose slightly, in others, and particularly in the United States, it declined sharply.

It is generally assumed that this fall in consumption is due to the rapid increase in prices for leather footwear (Table 37) which rose by 100 per cent in 10 years coupled with the world economic recession and consequent high unemployment. Proof of this assumption must await the availability of data for 1977 which will reflect the rapid rise in prices during 1976.

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10/ See [37] relevant years, for the source of the tabular data in this section. This source, while giving some country data for 1974, does not generally give full regional aggregates for that year. Thus, 1973 is the latest year for which complete data are available.

Table 36. Apparent consumption[a/] of footwear with leather uppers in selected OECD countries, 1962, 1973 and 1974.

(a) Millions of pairs

| | 1962[b/] | 1973 | 1974 |
|---|---|---|---|
| Denmark | 8.1 | 6.1 | 8.7 |
| France | 88.1 | 76.2 | 84.2 |
| Germany (Fed.Rep.) | 121.6 | 153.5 | 154.4 |
| Italy | 54.9 | 102.6 | 91.3 |
| United Kingdom | 120.1 | 93.4 | 85.6 |
| Spain | 36.1 | 66.1 | 72.5 |
| Sweden | 14.9 | 11.7 | 11.6 |
| Canada | 41.2 | 37.6 | 26.7 |
| Japan | 24.7 | 42.1 | 41.1 |
| United States | 547.2 | 515.2 | 468.4 |
| Total OECD | 1,122.6 | 1,197.5 | 1,054.5 |

(b) Pairs per capita

| | 1962[b/] | 1973 | 1974 |
|---|---|---|---|
| Denmark | 1.74 | 1.21 | 1.72 |
| France | 1.87 | 1.46 | 1.60 |
| Germany (Fed.Rep.) | 2.22 | 2.48 | 2.49 |
| Italy | 1.10 | 1.87 | 1.65 |
| United Kingdom | 2.25 | 1.67 | 1.53 |
| Spain | 1.17 | 1.90 | 2.07 |
| Sweden | 1.97 | 1.44 | 1.42 |
| Canada | 2.21 | 1.70 | 1.19 |
| Japan | 0.25 | 0.39 | 0.37 |
| United States | 2.93 | 2.45 | 2.22 |
| Average | 2.2 | 1.79 | 1.73 |

a/ Apparent consumption = production + imports - exports. No account is taken of stock variations.

b/ Although totals for this year were not calculated on the same basis as for later years, the trends are sufficiently closely indicated to be acceptable for present purposes.

Table 37. Trends in prices of leather-uppered footwear
(consumer price index)

| | 1963 | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|
| Netherlands | 100 | 142 | 151 | 174 | 192 | 215 |
| Spain | 100 | 133 | 141 | 150 | 171 | 215 |
| United Kingdom | 100 | 115 | 121 | 130 | 140 | 155 |

Table 38 presents data on the production of footwear with leather uppers in some selected OECD countries. The cyclic nature of the industry must be borne in mind, and a comparison of the average of 1962 and 1973 shows an over-all increase in production of 5-6 per cent which almost equals the increase in consumption.

However, within the OECD countries large discrepancies occur: production within the OECD countries of Europe over the 10-year period increased by a significant 24 per cent owing to the efforts of Italy and Spain, whereas production in the United States fell by 30 per cent over the same period.

Table 38. Production of footwear with leather uppers
in some selected OECD countries
(millions of pairs)

| | 1962[a] | 1973 | 1974 |
|---|---|---|---|
| Denmark | 6.7 | 4.4 | 6.7 |
| France | 99.1 | 87.1 | 87.8 |
| Germany (Fed.Rep.) | 111.4 | 95.1 | 85.6 |
| Italy | 88.0 | 242.5 | 241.3 |
| United Kingdom | 115.5 | 84.0 | 72.8 |
| Spain | 37.9 | 112.0 | 125.3 |
| Sweden | 10.2 | 4.0 | 3.8 |
| Canada | 39.8 | 32.2 | 18.9 |
| Japan | | 42.1 | 41.4 |
| United States | 528.0 | 377.7 | 344.5 |
| Total | 1,109.9 | 1,182.9 | 1,028.1 |

[a] Totals for this year were not calculated on the same basis as for 1973 and 1974.

It is difficult to draw a definite conclusion from the production and consumption data for the OECD countries. Evidence certainly exists to show that per capita consumption is declining, but future trends in the group's production and balance of trade are much less definite.

There are some indications that imports of leather-uppered shoes from countries other than those of the OECD could increase rapidly. However, if the past success of Italy and Spain in producing fashionable footwear at a realistic price is maintained, the OECD countries could increase rapidly. However, it the past success of Italy and Spain in producing fashionable footwear at a realistic price is maintained, the OECD countries may almost attain self-sufficiency in this category of footwear. This will depend upon the ability of the developing countries to expand the whole sector thus possibly denying other countries access to the imported raw materials upon which they depend.

Although imports entering the OECD market over the past decade from the centrally planned economies and some developing countries have undoubtedly increased, these imports have, in general, been cheap and utilitarian rather than fashion items.

Tables 39 and 40 show, respectively, average prices of footwear as traded by OECD countries in 1962 and 1974, and trade flows in the major producers and markets.

Table 39. Average price of footwear with leather uppers traded by OECD countries

(dollars)

| | 1962 | 1974 |
|---|---|---|
| Total OECD imports | 3.35 | 6.07 |
| Total OECD exports | 3.56 | 6.54 |
| OECD imports from centrally planned economies | a/ | 4.29 |
| OECD imports from other countries | 1.74 | 3.91 |

a/ No data available

Table 40. Balance of foreign trade in footwear with leather uppers

| | 1963 | 1974 | 1963 | 1974 |
|---|---|---|---|---|
| | (Million pairs) | | (per cent share of imports in consumption) | |
| Austria | + 0.5 | + 5.0 | 7.0 | 55.0 |
| Belgium and Luxembourg | - 3.7 | - 13.3 | 35.0 | 84.0 |
| Canada | - 1.8 | - 7.8 | 7.0 | 32.0 |
| Denmark | - 1.5 | - 2.1 | 19.0 | 56.0 |
| France | + 11.9 | + 3.6 | 4.0 | 24.0 |
| Germany (Fed.Rep.) | - 14.0 | - 69.0 | 14.0 | 51.0 |
| Ireland | + 1.1 | + 0.8 | | 42.0 |
| Italy | + 42 | + 150 | | |
| Japan | + 5.4 | + 0.3 | | |
| Netherlands | - 1.8 | - 14.4 | 19.0 | 68.0 |
| Norway | - 1.3 | - 4.3 | 24.0 | 74.0 |
| Portugal | + 0.4 | + 2.8 | | |
| Spain | + 1.8 | + 53.0 | | |
| Sweden | - 5.3 | - 7.8 | 35.0 | 74.0 |
| Switzerland | - 1.3 | - 8.4 | 31.0 | 71.0 |
| United Kingdom | - 4.1 | - 12.8 | 8.0 | 26.0 |
| United States | - 24.0 | - 125.0 | 5.0 | 27.0 |
| | + 4.3 | - 49.4 | | |

+ = Experts. - = Imports

There is certainly a market in the developed countries for low-priced leather footwear, and whether the new, highly-capitalized leather and footwear industries of the developing countries are economically able, or even prepared, to supply the developed countries with high-quality leather footwear at acceptable price levels is much discussed throughout the industry. Potentially large imports from the developing countries may also become the subject of critical political debate.

Statistical data on the volume of low- to medium-priced leather goods (garments, handbags, etc.) entering the OECD countries are not easily available owing to the fact that trade in these articles has only recently occurred. It is clear, however, that international demand for leather garments is growing, and for those developing countries which have reached high-quality levels in the clothing field, vast markets are to be found in the developed countries. It is interesting to note that

in 1970 the leather garment market in the United States was of the order of 5.9 million units, with domestic production at 4.2 million and imports at 1.7 million. By 1974 the total market was thought to be 9 million units, with domestic production at 5.6 million and imports at 3.4 million. It has been forecast[6] that by 1980 the total market will amount to 15.6 million units, of which domestic production will constitute 9.3 million and imports 6.3 million units.

## Regional variations in the production of footwear and leather goods

### Caribbean and Central America

Footwear production is not of great significance in this region where leather production is not traditional. It is reported[25] that with the exception of Mexico leather footwear production is at the artisan or small-mechanized level. Mexico is said to have 1,500 footwear production units, of which one unit has a capacity of 10,000 pairs per day and the rest between 500 and 3,000 pairs per day. The number of establishments producing footwear (as defined in ISIC 324) in other countries of the region is reported to be as follows:

| | Production units |
|---|---|
| El Salvador | 11 |
| Ecuador | 12 |
| Guatemala | 69 |
| Honduras | 66 |
| Jamaica | 24 |
| Panama | 20 |

Source: OECD, The Footwear Industry: Structure and Governmental Policies, Paris, 1976.

Footwear availability in the region varies greatly, and the following consumption is reported [25]:

| | Pairs per annum |
|---|---|
| Nicaragua | 1.20 |
| Costa Rica | 1.10 |
| Mexico | 0.45 |
| Jamaica | 0.23 |
| Haiti | 0.15 |

Latin America

This region, which produces considerable quantities of leather, is a significant producer of footwear and leather goods. The most important centres of leather-footwear production in Latin America are [25]: Argentina (Buenos Aires, Córdoba and Rosario); Brazil (Franca, São Paulo; Novo Hamburgo, Rio Grande do Sul); Bolivia (Cochabamba); Chile (Melipilla); and Uruguay (Montevideo). In most other countries in the region the major shoe production area is located within the capitals.

Until ten years ago, the footwear production industry in the region consisted of medium to small-scale mechanized operations. During the past decade, attempts were made by most countries within the region to reduce the quantity of imported footwear by banning it or heavily protecting local production. To compensate for this, Bolivia, Chile, Peru and others used foreign capital to build one or more large-capacity plants (producing 5,000 - 10,000 pairs per day) which competed heavily with domestic small-scale production units. Argentina and Uruguay, however, adopted powerful protectionist policies against these high-capacity plants. Consumption of footwear in some of the major countries is currently reported to be [25]:

| | Pairs per annum |
|---|---|
| Uruguay | 4.12 |
| Argentina | 4.12 |
| Paraguay | 2.00 |
| Brazil | 0.73 |
| Chile | 0.41[a] |
| Peru | 0.31[a] |

[a] Typical of most of the region

Asia

Bangladesh, India, and Pakistan are the major leather footwear producers of the region, although Iran, Malaysia, the Philippines, Sri Lanka and Thailand also possess significant production capacity in this sector.

India has a large number of important production centres such as Agra, Bombay, Calcutta, Delhi, Hyderabad, Kanpur and Patna. In each centre, the means of production as well as the final product may differ.

Agra [10] is said to be the biggest production centre, producing 45 per cent of Indian footwear exports in 1972/73. About 50 per cent of the city's population is directly involved in footwear production and associated activities, with 50,000 persons producing some 55,000 pairs of shoes daily in some 3,000 production establishments. However, only 156 production units produce more than 150 pairs daily.

In Calcutta and Patna, two large mechanized factories built by a transnational corporation reportedly produce up to 50,000 pairs of leather as well as canvas and rubber footwear daily, and manufacture some 40 per cent of India's footwear exports.

India's traditional leather products include the chappals made of vegetable-tanned leather in Kolhapur and adjacent areas; and the hand-painted, embossed shantiniketan of Calcutta. Bombay is also renowned for its leather products and both Julbandar and Meerat specialize in the manufacture of sports goods.

Iran traditionally possesses a footwear industry based on artisan production, but the past ten years have seen the construction of six new footwear factories (some for leather footwear) to operate in tandem with three new tanneries built in the same period.

The Philippines' major footwear production centre, according to a recent unpublished report on the country's footwear industry, is at Marikina where footwear manufacture is 85 per cent hand-operated and 15 per cent mechanized.

Other important centres in Asia for the manufacture of leather products are: Pakistan (Karachi, Hyderabad and Lahore, and Sialkot for sports goods); Bangladesh (Dacca and Chittagong); Thailand (Bangkok); and Burma (Rangoon and Mandalay).

The region, which produces some 0.40 pairs of shoes per capita per annum, has a large number of artisan shoemakers (many producing traditional products) augmented by a growing number of more modern mechanized units. Many countries in the region (e.g. Afghanistan, India, Indonesia, Nepal and Thailand) have a higher potential for leather footwear than is indicated by current production, since some bovine hides are not processed through to final production.

No reports are available on the footwear industry in the centrally planned economies of the region.

Middle East

The production of footwear and leather goods is well established in this region with both traditional artisan manufacture and some modern mechanized production units. There are no heavily concentrated production centres, except in Turkey, and artisan activity is widely dispersed. No reliable data are available on per capita footwear production or consumption.

Northern Africa

This is one of the traditional areas for leather work, and artisan production of local footwear, bags and other leather items is now being augmented by modern production units. Tunisia has some 20 mechanized shoe factories producing some 4 million pairs of shoes of which some 2 million are of leather (0.32 pairs per capita). In addition, it is estimated that a further 1 million leather shoes are to be produced by artisan units. Some 2,000 people - 0.04 per cent of the population - are said to be employed in the production of leather goods and shoes.[26] The mixture of artisan and industrial production units is also common to most other countries in northern Africa. In January 1975, Algeria was reported to be building a mechanized leather-goods production plant,[6] and Egypt, to augment its well-established tanning and footwear industry, has built a large new tannery and in April 1974 was establishing a modern shoe factory.[6]

The region's shoe production is poorly recorded and no reliable per capita consumption data are therefore available.

Central Africa

This region has not in the past been a producer of leather. In Zaire, however, a transnational corporation has now established a large footwear production unit, and modern units are also reported in some other countries in the region.

Eastern Africa

Footwear and leather goods are manufactured in this region at all levels of operation. Leather goods are widely produced, mainly by artisans, in sufficient quantities to meet local demand.

Footwear, both leather and non-leather, is generally produced either by large mechanized units which are often offshoots of transnational corporations, or by units in association with their own tanneries. In general, these industrial production units are in or near the capitals. The scale of operations in such units is high, and they have secured an increasing share of the market owing to their greater efficiency and the growing discrimination shown by consumers. It was reported in September 1975 that a major shoe factory in Kenya has an annual production of 2 million pairs of leather shoes, in addition to 6 million pairs of rubber and plastic footwear.[6]

Southern Africa

No significant industrial or rural production of footwear has been reported in this region.

Western Africa

Footwear manufacture in Western Africa is rural, artisanal and industrial. In general, production units are located in the countries' capitals with the notable exception of Nigeria: in that country, Sokoto and Kano (the tanning areas) have a virtual monopoly of leather-goods production, while footwear is more widely manufactured in the eastern and western districts.

## Production trends in the developing countries

Caribbean and Central America

Data showing the expansion of the leather-products sector in the past decade are limited and sometimes conflicting.

The Yearbook of Industrial Statistics[26] shows that annual growth in the footwear production sector (ISIC 324) between 1964 and 1973 was as follows:

| | Per cent |
|---|---|
| Dominican Republic | 10.3 |
| El Salvador | 8.4 |
| Panama | 3.2 |

The growth in production of footwear with leather uppers is elsewhere [38] reported as:

| | 1963 | 1971 | 1972 | Annual growth rate |
|---|---|---|---|---|
| | (Thousands of pairs) | | | (per cent) |
| Dominican Republic | 435 | | 647 | 4.5 |
| El Salvador | 901 | 5,420 | | 25.1 |
| Jamaica | 1,792 | | 2,578 | 4.1 |

Information on Mexican leather-footwear production is also conflicting, but exports of leather footwear have been reported [3] as amounting to $728,000 in 1964, and to $7,408,000 in 1973, a fair indication of the sector's development.

Latin America

Statistical data regarding the growth of the footwear industry, in particular tht leather-footwear sector, is scant also for this region. The Yearbook of Industrial Statistics [26] reports the following growths (ISIC 324):

| | 1964-73 | 1965-73 |
|---|---|---|
| | (Per cent) | |
| Chile | 2.2 | |
| Ecuador | | 12.1 |
| Peru | 3.9 | |

The major producers of the region are Brazil and Argentina, which have greatly increased their exports of leather footwear. The value of exports from Brazil, which was insignificant in 1964, grew to $160 million in 1975; and the quantity of Argentina's exports increased from 300,000 pairs in 1971 to 6,000,000 pairs in 1973.

In the leather-goods sector too, although no firm data are available, Brazil and Argentina are apparently expanding to become major exporters.

Asia

The growth of leather-footwear production in this region is, again, poorly documented. A recent study [10] suggests that demand for leather footwear in the developing countries will grow at an annual rate of 4.8 per cent (compared to a growth in world demand of 2 per cent), and estimates the following demand in Asia:

| | Per capita consumption (Pairs) | Production (Millions of pairs) |
|---|---|---|
| 1969 | 0.30 | 305 |
| 1975 | 0.39 | 469 |
| 1980 | 0.56 | 740 |

Statistical data [38] for some countries in the region show a decline in production between 1963 and 1972. This, however, seems somewhat unrealistic and may relate to the effect of those taxation systems which impose a duty on mechanized shoe production, and thus invite under-reporting of production.

Typical of the large-scale producers in the region is India, which enjoyed a substantial growth between 1962 and 1972 in the production, consumption and export of leather footwear [39]:

| | Production | Exports | Consumption | |
|---|---|---|---|---|
| | | | Total | Per capita |
| | (Millions of pairs) | | | (Pairs) |
| 1962 | 122.3 | 2.6 | 119.7 | 0.26 |
| 1972 | 222.9 | 7.8 | 216.2 | 0.37 |

No statistics are available regarding the manufacture of leather products in the centrally planned economies in the region.

Middle East

Iraq is one of the few countries in the region about which data are available. It is reported [38] that Iraq's production of leather footwear grew from 5.3 million pairs in 1963 to 9.3 million pairs in 1969.

In order to utilize available skins and satisfy recent global demand, Turkey and Israel are rapidly developing the manfacture and export of leather clothing. Production data are not available but exports of leather clothes and accessories (as defined in SITC 8413) have risen [40]:

| | 1963 | 1966 | 1970 | 1971 | 1974 |
|---|---|---|---|---|---|
| | | (Millions of dollars) | | | |
| Turkey | negligible | | 3.7 | | 71.9 |
| Israel | | 2.1 | | 6.8 | 13.1 |

Northern Africa

Data relating to the development of the footwear sector in this region are scant and unreliable. The following statistics on the production of footwear with leather uppers have been published [38]:

| | 1963 | 1967 | 1969 | 1970 | 1971 | 1972 |
|---|---|---|---|---|---|---|
| | (Thousands of pairs) | | | | | |
| Algeria | 1,080 | | 4,694 | | | |
| Egypt | 11,035 | | | | 17,186 | |
| Morocco | 2,110 | | | 1,696 | | |
| Tunisia | | 1,295 | | | | 1,558 |

Central Africa

Only limited data are available to show the growth of the footwear industry in the region. Growth in the production of footwear with leather uppers appears to be rapid in the following countries [38]:

| | 1967 | 1968 | 1969 | 1970 | 1972 |
|---|---|---|---|---|---|
| | | (Thousands of pairs) | | | |
| Angola | 146 | | | | 186 |
| Cameroon | | 2,029 | | | 4,466 |
| Central African Empire | | | 200 | | 720 |
| Zaire[a] | | 1,334 | | | 2,319 |

[a] Leather, February 1974

Eastern Africa

The following data on the production and consumption of leather footwear in the region are available:

| | 1963 | 1967 | 1971 | 1972 |
|---|---|---|---|---|
| | | (Thousands of pairs) | | |
| Ethiopia [29] | | 769 | 1,196 | |
| Madagascar [40] | 515 | | | 681 |

The pattern of development in other countries in the region may be similar to that shown above for Ethiopia and Madagascar.

Southern Africa

No statistical material is available concerning the leather-products industry in this region, which is limited.

Western Africa

As is the case with most other areas of Africa, data relating to the production and consumption of leather footwear are sparse for this region. The following production figures have been reported [38]:

| | 1965 | 1967 | 1971 | 1972 |
|---|---|---|---|---|
| | (Thousands of pairs) | | | |
| Ghana | | 539 | 697 | |
| Nigeria | 993 | | | 4,539 |

In all four regions of Africa, the demand for leather shoes and goods has been closely linked to the rate of urbanization which, in most of the countries concerned, has been at a level of about 5 per cent per annum. A similar rate of increase in the manufacture of leather products might be expected since in the majority of countries in the region, production is for domestic consumption. Leather-shoe production however, may have decreased in the early 1970s in some countries in the area because of the impact of the high prices of hides and skins on those of leather shoes. In addition, there are now cheaper alternatives, and the demand for plastic shoes has shown a 13 per cent increase per annum.[41]

Few reliable figures have been published on per capita availability of footwear in the African countries. Available statistics are open to question since they tend to include only artisan and industrial production (often underreported in countries where taxes are imposed), but completely ignore rural/family production which in some countries accounts for up to 50 per cent of the total. It has been suggested[41] that per capita consumption in Africa varies from 0.06 - 0.66 pairs of leather shoes per annum, with all types of shoes varying from 0.2 - 1.8 pairs per capita per annum; figures are comparable with a consumption of 3 - 4 pairs per capita per annum in developed countries. Thus, taking account of population growth and the increasing prices of leather products, it is possible to foresee limited advances in per capita leather footwear consumption with a more rapid rise in per capita consumption of canvas, rubber and plastic shoes.

Current global and regional production of leather-uppered footwear

Although there are no definitive data, various authorities have made estimates in this field, but their methodology has not usually been elaborated. In this study, a crude estimate of global leather footwear production has been derived from raw material availability.

Thus, if it is assumed that of the 8,488 million $ft^2$ of bovine leather available globally (see earlier chapter) in 1975, 65 per cent is destined for use as footwear upper leather ( = 5,517 million $ft^2$), and, if it is further assumed that 1.6 $ft^2$ is a realistic average input of upper leather per pair of shoes, it would suggest an annual global production of 3,448 million pairs of leather-uppered footwear.[11]

Current regional allocation of leather footwear production

The regional distribution of leather footwear production is nowhere authoritively summarized, but through aggregation and estimation the following is obtained:

| | Millions of pairs | Percentage of global production |
|---|---|---|
| Developed countries | | |
| OECD countries [a] | 1,120.9 | |
| European centrally planned economies and USSR [b] | 976.8 | |
| | 2,097.7 | 65.4 |
| Developing countries [c] | 1,109.9 | 34.6 |
| Annual global production | 3,207.6 | |

[a] 1974 data where available, or 1973 data [37]

[b] Aggregated from data for various years 1972-1974 from sources available [26], [42], with an estimate of Bulgarian leather footwear production at 8.8 million pairs per annum.

[c] Extrapolated from data in Table 41, leather footwear production of 36 developing countries representing 79.0 per cent of those countries' hide production.

[11] An underestimate, probably, as some volume of leather footwear will be produced from non-bovine leathers.

It may be noted that this allocation falls short, by some 7 per cent, of the earlier estimate of global leather footwear production. This may be due to the crudeness of the estimation with no allowances for scrap or alternative uses, but it may also be due to incomplete recognition of rural footwear production in some developing countries.

Global distribution of leather footwear production in 1975 is shown below, in billions of pairs.

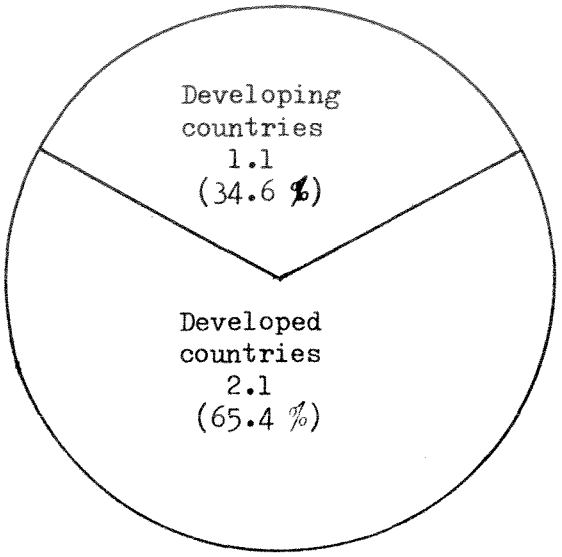


Table 41 provides a summary of the current production activity and raw material utilization reported in 1975 for 36 developing countries for which information is available. The countries listed represent, in human population terms, 81.6 per cent of the developing countries (1975). In hide production, they represent 79.0 per cent of the developing countries (1975).

In the table, leather footwear production, in most countries, refers to western-style closed shoes. Sandals, where produced under industrial conditions, may be included. In many countries, a significant volume of simple leather sandals is produced at the rural/handicraft level and may not be recorded as footwear production.

Table 41. Reported production of leather footwear [a] and assessment of apparent utilization [b] of domestic hides, selected developing countries, 1975 (unless otherwise indicated)

| | Data source | Leather footwear production (Million pairs) | 1975 Human population (Millions) | 1975 Hide production (Thousand pieces) | Leather footwear production (per capita per annum) | Apparent utilization, domestic hides (Percentage) |
|---|---|---|---|---|---|---|
| **Caribbean and Central America** | | | | | | |
| Dominican Republic (1972) | 32 | 0.7 | 5.1 | 321 | 0.14 | 13 |
| El Salvador (1971) | 32 | 5.4 | 4.1 | 149 | 1.32 | 100+ |
| Guatemala | 20 | 2.2 | 6.1 | 384 | 0.36 | 35 |
| Haiti (1970) | 32 | 1.2 | 4.6 | 88 | 0.26 | 84 |
| Jamaica | a/ | 2.7 | 2.0 | 85 | 1.35 | 100+ |
| Mexico | 20 | 79.0 | 59.2 | 3,483 | 1.33 | 100+ |
| Panama | 10 | 1.8 | 1.7 | 216 | 1.06 | 51 |
| **South America** | | | | | | |
| Argentina | 26 | 55.0 | 25.4 | 14,210 | 2.17 | 24 |
| Brazil | 19 | 110.0 | 109.7 | 11,143 | 1.00 | 61 |
| Chile | 32 | 5.8 | 10.3 | 649 | 0.56 | 55 |
| Uruguay | 19 | 5.4 | 3.1 | 2,193 | 1.74 | 15 |
| Venezuela | c/ | 23.0 | 12.2 | 1,182 | 1.89 | 100+ |
| **Asia** | | | | | | |
| India | 20 | 224.0 | 613.2 | 29,165 | 0.37 | 47 |
| Indonesia | 19 | 9.9 | 136.0 | 1,522 | 0.07 | 40 |
| Iran | 1 | 33.0 | 32.9 | 1,439 | 1.00 | 100+ |
| Korea (Republic of) | 31 | 3.4 | 34.0 | 343 | 0.10 | 61 |
| Malaysia (W) | 19 | 1.0 | 12.1 | 91 | 0.08 | 68 |
| Pakistan | 19 | 15.0 | 70.6 | 3,832 | 0.21 | 24 |
| Philippines | 19 | 6.4 | 44.4 | 730 | 0.14 | 54 |
| China | d/ | 219.0 | 838.8 | 13,476 | 0.26 | 100+ |
| **Middle East** | | | | | | |
| Turkey | 31 | 18.5 | 39.9 | 2,809 | 0.46 | 41 |

a/ All leather or footwear with leather uppers.

b/ "Apparent utilization" assumes all footwear bovine leather uppered and 16.25 pairs produced per hide.

c/ Private communication.

d/ Estimated.

Table 41. (cont'd)

| | Data source | Leather footwear production (Million pairs) | 1975 Human population (Millions) | 1975 Hide production (Thousand pieces) | Leather footwear production (per capita per annum) | Apparent utilization, domestic hides (Percentage) |
|---|---|---|---|---|---|---|
| North Africa | | | | | | |
| Algeria | c/ | 6.8 | 16.8 | 275 | 0.40 | 100+ |
| Egypt (1971) | 32 | 17.2 | 37.5 | 1,393 | 0.46 | 76 |
| Morocco | c/ | 9.0 | 17.5 | 660 | 0.51 | 84 |
| Tunisia | 20 | 2.1 | 5.7 | 234 | 0.37 | 55 |
| Central Africa | | | | | | |
| Angola (1972) | 32 | 1.9 | 6.4 | 322 | 0.30 | 36 |
| Cameroon (1970) | 32 | 4.5 | 6.4 | 286 | 0.70 | 97 |
| Central African Empire (1972) | 32 | 0.7 | 1.8 | 56 | 0.39 | 77 |
| Zaire | 20 | 2.3 | 24.5 | 156 | 0.09 | 91 |
| East Africa | | | | | | |
| Ethiopia | 19 | 1.1 | 28.0 | 2,101 | 0.04 | 3 |
| Madagascar (1970) | 32 | 0.7 | 8.9 | 795 | 0.09 | 5 |
| Somalia | c/ | 0.5 | 3.2 | 275 | 0.16 | 11 |
| Tanzania | 19 | 1.8 | 18.1 | 1,320 | 0.10 | 8 |
| Southern Africa | | | | | | |
| Botswana | | 0.0 | 0.7 | 253 | 0.00 | 0 |
| West Africa | | | | | | |
| Ghana | c/ | 0.3 | 9.9 | 120 | 0.03 | 15 |
| Nigeria | c/ | 5.5 | 62.9 | 1,100 | 0.09 | 31 |
| Total (36 selected countries) | | 876.8 | 2312.8 | 96,856 | 0.38 | 55.7 |

Although in the developed world the percentage of bovine leathers ultimately destined for the footwear industry has declined concomitant with the growth of leather garment and other leather trends, in the majority of developing countries leather footwear represents some 80 per cent of total bovine leather utilization. In the table, therefore, where countries record figures approaching this level, it may be assumed that they are fully utilizing their bovine hides.

Trade and trade barriers in leather products markets [12/]

It has been shown that the developing countries have the potential to penetrate and create markets in this category of goods. The following is a summary, in monetary terms, of current performance and the constraints to their desired trade expansion.

The major markets at present are the 21 developed market economies. Data regarding the imports for the whole leather sector are given in Table 42. Imports of leather products from the world in 1975 were valued at $258 million, representing an annual growth rate of 19 per cent. The main import items from the world and the developing countries in this product category were prepared parts of footwear: $178 million and $31 million, respectively. Increase in imports from developing countries were particularly rapid (44 per cent a year between 1970 and 1975) and the share of developing countries in prepared parts of footwear rose from 5 per cent to 17 per cent during the period.

Travel goods, handbags and similar articles (SITC 831)

Imports of travel goods, handbags and similar goods from the world by the 21 developed market economy countries rose from $184 million in 1967 to $821 million in 1975, at an annual rate of 21 per cent. Imports from developing countries rose much faster at 29 per cent, from a value of $34 million in 1967 to $255 million in 1975, and the market share of developing countries rose from 19 to 31 per cent during the period.

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12/ Contribution by UNCTAD.

Table 42. Imports of hides and skins, leather, leather products and footwear by 21 developed market economy countries from the world and developing countries and territories (DC), 1967 and 1975
(Value of imports in millions of dollars)

| SITC code | Products | 1967 | | | 1975 | | | Growth rate a/ 1967-1975 (per cent) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Value of imports from: | | DC market share a/ (per cent) | Value of imports from: | | DC market share a/ (per cent) | | |
| | | World | DC | | World | DC | | World | DC |
| 211 | Hides and skins | 567 | 156 | 28 | 936 | 168 | 18 | 7 | 1 |
| 211.1 | Bovine and equine hides other than calf and kid skins | 226 | 37 | 17 | 445 | 15 | 3 | 9 | -11 |
| 211.2 | Calf skins and kid skins | 57 | 3 | 5 | 87 | 2 | 2 | 5 | -4 |
| 211.4 | Goat skins and kid skins | 47 | 31 | 65 | 66 | 38 | 58 | 5 | 3 |
| 211.6 | Sheep and lamb skins, with the wool on | 118 | 33 | 28 | 148 | 28 | 19 | 3 | -2 |
| 211.7 | Sheep and lamb skins, without the wool | 78 | 24 | 31 | 152 | 67 | 44 | 9 | 14 |
| 211.8 | Waste and used leather | 3 | 0 | 11 | 5 | 0 | 6 | 8 | 0 |
| 211.9 | Hides and skins, n.e.s. | 38 | 28 | 73 | 32 | 18 | 56 | -2 | -5 |
| 611 | Leather | 422 | 113 | 27 | 1170 | 348 | 30 | 14 | 15 |
| 611.2 | Reconstituted or artificial leather | 8 | 0 | 1 | 13 | 0 | 0 | 7 | -25 |
| 611.3 | Calf leather | 62 | 7 | 11 | 108 | 18 | 16 | 7 | 12 |
| 611.4 | Leather of other bovine cattle and equine leather | 122 | 31 | 26 | 499 | 120 | 24 | 19 | 18 |
| 611.9 | Leather, n.e.s. | 224 | 74 | 33 | 551 | 211 | 38 | 12 | 14 |
| 611.9(1) | Leather of sheep and lamb skins | 80 | 25 | 31 | 230 | 58 | 25 | 14 | 11 |
| 611.9(2) | Leather of goat and kid skins | 69 | 35 | 51 | 186 | 117 | 63 | 13 | 16 |
| 611.9(3) | Chamois-dressed leather | 13 | 0 | 1 | 22 | 1 | 4 | 8 | 32 |
| 611.9(4) | Parchment-dressed leather | 0 | 0 | 4 | 0 | 0 | 5 | 19 | 22 |
| 611.9(5) | Patent and metallized leather | 19 | 0 | 1 | 12 | 2 | 17 | -6 | 45 |
| 611.9(9) | Other leather | 42 | 14 | 33 | 101 | 33 | 33 | 12 | 11 |
| 612 | Manufactures of leather | 62 | 5 | 8 | 258 | 47 | 18 | 19 | 32 |
| 612.1 | Machine leather belting, etc. | 5 | 0 | 0 | 10 | 0 | 4 | 8 | 45 |
| 612.2 | Saddlery, etc. | 8 | 1 | 17 | 38 | 8 | 22 | 21 | 25 |
| 612.3 | Uppers, legs and other prepared parts of footwear | 37 | 2 | 5 | 178 | 31 | 17 | 22 | 44 |
| 612.9 | Manufactures of leather, n.e.s. | 12 | 2 | 17 | 32 | 7 | 23 | 13 | 18 |
| 831 | Travel goods, handbags and similar art. | 184 | 34 | 19 | 821 | 255 | 31 | 21 | 29 |
| 841.3 | Apparel and clothing accesories of leather | 98 | 18 | 18 | 873 | 336 | 39 | 31 | 44 |
| 851.0(2) | Footwear with soles of leather, etc. | 658 | 45 | 7 | 3131 | 472 | 15 | 22 | 34 |

Source: Special tabulations by the UNCTAD secretariat.
a/ Calculated before rounding the value of imports to million dollars.

Apparel and clothing accessories of leather

This is a product category in which developed countries' imports from the world grew most rapidly. The value of imports rose from $98 million in 1967 to $873 million in 1975, at an annual rate of 31 per cent during the period. Growth in imports from developing countries was more spectacular - from $18 million in 1967 to $336 million in 1975, at an annual growth rate of 44 per cent for the period. Thus, whereas imports from the world grew rapidly, developing countries still were able to increase their market share from 18 per cent to 39 per cent.

Leather footwear (SITC 851.0(2))

The value of imports of leather footwear from the world by the 21 developed market economy countries reached more than $3 billion in 1975 at a respectable rate of increase of 22 per cent a year between 1967 and the terminal year. Imports from developing countries grew much faster, at 34 per cent a year, from $45 million in 1967 to $472 million in 1975. The developing countries' share in the import market of the developed countries more than doubled, from 7 to 15 per cent during the period.

Exports of leather and footwear from selected developing countries to the world

Up to now, the review of trade pattern was based upon trade data of the 21 developed market economy countries. In this section, export data of developing countries are used in order to examine also the developing countries' exports to socialist countries and to other developing countries.

Table 43 summarizes information on exports of leather and footwear from selected developing countries for which 1973 trade data are available.[13/] There were 30 such countries whose exports to the world of this product category were valued at $1 million or more in 1973. Major developing country exporters in 1973 were India, with exports of $255 million, Yugoslavia ( $143 million), Brazil ( $136 million), Argentina ( $123 million) and the Republic of Korea ( $113 million) followed by Pakistan ( $62 million) and Hong Kong ( $55 million).

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13/ There were more than 50 such developing countries and territories as of May 1977.

Other countries with exports of $10 million or more in 1973 were Colombia ( $24 million), Egypt, Iran, Nigeria, and Mexico, in that order. Six developing countries' exports ranged between $5 million and $10 million, whereas the value of exports of 12 developing countries ranged between $1 million and $5 million (see Table 43).

Table 43. Exports of leather and footwear [a] from selected developing countries in 1973

(million dollars)

| Exporting country [b] | Value of exports to | | | |
|---|---|---|---|---|
| | World | Developed market economy countries | Socialist countries | Developing countries |
| India | 255 | 160 | 85 | 9 |
| Yugoslavia | 143 | 56 | 85 | 1 |
| Brazil | 136 | 129 | 0 | 2 |
| Argentina | 123 | 87 | 24 | 9 |
| Republic of Korea | 113 | 111 | 0 | 1 |
| Pakistan | 62 | 48 | 5 | 2 |
| Hong Kong | 55 | 46 | 0 | 5 |
| Colombia | 24 | 19 | 0 | 2 |
| Egypt | 16 | 0 | 15 | 0 |
| Iran | 11 | 1 | 0 | 1 |
| Nigeria | 10 | 10 | 0 | 0 |
| Mexico | 10 | 10 | 0 | 0 |
| Morocco | 9 | 8 | 0 | 1 |
| Singapore | 9 | 3 | 0 | 5 |
| Lebanon | 8 | 2 | 0 | 6 |
| Israel | 7 | 6 | 0 | 0 |
| Thailand | 5 | 3 | 0 | 3 |
| Malaysia | 5 | 3 | 0 | 2 |
| Senegal | 4 | 1 | 0 | 3 |
| Bahrain | 4 | 0 | 0 | 4 |
| Indonesia | 3 | 3 | 0 | 0 |
| Philippines | 2 | 2 | 0 | 0 |
| Equatorial Africa | 2 | 1 | 0 | 1 |
| Madagascar | 2 | 2 | 0 | 0 |
| Kuwait | 1 | 0 | 0 | 1 |
| Venezuela | 1 | 1 | 0 | 0 |
| Niger | 1 | 1 | 0 | 0 |
| Ivory Coast | 1 | 0 | 0 | 1 |
| Cameroon | 1 | 0 | 0 | 1 |
| Trinidad and Tobago | 1 | 0 | 0 | 1 |
| Total above | 1,024 | 713 | 223 | 61 |
| Per cent of exports to world | 100 | 70 | 22 | 6 |

Source: Special tabulations by the UNCTAD secretariat on the basis of export data of developing countries.

a/ Sum of SITC 61 and 85.

b/ Developing countries for which 1973 trade data are available in SITC code and of which exports of leather and leather products were valued at $1 million or more are listed in descending value of their exports.

For the majority of these exporting countries, developed market economy countries were major markets. For the 30 countries listed in Table 43, exports to the developed market economy countries accounted for 70 per cent of their exports of leather and footwear to all destinations, whereas exports to the socialist countries accounted for 22 per cent of the total. Of those developing countries listed in Table 43, the major developing suppliers of this product group to socialist countries in 1973 were India and Yugoslavia, both with exports of $85 million, followed by Argentina ( $24 million), Egypt ( $15 million), Iran ( $9 million), and Pakistan ( $5 million).

Trade in leather and footwear between the developing countries accounted for only 6 per cent of the total exports from the 30 developing countries to the world. In order to achieve the Lima target of 25 per cent industrial production by developing countries by the year 2000, intra-trade in leather and footwear has to increase greatly.[14/] Of the 30 developing countries listed in Table 43, the main suppliers of trade between developing countries in 1973 were India ( $9 million), Argentina ( $9 million), Lebanon ( $6 million), Hong Kong ( $5 million), Singapore ( $5 million), Bahrain ( $4 million), Thailand ( $3 million) and Senegal ( $3 million). Intra-trade of thirteen other developing countries ranged from $1 million to $3 million in 1973.

## Tariffs and tariff structures in selected developed market economy countries

### EEC

Tariffs and tariff structures are summarized for EEC in Table 44 according to most forward nations (MFN) and General System of Preferences (GSP) status of imports of hides and skins, leather, leather products and footwear classified according to the stage of processing. Information on the value of imports and on major suppliers among GSP beneficiaries are given according to source and status of imports. Data on trade and tariffs refer to the year 1974, whereas GSP coverage is for 1976.

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14/ See UNCTAD, The dimensions of the required restructuring of world manufacturing output and trade in order to reach the Lima target. (TD/185/Supp.1), May 1976.

Table 44. The range and average rates of tariffs according to MFN and GSP status of imports by EEC of hides and skins, leather, leather products and footwear classified according to the stage of processing (trade and tariff rates refer to 1974; GSP coverage, 1976)

| Products and BTN headings | Source and/or status of imports | No. of tariff line items | Duty rates | | | Value of imports (in $1,000) | Major suppliers among GSP beneficiaries f/ (value of imports in $1,000) |
|---|---|---|---|---|---|---|---|
| | | | Range | Simple average | Weighted average | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Raw hides and fur skins (41.01; 41.09; 43.01) a/ | MFN duty free | 3 | 0-0 | 0 | 0 | 715,509 | |
| | MFN dutiable | 0 | 0-0 | 0 | 0 | 0 | |
| | From MFN countries | 0 | 0-0 | 0 | 0 | 0 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 0 | 0-0 | 0 | 0 | 0 | |
| | From GSP beneficiaries | 0 | 0-0 | 0 | 0 | 0 | |
| | Of which covered by GSP | 0 | 0-0 | 0 | 0 | 0 | |
| | From EFTA countries | 0 | 0-0 | 0 | 0 | 0 | |
| | From other special preference countries | 0 | 0-0 | 0 | 0 | 0 | |
| Semi-manufactures of leather and fur (41.02-08; 41.10; 43.02) b/ | MFN duty free | 4 | | | | 68,954 | India (33697), Pakistan (25784), Afghanistan (23274); Brazil (17043), Uruguay (10370), Yugoslavia (9530), Colombia (5501), Algeria (2451), Mexico (1566), Venezuela (1070), Sri Lanka (495), Peru (428), Bolivia (391), Rep. of Korea (248), Oth. Asia (217), Indonesia (211), Thailand (202), Saudi Arabia (172), Afghanistan (155), Iran (127), Panama (69). |
| | MFN dutiable | 13 | 8.0-3.0 | 4.7 | 5.6 | 307,073 | |
| | From MFN countries | 13 | 8.0-3.0 | 4.7 | 4.9 | 73,755 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 9 | 8.0-3.5 | 5.1 | 5.0 | 67,664 | |
| | From GSP beneficiaries | 12 | 8.0-3.0 | 4.7 | 6.3 | 133,248 | |
| | Of which covered by GSP | 9 | 8.0-3.5 | 5.1 | 7.2 | 102,124 | |
| | From EFTA countries | 13 | 8.0-3.0 | 4.7 | 6.2 | 31,887 | |
| | From other special preference countries | 12 | 8.0-3.0 | 4.7 | 4.7 | 68,181 | |
| Manufactured articles of leather and fur (42.01; 42.03-05; 43.03-04) c/ | MFN duty free | 0 | | | | 0 | Yugoslavia (14810), Afghanistan (4966), Brazil (2870), Argentina (2377), Pakistan (1774), Uruguay (1612), Oth. Asia (1324), India (954), Rep. of Korea (424), Iran (174), Thailand (173) Philippines (107), |
| | MFN dutiable | 12 | 13.0-5.0 | 8.7 | 9.5 | 151,873 | |
| | From MFN countries | 12 | 13.0-5.0 | 8.7 | 10.3 | 54,909 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 12 | 13.0-5.0 | 8.7 | 10.3 | 54,909 | |
| | From GSP beneficiaries | 12 | 13.0-5.0 | 8.7 | 9.1 | 31,800 | |
| | Of which covered by GSP | 12 | 13.0-5.0 | 8.7 | 9.1 | 31,800 | |
| | From EFTA countries | 12 | 13.0-5.0 | 8.7 | 8.5 | 0,922 | |
| | From other special preference countries | 12 | 13.0-5.0 | 8.7 | 9.1 | 55,241 | |
| Footwear (64.01-06) d/ | MFN duty free | 0 | | | | 0 | Yugoslavia (14160), Oth. Asia (6368), Pakistan (4665), India (3936), Brazil (3159), Rep. of Korea (2709), Malaysia (2448), Singapore (1553), Uruguay (782), Indonesia (460), Argentina (208), Algeria (180), Sri Lanka (97). |
| | MFN dutiable | 8 | 20.0-6.5 | 11.1 | 12.4 | 262,126 | |
| | From MFN countries | 8 | 20.0-6.5 | 11.1 | 15.4 | 114,388 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 8 | 20.0-6.5 | 11.1 | 15.4 | 114,388 | |
| | From GSP beneficiaries | 8 | 20.0-6.5 | 11.1 | 12.3 | 40,939 | |
| | Of which covered by GSP | 8 | 20.0-6.5 | 11.1 | 12.3 | 40,939 | |
| | From EFTA countries | 8 | 20.0-6.5 | 11.1 | 9.2 | 49,119 | |
| | From other special preference countries | 7 | 20.0-6.5 | 11.4 | 9.1 | 57,681 | |
| Travel goods and handbags (42.02) e/ | MFN duty free | 0 | | | | 0 | Yugoslavia (1411), India (473), Rep. of Korea (367), Singapore (310), Brazil (212), Oth. Asia (202), Argentina (128), Colombia (115), Iran (103), Afghanistan (82), Thailand (80). |
| | MFN dutiable | 2 | 15.0-7.5 | 11.3 | 9.2 | 50,013 | |
| | From MFN countries | 2 | 15.0-7.5 | 11.3 | 9.4 | 33,895 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 2 | 15.0-7.5 | 11.3 | 9.4 | 33,895 | |
| | From GSP beneficiaries | 2 | 15.0-7.5 | 11.3 | 9.1 | 3,633 | |
| | Of which covered by GSP | 2 | 15.0-7.5 | 11.3 | 9.1 | 3,633 | |
| | From EFTA countries | 2 | 15.0-7.5 | 11.3 | 9.7 | 4,212 | |
| | From other special preference countries | 2 | 15.0-7.5 | 11.3 | 8.0 | 8,274 | |

Source: Special tabulations by the UNCTAD secretariat.
For footnotes a/ to f/ see Table 45.

Raw hides and fur skins [15/]

In EEC, imports of raw hides and fur skins entered duty-free with a value of $716 million in 1974.

Semi-manufactures of leather and fur

In the case of semi-manufactures, 4 tariff-line items entered duty-free at $69 million. MFN dutiable rates ranged between 3 and 8 per cent with an import value of $307 million. The simple average duty was 4.7 per cent, whereas the weighted average was 5.6 per cent.

Imports from MFN countries were valued at $74 million, most of which ( $68 million) were also exported by GSP beneficiaries and covered by GSP. Imports from GSP beneficiaries consisting of 12 out of 13 tariff-line items making up this product category were worth $133 million; the simple and weighted average rates of duty were 4.7 and 6.3 per cent, respectively.

Imports from EFTA countries were valued at $32 million, with simple and weighted average rates of duty of 4.7 and 6.2 per cent, respectively. Imports from other special preference countries amounted to $68 million in 1974, with both average rates at 4.7 per cent.

The major suppliers among GSP beneficiaries in 1974 were India ( $34 million), Pakistan ( $26 million), Afghanistan ( $23 million), Brazil ( $17 million), Uruguay ( $10 million), Yugoslavia ( $9.5 million) and Colombia ( $5.5 million), (see Table 44 for other suppliers).

Manufactured articles of leather and fur

There were no MFN duty-free imports falling under this product category. Dutiable imports in 1974 were valued at $152 million. The duty range was 5 to 13 per cent, with a simple average rate of 8.7 per cent and a weighted average of 9.5 per cent. Imports from MFN countries accounted for about one-third, and all of these products were also exported by the GSP beneficiaries and covered by GSP. GSP beneficiaries supplied $32 million, the simple and weighted average rates being 8.7 and 9.1 per cent, respectively; all of these imports were covered by GSP. The largest dutiable supply came from other special preference countries ( $55 million).

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15/ See Table 44 for the definition of products in terms of BTN code.

Table 45. The range and average rates of tariffs according to MFN and GSP status of imports by Japan of hides and skins, leather, leather products and footwear classified according to the stage of processing (trade and tariff rates refer to 1974; GSP coverage, 1976)

| Products and BTN headings | Source and/or status of imports | No. of tariff line items | Duty rates | | | Value of imports (in $1000) | Major suppliers among GSP beneficiaries f/ (value of imports in $1000) |
|---|---|---|---|---|---|---|---|
| | | | Range | Simple average | Weighted average | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Raw hides and fur skins (41.01; 41.09; 43.01) a/ | MFN duty free | 3 | | | | 187,298 | Republic of Korea (155), Argentina (91), Mongolia (73) Indonesia (68), Paraguay (63), Bulgaria (53). |
| | MFN dutiable | 3 | 20.0-5.0 | 11.7 | 11.7 | 10,696 | |
| | From MFN countries | 3 | 20.0-5.0 | 11.7 | 11.9 | 10,084 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 2 | 20.0-5.0 | 12.5 | 11.9 | 10,002 | |
| | From GSP beneficiaries | 2 | 20.0-5.0 | 12.5 | 9.0 | 573 | |
| | Of which covered by GSP | 2 | 20.0-5.0 | 12.5 | 9.0 | 573 | |
| Semi-manufactures of leather and fur (41.02-08; 41.10; 43.02) b/ | MFN duty free | 0 | | | | 0 | India (10956), Pakistan (4155), Indonesia (2445), Argentina (1387), Bangladesh (1128), Mexico (706), Spain (704), Brazil (603), Greece (497), Hong Kong (422), Colombia (369), Rep. of Korea (369), Israel (340), Other Asia (230), Uruguay (115), Kenya (75), Paraguay (66), Nigeria (64). |
| | MFN dutiable | 18 | 25.0-7.5 | 14.9 | 11.9 | 58,549 | |
| | From MFN countries | 18 | 25.0-7.5 | 14.9 | 13.9 | 33,635 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 16 | 25.0-7.5 | 14.2 | 13.9 | 33,615 | |
| | From GSP beneficiaries | 16 | 25.0-7.5 | 14.2 | 9.2 | 24,914 | |
| | Of which covered by GSP | 16 | 25.0-7.5 | 14.2 | 9.2 | 24,914 | |
| Manufactured articles of leather and fur (42.01; 42.03-05; 43.03-04) c/ | MFN duty free | 0 | | | | 0 | Rep. of Korea (9928), Hong Kong (8774), Spain (3192), Other Asia (2085), Thailand (420), Indonesia (344) Brazil (269), Bulgaria (231), Israel (220), Greece (212), Argentina (209), Peru (146), Singapore (134), Kenya (99), Romania (77), Philippines (72), Uruguay (69), Colombia (57), Turkey (52). |
| | MFN dutiable | 15 | 25.0-7.5 | 15.0 | 16.7 | 46,644 | |
| | From MFN countries | 15 | 25.0-7.5 | 15.0 | 18.2 | 19,770 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 6 | 25.0-7.5 | 16.7 | 19.3 | 14,434 | |
| | From GSP beneficiaries | 14 | 25.0-7.5 | 15.0 | 15.7 | 26,874 | |
| | Of which covered by GSP | 6 | 25.0-7.5 | 16.7 | 18.9 | 14,904 | |
| Footwear (64.01-06) d/ | MFN duty free | 0 | | | | 0 | Rep. of Korea (53134), Other Asia (28466), Brazil (1196), Spain (1013), Malaysia (327), Hong Kong (300), India (241), Philippines (101), Yugoslavia (80), Argentina (72). |
| | MFN dutiable | 12 | 30.0-7.5 | 16.6 | 12.9 | 118,460 | |
| | From MFN countries | 12 | 30.0-7.5 | 16.6 | 17.6 | 33,397 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 9 | 30.0-7.5 | 17.9 | 24.6 | 16,473 | |
| | From GSP beneficiaries | 12 | 30.0-7.5 | 16.6 | 11.1 | 85,063 | |
| | Of which covered by GSP | 9 | 30.0-7.5 | 17.9 | 10.4 | 41,428 | |
| Travel goods and hand bags (42.02) e/ | MFN duty free | 0 | | | | 0 | Rep. of Korea (7394), Hong Kong (6993), Other Asia (1762), India (1008), Spain (761), Philippines (695), Morocco (179), Mexico (97), Thailand (91). |
| | MFN dutiable | 5 | 20.0-10.0 | 14.0 | 12.2 | 45,432 | |
| | From MFN countries | 5 | 20.0-10.0 | 14.0 | 13.3 | 26,216 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 5 | 20.0-10.0 | 14.0 | 13.3 | 26,216 | |
| | From GSP beneficiaries | 5 | 20.0-10.0 | 14.0 | 10.7 | 19,205 | |
| | Of which covered by GSP | 5 | 20.0-10.0 | 14.0 | 10.7 | 19,205 | |

Source: Special tabulations by the UNCTAD secretariat.

a/ Corresponding SITC codes are: 211; 212. b/ Corresponding SITC codes are: 611; 613.

c/ " " " " 612 excluding 612.3; 841.3; 842.

d/ " " " " 612.3; 851. e/ Corresponding SITC codes are: 831.

f/ GSP beneficiaries which supplied $50,000 or more in 1974 are listed in the descending order of the value of imports indicated in parentheses.

Major suppliers among GSP beneficiaries in 1974 were Yugoslavia ( $15 million), Afghanistan ( $5 million), Brazil ( $3 million), Argentina ( $2 million), Pakistan ( $2 million) and Uruguay ( $2 million).

Footwear

There were no MFN duty-free imports of footwear. Dutiable imports in 1974 amounted to $262 million, the duty rates ranging between 6.5 and 20 per cent, with a simple average of 11.1 per cent and a weighted average of 12.4 per cent. Classified according to sources and status of supply, MFN countries supplied $114 million, with simple and weighted averages of 11.1 and 15.4 per cent, respectively; all of these products were also exported by the GSP beneficiaries and covered by GSP. Imports from GSP beneficiaries were $41 million, or only 16 per cent of the dutiable imports of footwear in 1974. EFTA countries supplied $49 million, and other special preference countries $58 million.

Main suppliers among GSP beneficiaries in 1974 were Yugoslavia ( $14 million), Other Asia ( $6 million), Pakistan ( $5 million), India ( $4 million), Brazil ( $3 million), the Republic of Korea ( $3 million), Malaysia ( $2 million) and Singapore ( $2 million).

Travel goods and handbags

There were only two tariff-line items corresponding to dutiable imports of this product category, valued at $50 million in 1974. The range of duty rates was 7.5 to 15 per cent with a simple average rate of duty of 11.3 per cent and a weighted average of 9.2 per cent. The main sources of dutiable imports were the MFN countries which supplied almost 70 per cent of such imports followed by other Special Preference countries. Imports from GSP beneficiaries were valued at $3.6 million and of these countries only Yugoslavia's exports were in excess of $1 million.

Japan

Raw hides and fur skins

The bulk of raw hides and skins enter Japan duty-free; the value of such imports in 1974 was $187 million. Dutiable imports amounted to $11 million at an exceptionally high rate (both the simple and

weighted average) of 11.7 per cent with the range of duty rates of 5 to 20 per cent. Almost all of these imports came from MFN countries, leaving only $0.6 million to be supplied by the GSP beneficiaries - and of these countries only the Republic of Korea supplied $100 thousand in that year.

Semi-manufactures of leather and fur

All imports of this product category valued at $59 million in 1974 were dutiable at very high rates of duty, a simple rate of 14.9 per cent a weighted average of 11.9 percent with the range of duty rates of 7.5 to 25 per cent applied to 18 tariff-line items (see Table 45). The bulk of imports came from MFN countries ($34 million). Imports from the GSP beneficiaries amounted to $25 million at a relatively lower weighted average duty rate of 9.2 per cent compared with 13.9 per cent applied to imports from MFN countries. Major suppliers among the GSP beneficiaries in 1974 were India, which supplied $11 million worth, Pakistan ($4 million), Indonesia ($2.4 million), Argentina ($1.4 million) and Bangladesh ($1.1 million) (see Table 45 for other suppliers).

Manufactured articles of leather and fur

Imports of these products valued at $47 million in 1974 were all dutiable at a simple average of 15 per cent and a weighted average of 16.7 per cent, the range of duty rates being 7.5 to 25 per cent. MFN countries supplied $20 million at a weighted average duty rate of 18.2 per cent. Imports from the GSP beneficiaries amounted to $27 million at a weighted average duty-rate of 15.7 per cent. Of these imports, however, only 6 out of 15 tariff line items comprising this product category were covered by GSP and the weighted average duty rate was 18.9 per cent. Main suppliers among GSP beneficiaries in 1974 were the Republic of Korea ($10 million), Hong Kong ($9 million), Spain ($2 million) and Other Asia ($2 million). All the remaining GSP beneficiaries supplied less than $0.5 million.

Footwear

Footwear imports worth $118 million in 1974 were all dutiable, with a range of duty between 7.5 and 30 per cent; the simple and

weighted average rates of duty were 16.6 and 12.9 per cent, respectively. MFN countries supplied $33 million in 1974, of which nine tariff-line items were also exported by the GSP beneficiaries and covered by GSP (valued at $16 million, dutiable at the very high rate of 24.6 per cent). Imports from the GSP beneficiaries amounted to $85 million, but only about one-half of the value was covered by GSP, dutiable at a weighted average rate of 10.4 per cent compared with 24.6 per cent levied on comparable imports from MFN countries, indicating a substantial preferential margin for GSP beneficiaries. Major suppliers were the Republic of Korea, with exports of $53 million, and Other Asia ($28 million), followed by Brazil ($1 million) and Spain ($1 million).

Travel goods and handbags

Imports of these products valued at $45 million in 1974 were dutiable in the range of 10 to 20 per cent at simple andweighted average rates of 14 and 12.2 per cent. MFN countries supplied $26 million and GSP beneficiaries the remaining $19 million at a weighted average duty rate of 10.7 per cent (compared with 13.3 per cent levied on comparable imports from MFN countries). Major suppliers among GSP beneficiaries in 1974 were the Republic of Korea ($7 million), Hong Kong ($7 million), Other Asia ($2 million) and India ($1 million).

United States

Raw hides and fur skins

Almost all imports of this product category valued at $153 million entered the United States duty-free.

Semi-manufactures of leather and fur

A nominal amount of imports of these products entered the United States duty-free. Dutiable imports were valued at $137 million in 1974 and duty rates ranged between 2.5 and 18.5 per cent, with an average rate (both simple and weighted). The bulk came from MFN countries ($79 million), of which only imports worth $16 million were covered by GSP. Imports from GSP beneficiaries amounted to $59 million, of which imports worth only $2 million were covered by GSP, indicating that the value of GSP benefits in this product category would be nominal. The main suppliers among GSP beneficiaries in 1974 were: Argentina ($26 million), India ($15 million), Brazil ($8 million), Yugoslavia ($4 million), Mexico, Colombia, Uruguay and Thailand - the last four countries having supplied $1 million each (see Table 46).

Table 46. The range and average rates of tariffs according to MFN and GSP status of imports by the United States of hides and skins, leather, leather products and footwear classified according to the stage of processing (trade and tariff rates refer to 1974; GSP coverage, 1976)

| Products and BTN headings | Source and/or status of imports | No. of tariff line items | Duty rates | | | Value of imports (in $1000) | Major suppliers among GSP beneficiaries f/ (value of imports in $1000) |
|---|---|---|---|---|---|---|---|
| | | | Range | Simple average | Weighted average | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Raw hides and fur skins (41.01; 41.09; 43.01) a/ | MFN duty free | 33 | | | | 152,921 | |
| | MFN dutiable | 4 | 18.5-2.0 | 6.1 | 2.0 | 3,376 | |
| | From MFN countries | 4 | 18.5-2.0 | 6.1 | 2.0 | 3,364 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 2 | 2.0-2.0 | 2.0 | 2.0 | 2,191 | |
| | From GSP beneficiaries | 2 | 2.0-2.0 | 2.0 | 2.0 | 11 | |
| | Of which covered by GSP | 2 | 2.0-2.0 | 2.0 | 2.0 | 11 | |
| Semi-manufactures of leather and fur (41.02-08; 41.10; 43.02) b/ | MFN duty free | 1 | | | | 169 | Argentina (25781), India (14927), Brazil (8193), Yugoslavia (416), Mexico (1380), Colombia (1137), Uruguay (984), Thailand (950), Hong Kong (179), Other Asia (161), Rep. of Korea (114), Dominican Rep. (110). |
| | MFN dutiable | 44 | 18.5-2.5 | 5.5 | 5.5 | 137,433 | |
| | From MFN countries | 44 | 18.5-2.5 | 5.5 | 5.8 | 78,774 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 16 | 10.0-2.5 | 5.8 | 6.3 | 15,580 | |
| | From GSP beneficiaries | 34 | 10.0-2.5 | 5.6 | 5.0 | 58,659 | |
| | Of which covered by GSP | 16 | 10.0-2.5 | 5.8 | 5.3 | 2,233 | |
| Manufactured articles of leather and fur (42.01; 42.03-05; 43.03-04) c/ | MFN duty free | 1 | | | | 7 | Oth. Asia (40914), Rep. of Korea (32619), Argentina (9073), Philippines (7595), Israel (6060), Uruguay (5732), Brazil (5307), Turkey (2771), Yugoslavia (2735), Colombia (1817), Thailand (1414), Haiti (1113), Guatemala (262), Pakistan (223), India (219), Peru (219), Romania (162), Bolivia (151). |
| | MFN dutiable | 57 | 68.3-3.0 | 18.6 | 9.1 | 259,223 | |
| | From MFN countries | 54 | 68.3-3.0 | 17.7 | 8.0 | 95,194 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 27 | 18.5-3.0 | 7.8 | 6.8 | 86,593 | |
| | From GSP beneficiaries | 55 | 68.3-3.0 | 18.3 | 9.7 | 164,029 | |
| | Of which covered by GSP | 27 | 18.5-3.0 | 7.8 | 7.8 | 125,419 | |
| Footwear (64.01-06) d/ | MFN duty free | 1 | | | | 78 | Oth. Asia (171607), Rep. of Korea (105666), Brazil (89244), Mexico (28255), Argentina (27049), Yugoslavia (14121), Hong Kong (11765), Romania (11329), India (5702), Colombia (5118), Haiti (2097), Philippines (1866), Uruguay (1163), Dominican Rep. (632), Costa Rica (342), Portuguese Asia (258), Jamaica (165), Guatemala (138), Pakistan (124), Cyprus (111). |
| | MFN dutiable | 130 | 37.5-2.5 | 10.6 | 10.4 | 1,160,714 | |
| | From MFN countries | 129 | 37.5-2.5 | 10.6 | 9.3 | 683,363 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 5 | 8.0-3.5 | 5.7 | 6.1 | 2,480 | |
| | From GSP beneficiaries | 124 | 37.5-2.5 | 10.6 | 11.9 | 477,351 | |
| | Of which covered by GSP | 5 | 8.0-3.5 | 5.7 | 5.4 | 17,166 | |
| Travel goods and handbags (42.02) e/ | MFN duty free | 0 | | | | 0 | Hong Kong (34683), Oth. Asia (34474), Rep. of Korea (26679), Mexico (12821), Lebanon (11031), Brazil (7582), Colombia (2888), Argentina (2491), Morocco (2183), India (1642), Dominican Rep. (1357), Israel (635), Haiti (527), Uruguay (521), Jamaica (461), Philippines (427), Thailand (321), Yugoslavia (239), Honduras (148), Barbados (129), Pakistan (108). |
| | MFN dutiable | 28 | 21.0-4.0 | 13.8 | 15.3 | 207,476 | |
| | From MFN countries | 28 | 21.0-4.0 | 13.8 | 13.7 | 65,843 | |
| | Of which exported by GSP beneficiaries and covered by GSP | 9 | 20.0-4.0 | 11.5 | 8.0 | 5,246 | |
| | From GSP beneficiaries | 28 | 21.0-4.0 | 13.8 | 16.0 | 141,632 | |
| | Of which covered by GSP | 9 | 20.0-4.0 | 11.5 | 15.3 | 5,017 | |

Source: Special tabulations by the UNCTAD secretariat.

For footnotes a/ to e/ see Table 45.

f/ GSP beneficiaries which supplied $100,000 or more in 1977 are listed in the descending order of the value of imports indicated in the parentheses.

Manufactured articles of leather and fur

Imports of this product category were valued at $259 million in 1974 and duty rates ranged between 3 and 68.3 per cent with simple and weighted average rates of 9.1 per cent and 18.6 per cent, respectively. MFN countries supplied $95 million, most of which were also exported by GSP beneficiaries and covered by GSP. Imports from GSP beneficiaries amounted to $164 million, of which about three-quarters in value were covered by GSP dutiable at 7.8 per cent (both simple and weighted average rates).

The major suppliers among GSP beneficiaries in 1974 were Other Asia ( $41 million), the Republic of Korea ( $33 million), Argentina ( $9 million), the Philippines ( $8 million), Israel ( $6 million), Uruguay ( $6 million), Brazil ( $5 million), Turkey ( $3 million), Yugoslavia ( $3 million), Colombia ( $2 million), Thailand ( $1 million) and Haiti ( $1 million).

Footwear

Imports of footwear amounted to more than $1 billion in 1974. Duty rates ranged between 2.5 and 37.5 per cent on 130 tariff-line items with simple and weighted average rates of 10.6 and 10.4 per cent, respectively. Imports from MFN countries were valued at $683 million at a weighted average rate of 9.3 per cent, of which imports worth only $ 2 million were also exported by GSP beneficiaries and covered by GSP. The GSP beneficiaries supplied $48 million at a weighted average rate of duty of 11.9 per cent, of which imports of less than one-third in value were covered by GSP at a weighted average of 5.4 per cent.

There were three large suppliers of footwear to the United States market among the GSP beneficiaries: "Other Asia" with exports of $172 million in 1974, the Republic of Korea ( $106 million), and Brazil ( $89 million). Other major suppliers were Mexico ( $ 28 million), Argentina ( $27 million), Yugoslavia ( $14 million), Hong Kong ( $13 million), Romania ( $11 million), India ( $6 million), Colombia ( $5 million), Haiti ( $2 million), Philippines ( $2 million) and Uruguay ( $1 million).

Travel goods and handbags

Imports of this product category were worth $207 million in 1974, with duty rates ranging from 4 to 21 per cent, simple and weighted average rates of duties being 13.8 and 15.3 per cent, respectively. MFN countries supplied less than one-third of the total. Imports from the GSP beneficiaries amounted to $142 million, with simple and weighted average rates of duty of 16 per cent. However, less than 4 per cent of these imports were covered by GSP. Major suppliers among GSP beneficiaries in 1974 were Hong Kong ( $35 million), "Other Asia" ( $34 million), the Republic of Korea ( $27 million), Mexico ( $13 million), Lebanon ( $11 million), Brazil ( $8 million), Colombia ( $3 million), Argentina ( $2 million), Morocco ( $ 2 million), India ( $2 million) and Dominican Republic ( $1 million).

Escalation of tariffs according to degree of processing

An examination of Table 47 which summarizes tariff structures by stages of processing of European Economic Commity, Japan and the United States reveals strong evidence of tariff escalation as degree of processing increases.

Most hides and fur skins enjoy duty-free entry. Even in the case of Japan, where the weighted average rate on this product category was very high, 94 per cent of such imports entered duty-free. In the case of semi-manufactures, the weighted average was around 5.5 per cent for EEC and the United States. The very high rate of 11.9 per cent for Japan is rather an exception.

In order to reach the Lima target, an ever-increasing degree of processing must be given to locally available raw materials through various stages of processing. Escalation of tariffs and, in particular, further escalation in effective protection in many developed market economy countries severely hinders efforts of developing countries in increasing the degree of processing in this important sector.

Non-tariff barriers

Problems of liberalizing non-tariff barriers affecting exports of manufactures and semi-manufactures are receiving continuing attention and consideration within UNCTAD, in particular in the Committee on Manufactures.

Table 47. Range and weighted average rates of tariffs by stages of processing for selected developed market economy countries, 1974

| | European Economic Community | | Japan | | United States | |
|---|---|---|---|---|---|---|
| | Range | Weighted average | Range | Weighted average | Range | Weighted average |
| I. Raw materials | | | | | | |
| Raw hides and fur skins a/ | 0-0 | 0 | 5-20 | 11.7 | 2-18.5 | 2 |
| II. Semi-manufactures | | | | | | |
| Semi-manufactures of leather and fur a/ | 3-8 | 5.6 | 7.5-25 | 11.9 | 2.5-18.5 | 5.5 |
| III. Manufactures | | | | | | |
| Manufactured articles of leather and fur a/ | 5-13 | 9.5 | 7.5-25 | 16.7 | 3.0-68.3 | 9.1 |
| Footwear a/ | 6.5-20 | 12.4 | 7.5-30 | 12.9 | 2.5-37.5 | 10.4 |
| Travel goods and handbags a/ | 7.5-15 | 9.2 | 10-20 | 12.2 | 4-21 | 15.3 |

Source: See Tables 44, 45 and 46.

a/ See Table 44 for definition of products in terms of BTN and SITC codes.

Table 48. Non-tariff barriers on imports of hides and skins, leather, leather products and footwear in developed market-economy countries

| BTN | SITC | Product | Country | Non-tariff barriers |
|---|---|---|---|---|
| 41.01 | 211 | Raw hides and skins | Italy | Health and sanitary regulations |
| 41.02 | 611.3<br>611.4 | Bovine and equine leather | Canada<br>Japan<br>New Zealand | Health and sanitary regs.<br>Discretionary licensing<br>Import quota, discretionary licensing |
| 41.03 | 611.9(1) | Leather of sheep and lamb skins | Japan<br>New Zealand | Discretionary licensing<br>Import quota |
| 41.04 | 611.9(2) | Leather of goat and kid skins | Japan | Discretionary licensing<br>Import quota |
| 41.05 | 611.9(9) | Other leather | New Zealand | Import quota |
| 41.06 | 611.9(3) | Chamois-dressed leather | New Zealand | Discretionary licensing |
| 41.08 | 611.9(5) | Patent and metallized leather | Japan<br>New Zealand | Discretionary licensing<br>" "<br>Import quota |
| 42.01 | 612.2 | Saddlery and harness | New Zealand | Import quota |
| ex42.02 | ex831 | Travel goods, hand bags | New Zealand | " " |
| 42.03 | 841.3 | Apparel and clothing accessories | " " | " " |
| 42.04 | 612.1 | Machine leather belting, etc. | " " | " " |
| 42.05 | 612.9 | Manufactures of leather, n.e.s. | " " | " " |
| ex64.02 | 851.0(2) | Footwear with soles of leather | Australia<br>Japan<br>Ireland<br>New Zealand<br>United States | " "<br>Discretionary licensing<br>Import quota<br>" "<br>Countervailing duties<br>Bilateral import quota |
| 64.05 | 612.3 | Prepared parts of footwear | Japan<br>New Zealand<br>Portugal<br>United States | Discretionary licensing<br>Import quota<br>Discretionary licensing<br>Countervailing duties |

Source: Information supplied to the UNCTAD secretariat.

Information on non-tariff barriers is difficult to obtain and the information presented in Table 48 is far from being complete. Frequently used measures include health and sanitary regulations, discretionary licensing, import quota (both global and bilateral) and countervailing duties. Incidences of non-tariff measures as listed in the table were most frequent in New Zealand and Japan. Effects of non-tariff measures on trade are difficult to measure and evaluate; certainly, the frequency of incidences of non-tariff barriers for New Zealand, as listed in Table 48, is due more to the availability of information on that country than the reflection of the severity of the measures used by New Zealand compared with other developed market economy countries.

## Chapter V

## 1985 and 2000: ADVANTAGES TO BE GAINED BY THE DEVELOPED COUNTRIES BY EXPANDING THEIR LEATHER AND LEATHER PRODUCTS SECTORS

### Plant-to-plant relocation

The last decade has witnessed the slow beginnings of a "migration" from the developed to the developing countries of the leather and footwear sectors of industry.[16/] However, there has been little organized relocation of surplus capacity from the industrialized countries.

With the decline of the tanning and footwear sectors and the closure of large numbers of manufacturing units in the OECD countries, means should be found for the rational redeployment of these resources to the developing world. This is an opportune time to consider the situation, but of course on a case-by-case basis.

It is reported[/5] that in 1973/74, in the Federal Republic of Germany, 50 shoe manufacturers ceased business, making 7,000 footwear workers redundant, and 19 tanneries closed down, with loss of employment for another 1,500. The situation is similar in some other north European countries, and in the United States up to 30 small-scale tanneries may close as a result of the Government's pollution control regulations. Yet, there is no mechanism for the redeployment of these capacities and facilities to the developing world, even if it were convenient to all concerned.

The assertion that the new tanning sectors of Africa and Asia are producing low-quality leathers is to some extent justified; this would be true of any new industry in any part of the world. However, this situation could be improved by the relocation, when suitable, of manufacturing units from the developed world.

Plant-to-plant relocation in the leather and leather footwear sectors is feasible as the plant and machinery concerned are robust, not over-sophisticated, and have in most cases a working life of several decades.

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16/ These sectors have been marked by stagnation and decline in the OECD countries; it is noted, however, that they have enjoyed rapid growth in the European centrally planned economy countries (5-7 per cent per annum).

## Leather production

### Rate of new tannery erection and expansion of tanning capacity

If the projected growth of the leather sectors of the developing countries follows the pattern illustrated in earlier chapters, tanning activity should be as follows:

**Estimated and projected tanning activity in the developing countries**
(Million $ft^2$ finished leather per annum)

| | Skin | Hide | Total tanned area |
|---|---|---|---|
| 1975 | 932 | 2,559 | 3,491 |
| 1985 | 1,760 | 3,929 | 5,689 |
| 2000 | 2,687 | 7,563 | 10,250 |

Little published data are available in the tanning sector regarding the apportionment of new tanning capacity between the expansion of existing tanneries and the erection of new units, but many authorities suggest that the division will be equal. New tanneries therefore will be needed to cater for only 50 per cent of the extra required capacity.

If it is assumed that typical medium- to large-scale skin tanneries produce at the rate of 6 million $ft^2$ per annum,[17] and hide tanneries at the rate of 10 million $ft^2$ per annum, the new tannery requirements should be:

1975 - 1985

Skin tanneries: 69 (or 7 per annum)

Hide tanneries: 69 (or 7 per annum)

1985 - 2000

Skin tanneries: 77 (or 5 per annum)

Hide tanneries: 182 (or 12 per annum)

Few official data are available on new tannery installations. In recent years, however, the trade journals have reported a spate of new tanneries being erected or newly operational in developing countries. In general, the volume of these tanneries is 600 - 2,000 hides (or the skin equivalent) per day.

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17/ Not necessarily the most efficient tanning unit in all circumstances: see earlier chapters.

The total number of new tanneries erected in the period 1973-1976 would appear to be of the order of 75, or 25 per annum. This does not include all the many new tanneries projected in Argentina and elsewhere in Latin America. Nor does it include the often modest expansion of countless hundreds of existing tanneries throughout the developing world.

This rapid build-up may partially account for the low levels of capacity utilization which seem common to many of the new tanneries in Africa and Asia. Without doubt, at this time, global tanning capacity exceeds raw material supplies.

The tannery expansion suggested above for the developing countries ignores replacement of existing plants. Replacement of old plant may be covered by depreciation resources or other sinking funds and is often covered by current production without there being any need to resort to new capital. If the mechanization of the rural tanning sector is attempted, the requirement for new production facilities will be greatly increased in some countries, with the consequent need for external capital.

Capital requirements to process leather as projected

The total capital requirements for new tanning units and expanded existing units to increase finished leather capacity in the developing countries may be summarized as follows. Costs are calculated at 1977 levels and foreign currency requirements are assumed to be 51.6 per cent of total investment which, together with unit capital costs, was derived in Chapter III.

| | Total | Possible foreign currency requirement |
|---|---|---|
| | (millions of dollars) | |
| 1975 - 1985 | | |
| 138 Skin tanneries at 5.33 | 735.5 | |
| 137 Hide tanneries at 6.73 | 922.0 | |
| 275 Total for 10 years | 1,657.5 | 855.3 |
| | | i.e. 85.5 per annum |
| 1985 - 2000 | | |
| 154 Skin tanneries at 5.33 | 820.8 | |
| 363 Hide tanneries at 6.73 | 2,443.0 | |
| 517 Total for 15 years | 3,263.8 | 1,684.1 |
| | | i.e. 112.3 per annum |
| 1975 - 2000 | | |
| 792 (of which only 50 per cent new units) | | |
| Total over 25 years | 4,921.3 | 2,539.4 (51.6 per cent) |

The capital calculation assumes the purchase of finished leather tanning units. Great advantages may be gained by adopting the step-by-step approach described below.

Install wet blue tannery; operate for 3 - 5 years until sufficient experience is gained for market acceptability and cash reserves established; then purchase the necessary plant to extend operations to crust leather production for another 3 - 5 years before proceeding to installation of finishing plant. This approach offers three main advantages:

1. Wet blue and crust materials are easily marketed, and there is a demand for them; thus it is possible to operate at 100 per cent capacity.
2. Without the capital burden of finishing plant, the tannery can operate efficiently, and yield good returns on investment.
3. Efficient production of wet blue and crust leathers for 6 - 10 years - as well as developing the technical expertise so essential to finished leather production and marketing - could allow some profits from these operations to contribute to the cost of the more expensive finishing plant to be installed as the next step.

The step-by-step approach has been adopted generally in Latin America, the early stage of processing leading to significant self-generation of funds for later stages of processing. In Africa, however, where more ambitious projects have been undertaken - often including the initial erection of tanneries for 100 per cent finished leather - the results have often been less satisfactory.

Economic financial advantages of expansion

Some 50 per cent of potential tanning activity in the developing world is expected to take place in countries which currently import virtually all the chemicals and machinery they require. Thus, the full potential value added may not be achieved, as a large part of the production costs could be swallowed up in the purchase of these items and in capital and interest repayments. When this situation improves, (as it should) the potential annual value added, based on the projected levels of tanning activity, that the developing countries

can realize could be:

| Estimated 1975 | | Projected 1985 | | Projected 2000 | |
|---|---|---|---|---|---|
| Area of leather (Million ft$^2$) | Value added (Millions of dollars) | Area of leather (Million ft$^2$) | Value added (Millions of dollars) | Area of leather (Million ft$^2$) | Value added (Millions of dollars) |
| 3,491 | 1,920 | 5,689 | 3,129 | 10,250 | 5,637 |

With respect to the figures quoted, it should be noted that no static quantified value added can be firmly attributed to raw material costs due to rapid raw material price fluctuations in recent years. For the present purposes, it has been estimated that in 1977 in the developing countries, value added from the raw material to the finished leather stage was 55 per cent.

Assuming that the processing of 10 million ft$^2$ of leather per annum requires a labour force as stated in Chapter III, the projected increase from the 1975 level of activity in the tanning sector of the developing countries should provide the following job opportunities:

| | 1975-1985 | 1985-2000 |
|---|---|---|
| Increased area of leather produced (million ft$^2$) | 2,198 | 6,759 |
| Senior staff | 1,538 | 4,731 |
| Middle management | 3,077 | 9,462 |
| Labour | 56,929 | 175,059 |
| Total job opportunities | 61,544 | 189,252 |

The apparently low number of senior staff, management and technologists required could be trained in the institutes currently existing, especially if the institutes in some developing countries were operated on a regional basis.

## Leather products production

### Future activity levels

Because of the lack of historic data regarding leather footwear production in the developing countries, no reliable projections can be made for the year 2000. It would seem unlikely, however, that due to shortage of capital and expertise, the developing countries' leather products

will keep pace with the relatively rapid expansion rate of their tanning sectors. This situation is not helped by the objections being raised in the developed countries concerning current import levels of footwear and other leather goods, and that imposition of various barriers to imports are under active discussion.

Given these circumstances, three alternative hypotheses for the rate of expansion have been elaborated:

The first alternative (A) suggests that by the year 2000 the developing countries will be converting into footwear and other leather products all of the leather produced by their tanneries (i.e. indigenous material plus significant imports of raw hides and skins). This would imply a 4.2 per cent per annum growth rate in the leather footwear sector of these countries, with a concomitant 0.9 per cent per annum decline in the sector in the developed countries. The developing countries will attain 65 per cent of global production.

In the second alternative (B) production of leather footwear in the developed countries (both market economies and European centrally planned economies) remains at the 1975 level, with all increases taking place in the developing countries. This would imply a 3.6 per cent growth rate per annum in this sector in the developing countries which would then produce 56 per cent of global production.

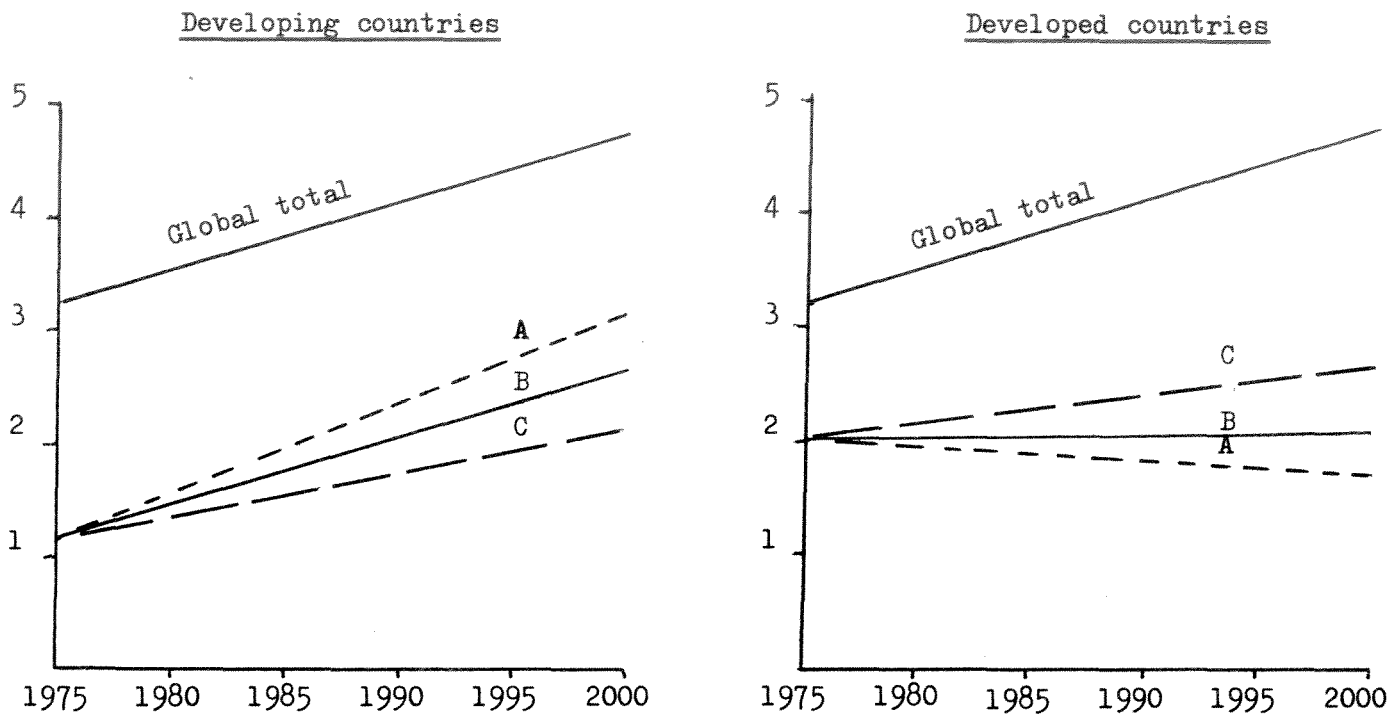
The third alternative (C) suggests that by the year 2000 the developing countries will convert to footwear and other leather products all of their indigenous raw hides and skins. This would imply a 2.6 per cent per annum growth in leather footwear production in these countries, with a concomitant 0.9 per cent per annum growth in the developed countries resulting in the developing countries' producing 45 per cent of the global total.

(All three alternatives assume that 65 per cent of hide leather is used for footwear uppers, and that 1.6 $ft^2$ of leather = 1 pair leather uppered shoes).

These alternatives are shown graphically in Figure 8:

Figure 8. Projected leather uppered footwear production to the year 2000

(Billions of pairs)




Assumed annual growth rates (per cent per annum)

| Alternative | Developing countries | Developed countries |
|---|---|---|
| - - - - - - A | + 4.2 | - 0.9 |
| ——— B | + 3.6 | - |
| — — — C | + 2.6 | + 0.9 |

Thus, increases in production in the developing countries from the 1975 base of 1,110 million pairs per annum could be:

Alternative A: 1,963 million additional pairs per annum
Alternative B: 1,556 million additional pairs per annum
Alternative C: 1,017 million additional pairs per annum

Capital requirements

The capital requirement for erecting the facilities needed for the production levels suggested in the alternatives would be:

| | Alternative A | Alternative B | Alternative C |
|---|---|---|---|
| Additional annual production of leather footwear (millions of pairs per annum) | 1,963 | 1,556 | 1,017 |
| Daily production (millions of pairs) | 7,852 | 6,224 | 4,068 |
| Total project capital required (billions of dollars) a/ | 12,139 | 9,622 | 6,289 |
| Total cost of plant and machinery (billions of dollars) b/ | 2,199 | 1,743 | 1,139 |
| Year 2000: possible additional added value per annum (billions of dollars) c/ | 7,656 | 6,068 | 3,966 |
| Additional annual added value / Total capital required | 63.1 % | 63.1 % | 63.1 % |
| Additional annual added value / Cost of plant and machinery | 348.2 % | 348.2 % | 348.2 % |

From the foregoing, it may be seen that provided the plant and machinery only are purchased with foreign currency, the returns may be rewarding.

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a/ At $ 1,546 per pair leather footwear per day production capacity.

b/ At $ 280 per pair leather footwear per day production capacity.

c/ Based on upper leather input of $ 1.60 and sales at $ 5.50; ignores high value of other material inputs.

The above estimates of value added relate to manufacture of products from bovine leather. Though products from skin sources may also yield good returns, if the sector is developed, production value added in this sector is less. In classical leather goods and garment manufacture, the raw skin material may represent only some 60 per cent of the finished product sales value, indicating an uplift of a mere 66 per cent on the raw material input value.

No details are available concerning the current manufacture of leather goods from skin material in developing countries, but the additional skin leather over 1975 levels available to the developing countries could yield:

| | Additional annual area of skin leather (millions of $ft^2$) | Estimated value added from products manufactured from skin leathers (millions of $ per annum) |
|---|---|---|
| 1985 | 828 | 546 |
| 2000 | 1,755 | 1,158 |

## Job opportunities

The activity levels suggested in alternatives A, B and C for the year 2000 could create the following job opportunities in the developing countries (based on the 1975 production level of 1,250 pairs of shoes per annum, or 5 pairs daily):

| Alternative | Millions of additional pairs of shoes per annum | Millions of jobs |
|---|---|---|
| A | 1,963 | 1.57 |
| B | 1,566 | 1.25 |
| C | 1,017 | 0.81 |

In some areas, however, e.g. in the Middle East and Asia, where productivity is now far below 5 pairs of shoes per day, increased mechanization may allow the projected levels of production to be reached without the creation of additional jobs.

The additional annual area of skins that may be available in the year 2000 (1,755 million $ft^2$), however, could yield a further 350,000 jobs (at 20 $ft^2$ per person per day).

## Developing countries total capital requirements, value added and job opportunities if projected levels of tanning and footwear activity are reached by 2000

### Total sectoral capital requirement

(Billions of dollars)

| | Alternative A | Alternative B | Alternative C |
|---|---|---|---|
| Total capital: 1975 - 2000 | 17.06 | 14.54 | 11.21 |
| of which foreign currency requirement, plant and machinery may be | 4.74 | 4.28 | 3.68 |

### Increases in annual value added over 1975 levels

(Billions of dollars)

| | | | |
|---|---|---|---|
| Leather products | 3.72 | 3.72 | 3.72 |
| Leather footwear | 7.66 | 6.07 | 3.97 |
| Other leather products | 1.16 | 1.16 | 1.16 |
| | 12.54 | 10.95 | 8.85 |

### Increases in job opportunities

(Millions)

| | | | |
|---|---|---|---|
| Leather production | 0.19 | 0.19 | 0.19 |
| Leather footwear | 1.57 | 1.25 | 0.81 |
| Other leather products | 0.35 | 0.35 | 0.35 |
| | 2.11 | 1.79 | 1.35 |

# Chapter VI

# STRATEGY FOR DEVELOPMENT

## Background

Where the leather industry is concerned, the industrial productivity of the developing countries exceeds the Lima target of 25 per cent of the world's production by the year 2000; the industry is therefore in a good position compared with others. However, not all countries are approaching 100 per cent utilization of their indigenous raw material which is suggested in the Lima Declaration as an alternative target. Countries that possess the raw material often lack the technology, business and marketing know-how and chemicals and machinery needed to manufacture leather and leather products of good and consistent quality. Although levels of finished goods manufacture may be high, these manufactures do not always achieve their potential earnings through lack of quality or poor design.

It is apparent that groups of countries within the developing world are at different stages of development. Countries that have supplies of appropriate raw materials, well-established technology and management techniques in tanning and product manufacture, and indigenous supplies of chemicals and machinery are in the best position to take full advantage of value added. In most other developing countries, much of the value added gained may be lost in foreign exchange requirements for the purchase of these essentials.

In some countries, the raw materials are low quality; in others, the leather and leather products industries may possibly be beginning to grow under the aegis of a national economic plan. In other countries, industrialization has hardly begun and may largely constitute artisan tanneries and product manufacturing at low levels of raw material utilization.

By the year 2000, it is projected (Chapter II), the developing countries will produce 48 per cent of the world supply of raw materials.

The aim must be, therefore, to evolve an industrial structure that will be able to accommodate this approximate doubling of the present supply level.

Previous attempts by developing countries to expand the industry have not been fully successful, despite capital investments or national, international or bilateral assistance. This low success rate has been due, firstly, to poor global liaison, resulting in attempts to penetrate markets against such factors as tariff and non-tariff barriers, lack of appreciation of quality standards required for marketing, underestimation of strength of competition, and the serious deficiency in statistical evidence of the global state of the industry; and secondly to the initiation of development schemes that are overambitious technically or in terms of capacity, that are based on poor statistical evidence of markets, and that are sometimes wrongly oriented to obtain the optimum compromise between value added and ability to produce at an appropriate level.

To enable countries to assess their state of development and enter the industry at an appropriate point, it would be desirable to establish a system of global liaison aimed at integrating the development of the industry. This system should take into account all changes likely to take place as well as causes at all levels of the industry, in both developed and developing countries, which are indicatively stated previously in this study.

Each country has an individual potential of raw material availability, the ability to absorb technology, and market and socio-economic structures within which the industry must be integrated. It is not possible to elaborate a common strategy for development attuned to individual country requirements; therefore, the comments below are generalizations of the parameters of development which should be taken into account in evolving a strategy for expansion at both national and international levels. From these considerations it should be possible for individual countries to assess the degree to which the requirements of each parameter are applicable to their own situation and thus build up a viable national policy.

## Materials

No country can have a leather industry without an indigenous supply of hides and/or skins. Importing raw materials as a basis for the industry is to be deprecated since production prices will vary with fluctuations in the international raw material market, and commercial viability will be erratic. Imported material should be considered only an adjunct to that locally produced and where conditions are such that economies of scale are desirable and possible.

In Chapter III it is shown that from past experience not only countries with a large volume of raw material can sustain a viable tanning industry, but countries with a production of about 59 hides (or the equivalent in skins) per 1,000 population are also capable of efficient production.

This capability, however, will depend both on quality and on geographical distribution of material. These two factors require good breed characteristics, animal husbandry and slaughter, curing and collection systems. If they do not exist, satisfactory conditions will need to be created.

Distribution, curing, and collection systems will largely determine the location and size of tanning units. For optimum efficiency, a supply of at least 400 hides per day is required to allow the utilization of a modern industrialized plant. There is a place, however, for smaller, 20-100-hide semi-mechanized units, to supply local product manufacturers, possibly for small domestic markets.

Originally regarded as a threat, the various synthetic and textile materials are generally regarded today as a cheaper complement to leather. With insufficient leather available in the world to cover the demand for traditional leather uses in goods, synthetics have a vital role to perform since cheaper synthetic goods can be sold in the local markets and the leather or finished goods can be exported. In Ethiopia, for instance, 50 per cent of the home footwear is served with cheap synthetic goods.

A wide variety of chemicals is used in tanning, several of which are alternatives. The existence or provision of an adequate local supply of these at competitive prices needs to be ensured. Where import of chemicals is necessary, consideration may be given to fiscal measures to reduce costs to users. So wide is the variety of chemicals that even many developed countries import certain items so that chemical producers are able to

manufacture optimum quantities to allow economy of scale to be achieved. Thus, while self-sufficiency may be attainable in some types of chemicals, there will be a continuing need for developing countries to import if quality is to be achieved at competitive price levels.

## Markets

Because of the desirable physical and aesthetic qualities of leather, and its high demand, there is no lack of markets for either raw materials or leather at various levels of processing. The problem is to decide upon the level of processing which will give optimum value added (which is not necessarily the maximum possible), taking account of all the other factors which govern industrialization and the overall economic strategy of the particular country.

It can be argued that a sparsely populated country, lacking a significant domestic market for finished goods, could benefit from remaining a raw or semi-processed hide and skin exporter. Other industries, possibly with low labour requirement and higher value added potential, could be more attractive than finished leather products and the country could obtain a better overall return from export of raw material at premium prices as quantities of raw and semi-processed material on the world market diminish. Conversely, a densely populated country could benefit from immediate production of finished goods based on cheap labour resources using imported leather and other materials, purely as a means of increasing national property through the generation of foreign exchange from exports, and a step-by-step development (as described later) is normally advisable. Some countries following this course have experienced problems of competition and fluctuating prices in the world market.

Good markets for leather, at most of its stages of manufacture, exist in the developed world whereas the domestic market normally requires finished goods. As developing countries have industrialized, thus utilizing more of their raw materials, so manufacturing industry in the developed world has had to reduce its intake of certain types of raw hides and skins, and openings for imports of semi-processed and finished leathers have become apparent. Some countries producing high-quality finished goods have also penetrated developed country markets, and this trend is expected to continue.

Although it is apparent from the statistics covering the last ten years that there are growing markets in the OECD countries in which there is a history of reducing production, it should be noted that a large proportion of this market is currently being filled by export from the European countries to centrally planned economies, which in respect of the leather industry must surely be considered as fully developed.

Thus, in the battle for these large markets in the OECD area, the developing countries will have to confront the existing market penetration from the CPE countries. This penetration may be mitigated to some extent in the future since these countries need to import large quantities of raw material. In this context, it may be relevant to note that in many sources it is suggested that exports from the CPE countries to the OECD countries are at less than full economic cost. If this is true, it may be that this "subsidized trade" competition rather than the traditional trade barriers will be the major hurdle to be surmounted.

Notwithstanding this, during the past decade most developing countries have had falling exports of hides and skins and rising exports of leather, much of the latter being, however, in the semi-processed condition where only 50 per cent of the potential value added is achieved. As domestic consumptions have been fairly constant, the big earning potential has been in leather export. Where finished leather production has become well established, growth in shoe production has followed and there have been notable expansions in exports of this commodity.

Some South American countries exemplify a development pattern which other countries should study. Exports of hides and skins have been reduced and exports of processed leather have increased. Consolidation in finished leather manufacture at high-quality, export-acceptable level has been achieved; exports of footwear and, to a lesser extent, leather products have become established. There are no leather imports, and raw material is imported to achieve full utilization of installed capacity.

It is generally accepted that the industries in the developing countries need some form of protection in order to become established. Disincentives operate against them in the developed markets in the form of tariffs and non-tariff barriers and these have to be countered by various measures to keep products competitive despite the tariff impositions. Some of the measures suggested: (a) reduction or removal of taxes on production and export of

leather and finished goods: export of hides and skins can be taxed or prohibited; (b) a "drawback" system can be instituted wherein exporters are reimbursed for duties paid on imports of chemicals or machines; (c) export credit at low interest rates can be granted; (d) low interest payments on borrowed working capital and capital for equipment can also operate; (e) there may be air freight subsidies allowing manufacturers to reach the market at the right time; (f) some governments allow the redeployment of foreign exchange earnings into the import of machines and chemicals; (g) so that burgeoning industry can have a solid home market to back its export efforts, bans are often put on imports of leather and finished goods. The wisdom of this last measure should be questioned, as without keen competition quality is less likely to improve, and progress towards fully acceptable export quality impeded.

Penetration of export markets will depend upon marketability (price quality and deliveries) of the finished product; this will require marketing expertise and the co-operation of importers.

Manpower

Assuming adequate resources of raw material and finance, the fundamental requirement for success is the availability of trained manpower. To achieve full potential, skill is required at every level throughout the whole supply-processing and manufacturing sequence, from animal husbandry to marketing of the finished product.

However, because, as stated earlier, materials have widely varying characteristics, the attainment of academic skill in a particular discipline is not sufficient; the development of petty entrepreneurial ability is of equal importance, particularly in the tanning and finished products sectors. Thus, while technical training is essential, it should be complemented by in-plant training. This can be best obtained by on-the-job training, preferably within the plant where the trainee is expected to be employed. In this respect, the joint venture concept has advantages since it is in the interest of the external partner to ensure that efficient and capable staff are employed. In many cases, the partner will be responsible for the provision of initial expertise which could also be used for staff training purposes.

While the relevant areas for training in tanning will be mainly in technology, management and marketing, the finished goods industry will require good designers capable of ensuring that manufactures are in accordance with the fashion and quality requirements of the export markets.

As the future growth of the leather industry is likely to be at a less precipitate pace, the existing institutes should suffice to supply the world industry's need in technology. However, countries should accept the use of regional rather than national institutes and encouragement should be given to expanding existing national institutes to regional level.

In the developing countries, fundamental research is not required, rather the development and training institutes should be catalytic in transferring current technology to the industry.

International assistance may be needed, not only in training technologists, but in the techno-economic field. External management expertise can make a great contribution until sufficient nationals are trained and experienced in industry management. More emphasis should be placed on instruction and practice in industry and business management and marketing.

The industry in its most efficient form cannot be considered as one of the most highly labour-intensive, but it does have a high labour content. In view of the quality requirements for end products, social considerations should not excuse overmanning which results in deteriorating technical control and worker discipline, leading to poor quality.

Although a wet blue tannery, especially if it is an adjunct of an abattoir, may provide fewer jobs than those entailed in curing and exporting raw hides, it creates value added, is low in capital requirement, and all its production can usually be marketed overseas. Manufacture of 6.25 million pairs of shoes a year would generate 5,000 jobs and it is this that often impresses governments and motivates them to establish immediate large-scale industry. However, the high level of capital investment required in organized footwear production and necessary marketing arrangements should not be overlooked. A typical 6.25 million pairs/year factory would require an investment of $38.6 million, whereas the tannery would require only $6.7 million.

## Methods of production

The technology involved in the production of finished leather has been evolved from earlier times; while the chemicals have changed and machinery has improved, the principal operations as set out in column 1 of the accompanying chart are similar. The whole tanning process can be carried out in

a single unit, but now it is not uncommon for the process to be disaggregated for economy in satisfying appropriate markets within local constraints.

Considering operations 1 - 4 of column 1, the degree of operator skill, machinery and plant costs, operating cost, and value added, all increase incrementally as the level of process increases, the largest increase in value added for a fixed capital input occurring at the crust-to-finish operation.

The advantages of finish tanning and finished goods production are similar, they follow on from one another; they create value added, are particularly significant when it is desired to enter export business, create employment, and substitute for imported leather or finished goods. Prior to marketing, at each progressive stage towards finished leather, the leather should be selected and graded. An industry should seek to consolidate at each stage to ensure that consistency of production is achieved and market confidence gained. With a very competitive world market, efficiency and quality are essential. A wet blue plant can be operated with minimal capital investment at 100 per cent capacity, whereas a finished leather plant, if operated by inexperienced management, is inefficient and capital burden as insufficient return could be coming in to cover the capital investment.

A wet blue plant is potentially a capital generator, as the profits over a 6-10 year period should provide enough capital to purchase the equipment in order to take production through to the next stage - crust leather. Such gradual development also allows service and supply industries to become established and thus reduce further the foreign currency requirements. Argentina has adopted this form of progress, and as a result the leather and the footwear industries are served by chemical and machinery industries. Some other countries have gone for big industry schemes, often on a bilateral basis, which have never achieved economic operation.

Stepwise progress is more suited to the co-ordinated sectoral plan that is needed. Haphazard industrial development has resulted already in over-achievement in several countries. Installed tanning capacity exceeds raw material availability in several developing countries, and these countries are looking to imports as a means of satisfying their industries. A development plan could also organise the improvement of artisan tanneries with low-cost mechanical or reconditioned machines. Finished goods factories which have closed down in developed countries could be relocated in the developing

STEP BY STEP DEVELOPMENT

| 1<br>OPERATION | 2<br>MATERIAL | 3<br>SOURCE | 4<br>PRODUCT MARKET | 5<br>CAPITAL REQUIRED | 6<br>TECHNOLOGY LEVEL | 7<br>POTENTIAL VALUE ADDED | 8<br>CRITERIA FOR ENTRY |
|---|---|---|---|---|---|---|---|
| LEATHER PRODUCTION | | | | | | | |
| 1. Curing | Raw hides and skins | Local. National. | Local processors. Export. | Low | Low | Low | The only requirement is a sufficient supply of hides and skins. In cases of an integrated abbatoir/tannery complex this step may not be necessary. |
| 2. Tanning (wet blue) | Cured hides and skins | Local, national. imports. | Export. National finishers. | Medium low | Medium low | Low | Where previous experience in tanning does not exist easy penetration of export markets can be achieved. Tariff barriers low or non-existent. |
| 3. Retan and dry process (crust) | Cured hides and skins | Local, national. imports. | Export. National finishers. | Medium high | Medium | Medium | For countries with an established reputation as a wet blue exporter the transition to one of the crust forms is feasible. Tariff barrier lower than for fully finished products. Overcomes problems occurring in rapid changes in finish requirements in case of supply to remote markets. |
| Finishing | Semi-finished leather (wet blue or crust) | National semi-finishers. Imports. | National manufact. Export. | High | High | Medium | Large scale efforts in this respect should be taken when it is planned to enter or expand leather product manufacture within the country. Tariff barriers for export are high and internationar markets often require extremely high quality standards. |
| LEATHER GOODS MANUFACTURE (*) | | | | | | | |
| 4. Rural manufacture | Finished leather | National, finishers. imports. | Domestic, | Low | Medium | Medium | This activity exists in most countries: basic skills are usually available but quality is variable. Improved marketability could be achieved by formation of cooperatives or other aggregations of effort. |
| 5. Semi-mechanized production | Finished leather | National finishers. imports. | Domestic, export. | Medium | High | High | Feasible as the logical extension from the aggregation of artisan manufacture to the utilization of low cost machinery. It is an important step in progress from cottage to factory industrialization. Output can be substantial and requires a reasonably large input of finished leather. Normal entry point for countries without existing capacity. |
| 6. Fully mechanized production | Finished leather | National finishers. imports. | Domestic. export. | High | Very high | High | The final stage should be commenced only with a substantial domestic market to enable the development of products to international quality standards for export. Tariff barriers usually high. |

(*) The steps listed under this heading refer only to footwear manufacture since this is the major market. Manufacture of garments, gloves, handbags, etc. requires high skill, but low capital investment. Apart from industrial goods the market, although expanding, is smaller, is extremely variable, and subject to high tariff barriers.

countries and thus ameliorate the competition in world markets through attaining compatibility between capacity and raw material availability. At the same time, an efficient transfer of technology can be achieved.

The above considerations indicate that a step-by-step evolution of the industry is advisable. The system has the advantages that at the tanning end capital costs are low but returns on capital are high, export markets exist and foreign capital can be generated for progress to the next step where imported machinery may be needed. Similar considerations apply throughout the system.

An assessment of the various inputs, returns and criteria at discreet steps are set out in the chart to allow individual countries to decide an entry point in accordance with the stage of development existing at the national level.

## Investment requirements

As shown in Chapter III, the maximum total capital required to achieve the envisaged expansion is $2.5 billion for tanneries and $12 billion for leather products' manufacturing facilities. Taken together, this amounts to an annual investment of $630 million until the year 2000. Of this sum, approximately $330 million will need to be obtained from foreign sources, if past trends continue.

While this is a substantial foreign capital requirement, the industry is in the position where demand is growing faster than raw material supply, thus there is a good incentive for investors. The major difficulties to be faced are the establishment of financial credibility, and deciding a sound spread of investment from the various sources available.

The industry has been shown to be capable of generating a substantial return for re-investment, particularly if the step-by-step development strategy is used. However, even this is unlikely to fulfill local capital requirements; but the same incentives apply to local and foreign investors. Within a national strategy for utilization of available investment capital, the industry must stand in a favourable position.

Typical sources of funding from which a selection can be made, depending upon the type of expansion and national economic status, are:

1. Cash or local loans. This type of funding, which can usually be raised for expansion of existing plant, constitutes regenerated savings and loans from local banks against existing collateral.

2. National private equity. Such funds, either for existing plant expansion or for new plants, can be obtained through the issue of shares in the organization by the main entrepreneur to other individuals or bodies. This source is desirable in cases where it is preferred that only national finance is used.

3. National government support. Where the industry forms an important part of the national development plan, it is not uncommon for part or even all financing to be provided by the government. Support may be in the form of direct grant, subsidy, interest-free loans or other appropriate fiscal incentive plans. This source often incurs an infrastructure which is imposed and inflexible, whereas industry which has grown according to opportunity has blended its operations to its industrial and business environment. Government projects usually only succeed where a high degree of protection exists. Some large government tanneries, such as those which have been installed in Africa, have difficulty in operating economically.

4. International banks. Where commercial viability can be shown, where some national finance can be provided, and/or where the country is short of convertible currency, loans may be obtained from such bodies as the World Bank and Regional Development Banks. These banks operate on a commercial basis, but often at lower rates than private international banks.

5. Private international funds. Capital can be borrowed from commercial banks (many of which specialize in overseas investments) in the form of an equity holding, or as part of a partnership or contract agreement between entrepreneurs in developed and developing countries.

6. Bilateral aid. This is perhaps the swiftest means of obtaining the large volume of assistance required, but has not in the past enjoyed a good reputation in the leather sector. Projects tended to be over-ambitious, prestige-oriented, with over-specification of machinery and consequent high capital burdens.

The arrangements forged between governments in the developed and developing countries are usually, in effect, contracts exchanged between the companies or the national enterprises involved. Eastern European machinery-manufacturing organizations have supplied numerous plants to Asian and African countries through such channels. They offer the ready advantage of immediate sources of capital equipment with expertise supplied for construction and installation and subsequent technical and business management and marketing assistance for a run-in period. They are perhaps outweighed by the disadvantage

that they are often not fully commercially orientated, and constitute large and inflexible units which appear to be over-equipped. Technical and marketing abilities are often not sufficiently established before the bilateral partner departs.

7. Joint ventures. The results of the past decade suggest that commercial joint ventures yield the best results. They are generally tailored to actual requirements and can offer real entrepreneurial experience as well as the necessary know-how and market intelligence.

In a joint venture between companies in developing and developed countries, technical and managerial assistance is at hand as long as it is required. Projects quickly become commercially viable, often within two years, and are totally market-orientated through the established channels of the developed country partner. There are, of course, supplies of capital from the partner and the developing country's government and the plant design, its machinery and installation are tailored for the circumstances and the development planned.

The disadvantages occurring in commercial joint ventures fall into two categories: the developed country partner may demand a disproportionately large percentage of the equity as compensation for the transfer of his experience and he may demand that too high a percentage of the finished leathers pass through his own sales company in order that he may draw off the main benefit. The developed partner for his part has no guarantee that the industry he has helped to found will not be subject to unilateral nationalization; this has been a deterrent to many companies in the developed countries when considering the pros and cons of entering into manufacturing in the developed countries.

8. Long-term contracts. Long-term contracts can also be arranged with governments or enterprises able to give assistance at all levels (machines, training, and skilled manpower) and which accept commodities by way of compensation.

9. Relocation. With the decline of the tanning and footwear sectors in the countries of the Organisation for Economic Co-operation and Development (OECD) - marked by surplus capacity and the closure of large numbers of manufacturing units - scope exists for the redeployment of resources to the developing world. To some limited extent, redeployment has been arranged by machinery manufacturers who have reconditioned the machinery and exported it to the

developing world. However, this has never been part of the consistent programme which could have been a major plank in the development programmes of trade, national and international bodies. Redeployment of redundant capacity can be advantageous to both developer and seller. The surplus production unit from the developed world would certainly receive a far better return for its plant and capacity than happens at present when it is auctioned at near-scrap-iron levels. More important, however, the developing country taking over such a unit has the added advantage that it may be able to hire, for a period of time, some of the redundant operational and technical management - including such key workers as splitters and sorters - who had previously worked at the plant.

## International considerations

Because the major markets for leather goods are likely to remain in the developed countries during the period covered by the study, and because for various reasons, their production capacity has declined, the opportunity exists for developing countries which have other advantages to fill the growing consumption/production gap.

Although this production transfer process has been in progress during the last decade it has been in a haphazard fashion of less advantage to either developed or developing countries than could have occurred if full global liaison had been arranged.

At present, no international organization exists which is competent to liaise between the tanners of the developed and the developing worlds, or which could assist in the rational deployment and harmonious development of the global leather industry. In 1976, the International Council of Tanners (ICT) considered widening its activities to embrace the developing countries' leather sectors. At present, however, ICT membership consists only of some 20 developed countries and three or four developing countries.

Whether a new one is created, or an existing body expanded, there is a necessity for an international body to provide a platform for global liaison at all levels of the industry. Its essential task would be to act as a forum for the evolution of a global strategy for development of the industry, keeping in mind not only the targets of the developing countries, but also the possible impacts on the developed countries. Without co-operation, the same unsatisfactory development evident in the last decade will be repeated.

Its other activities would include: (a) raw material improvement and marketing; (b) improving livestock agriculture and increasing herd and flock offtakes; (c) monitoring institutes to ensure that research and development is industry-orientated; (d) preparing feasibility studies as advice to governments on industry potentials; (e) acting as "marriage broker" in joint venture enterprises; (f) assessing projects at the request of governments to see that overall aims and contents are correct; (g) organising the provision of better statistics; (h) harnessing the resources of declining industries in the developed countries for use in the new developing country industries; (i) negotiating the adjustment of tariffs to give the developing countries better penetration into developed markets; (j) promoting quality standard, but not at the expense of the aesthetic appeal of leather; and (k) improving liaison between developed and developing countries on market intelligence.

Given the great differences that exist in the development stages of the developing countries, and the rates of decline in developed countries, it may well be that no one harmonious policy is possible - but an international platform for the leather sector is imperative.

ANNEX I

## ENERGY REQUIREMENTS FOR THE LEATHER INDUSTRY

### Introduction

The leather industry is not energy-intensive. For example, the energy requirements of the industry in 1965 were 0.2 per cent for Italy and 0.18 per cent for France of total industrial energy requirements.[1/] Nevertheless, it should be noted that for developing countries which are expanding their industry, the energy requirement for this branch could be a more important part of the total, during the early stages of development.

Typical energy consumption variations in the leather industry in selected developing countries in the early 1960s (in percentage of total energy consumption of industry) are shown below:

| Country | Share of energy consumption (per cent) |
|---|---|
| Argentina | 0.6 |
| Burma | 0.5 |
| Ceylon | 0.9 |
| Chile | 0.6 |
| Ecuador | 0.6 |
| El Salvador | 0.8 |
| Ethiopia | 1.7 |
| Honduras | 0.3 |
| India | 0.1 |
| Republic of Korea | 0.5 |
| Mexico | 0.2 |
| Pakistan | 0.3 |
| Panama | 0.6 |
| United Arab Republic | 0.4 |
| Venezuela | 1.0 |

Source: The Growth of World Industry 1953 - 1965 National Tables, United Nations, New York 1967, pp. 1-500.

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1/ E/ECE/883/Rev.1: "Increased Energy Economy and Efficiency in the ECE Region", United Nations, 1976, pp. 22-23.

## Energy parameters

The possibility of higher fuel costs is a problem that all industries are faced with, particularly when as in the leather industry, the preponderance of tannery energy consumption is in the form of fossil fuels.

Electricity accounts for less than 10 per cent of tannery energy requirements, the remainder being supplied by directly utilized fuels. In a footwear factory, the contrary is true. At the same time, the cost of energy per sales dollar for the tannery is roughly 8 times that for footwear production.

A reduction of energy consumption often means a reduction in pollutant levels; thus, where the same corrective action benefits both situations, energy conservation should be given an even higher priority than fuel savings would justify.

## Energy utilization patterns

The centres of utilization of energy in the tanning industry are shown in Figure I, and for shoe factories in Figure II. Full lines denote present use and dotted lines possible routes for energy saving.

Various fuels are used in the leather industry, both for direct usage and for internal production of electricity. At present, however, because of the lack of statistics, it is not possible to estimate the breakdown of energy consumption by fuels in this industry.

In Figure III, possible non-conventional sources of energy are shown. Their use is discussed later.

## Specific energy and electric energy requirements

One of the major problems of an energy study within the leather field is the large variation in technology and the degree of mechanization employed. These variations yield different energy requirements according to local circumstances and climatic conditions. The variations are innumerable and cannot be compressed within this study, but considering that energy costs represent at the most only 3 - 4 per cent of production costs, the economic effects of these variations within individual plants is insignificant.

Consumption trends

In order to estimate future energy requirements, "key coefficients" prepared for UNIDO by Villa [16] were used. These "key coefficients" are based on the tanning industry in Argentina, which is considered to be sufficiently "typical" for use as a global indicator.

Using these coefficients, and on the basis of current technology and forecasts, the table overleaf showing forecast energy requirements to the year 2000, has been prepared.

Thus, total world energy consumption for the leather industry will increase from 3.3 million tce in 1975 to 4.4 million tce in 2000. The industry accounts for only 0.04 per cent of the total world energy consumption and its share appears to be diminishing as developing countries increase their development of more energy-intensive industries.

Problems of substituting other energy sources for conventional fuels

Tanneries represent a challenge in this respect because: (a) they consume over 90 per cent of their direct energy as process heat, and (b) they use low-temperature heat and are therefore perfectly suited for use of new energy sources, especially for solar energy. For example, the temperature in tanneries does not exceed 29°C in drums, and about 50° - 60°C in colouring.

The majority of developing countries enjoy an abundance of sun. Thus, solar water heaters could supply all the necessary hot water for tanneries all year round. Solar water heater technology has already passed the phase of research and development and is reliable and well-known.

The drying of hides and skins by solar energy is a very old practice which in recent years has been systematized and improved to the stage where it is possible to also use solar dryers. Some tanneries are already using this method.

Taking into account fuel prices and availability, the increased use of solar energy in tanneries could be substituted for traditional fuels and would consequently decrease pollution levels.

Projected energy consumption

in the leather and shoe industry of the world in 1975-2000

| REGION | VARIANT A | | | | | | VARIANT B | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1975 | | 1985 | | 2000 | | 1975 | | 1985 | | 2000 | |
| | $10^6$ tce | % | $10^6$ tce | % | $10^6$ tce | % | $10^6$ tce | % | $10^6$ tce | % | $10^6$ tce | % |
| Total World energy consumption | 7,971 | 100.0 | 11,300 | 100.0 | 18,300 | 100.0 | 7,971 | 100.0 | 11,300 | 100.0 | 18,300 | 100.0 |
| Developed countries[a] | 6,642 | 83.3 | 7,934 | 70.2 | 7,724 | 42.2 | 6,642 | 83.3 | 7,934 | 70.2 | 7,724 | 42.2 |
| Developing countries | 1,329 | 16.7 | 3,366 | 29.8 | 10,576 | 57.8 | 1,329 | 16.7 | 3,366 | 29.8 | 10,576 | 57.8 |
| Energy consumption in the leather and shoe industry | | | | | | | | | | | | |
| World $10^6$ tce | 3.3 | 0.04 | 3.7 | 0.03 | 4.4 | 0.02 | 3.3 | 0.04 | 3.7 | 0.03 | 4.4 | 0.02 |
| Developed $10^6$ tce | 2.3 | 0.03 | 1.9 | 0.02 | 2.3 | 0.01 | 2.3 | 0.03 | 1.7 | 0.01 | 1.7 | 0.01 |
| Developing $10^6$ tce | 1.0 | 0.01 | 1.8 | 0.01 | 2.1 | 0.01 | 1.0 | 0.01 | 2.0 | 0.02 | 2.7 | 0.01 |
| of which Electricity[b] | | | | | | | | | | | | |
| World $10^6$ tce | 0.4 | | 0.5 | | 0.6 | | 0.4 | | 0.5 | | 0.6 | |
| Developed $10^6$ tce | 0.3 | | 0.2 | | 0.3 | | 0.3 | | 0.2 | | 0.3 | |
| Developing $10^6$ tce | 0.1 | | 0.3 | | 0.3 | | 0.1 | | 0.3 | | 0.3 | |
| World $10^9$ kWh | 3.1 | | 3.6 | | 4.4 | | 3.1 | | 3.6 | | 4.4 | |
| Developed $10^9$ kWh | 2.1 | | 1.9 | | 2.1 | | 2.1 | | 1.9 | | 2.1 | |
| Developing $10^9$ kWh | 1.0 | | 1.7 | | 2.3 | | 1.0 | | 1.7 | | 2.3 | |

Source: World Energy Supplies, 1950-1974, United Nations, 1976, Series NIN 19.
J. Parikh: Energy problems of developing countries, Working Paper, IIASA, Laxemburg, 1976 and UNIDO.

[a] Including countries with centrally planned economies.

[b] 1000 kWh = 0.125 tons of coal equivalent (tce).

Figure I. Scheme of current direct tannery usage of energy, and possible ways of conserving energy

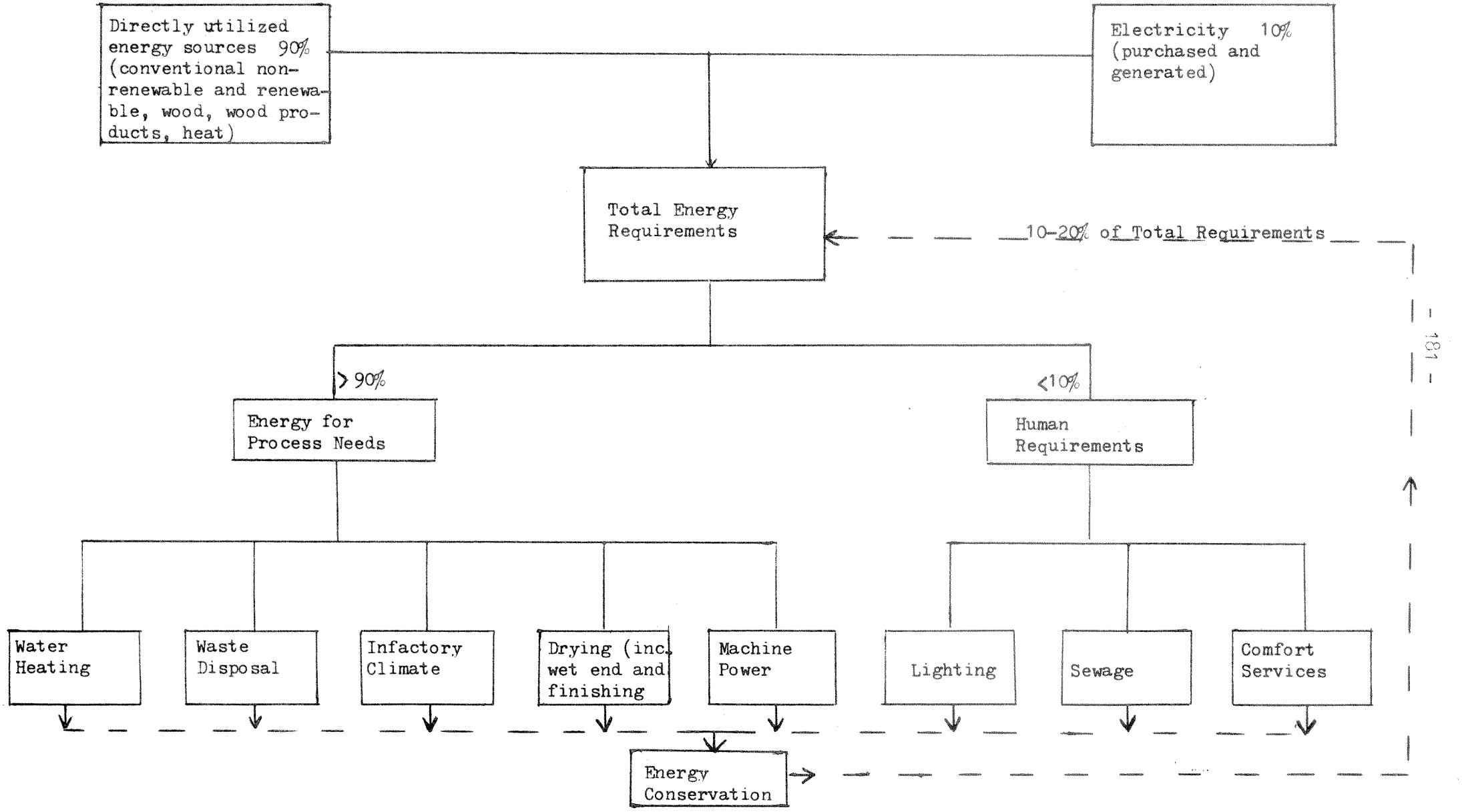


Figure II. Scheme of current direct shoe industry usage of energ

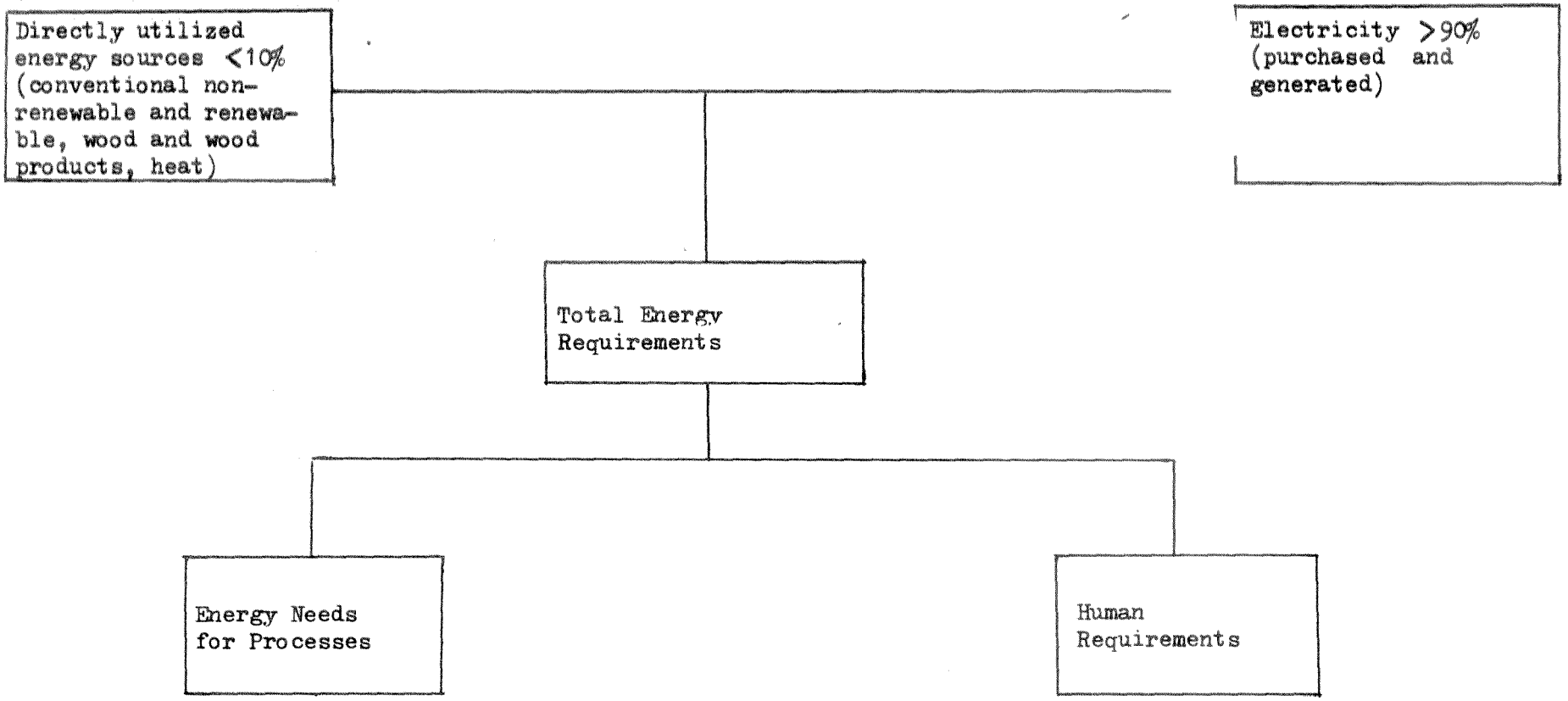
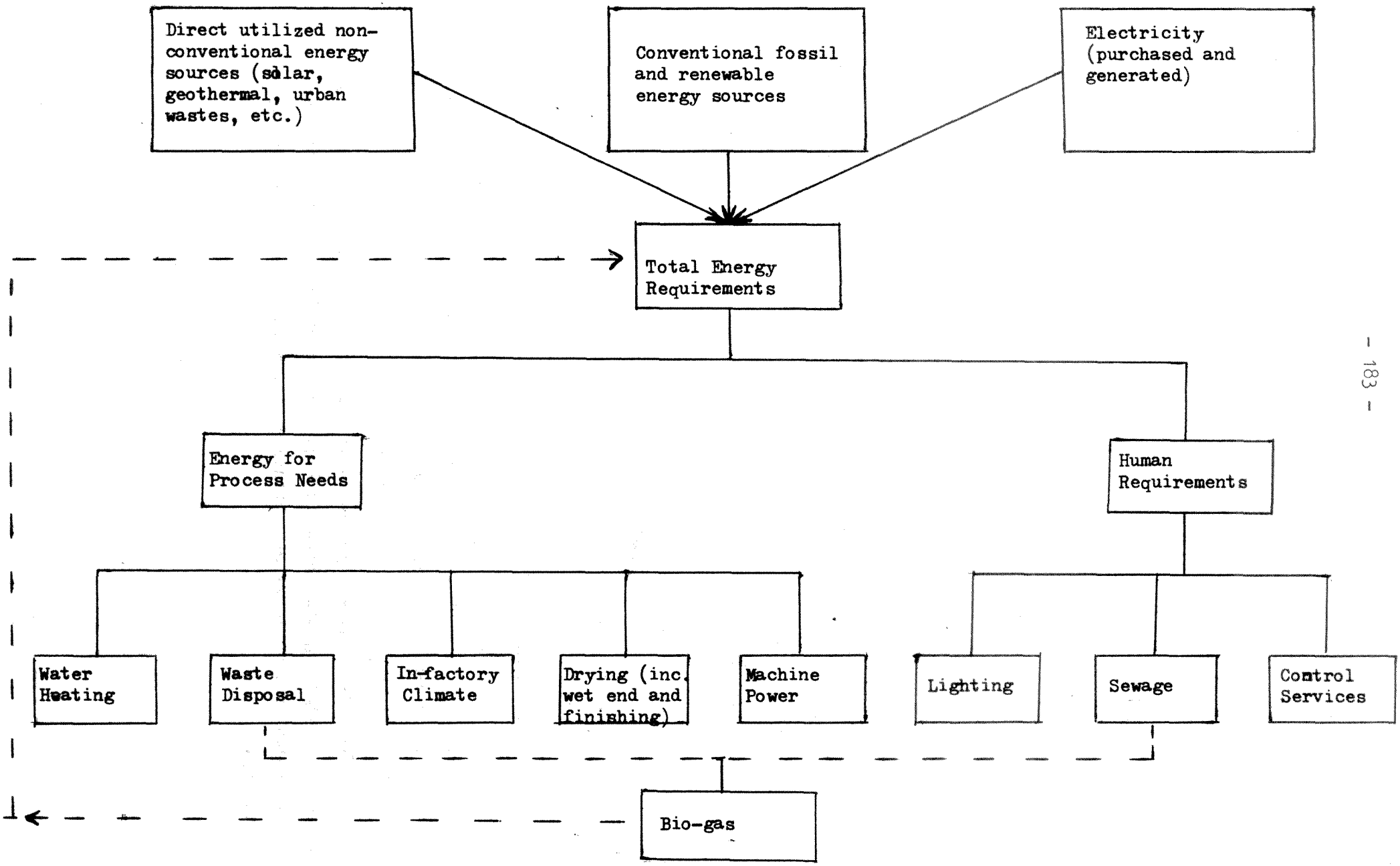


Figure III. **Scheme of future direct tannery usage of energy**



Many developing countries have forests of round wood which they can use for energy purposes. In the tropics it is often possible to grow eucalyptus yielding 15 $m^3$ or more per hectare per annum, and in managed tropical high forest 3 $m^3$/ha/an of fuel wood which can be expected in addition to increments of 6 $m^3$/ha/an of timber. It would be possible to supply the total fuel requirements for the leather industry in developing countries through properly managed forests of between 0.3 and 1.5 million hectares, depending upon location.

Waste sources of energy

At present, solid wastes (fleshings, hair, dung, etc.) are either buried or utilized for the manufacture of glue or gelatine. The alternative of mixing this waste with sewage for the production of bio-gas for use within the plant should be considered on a plant-by-plant basis. Because of differences in plant size, location and material processes, however, it is not possible here to assess overall viability.

Problems of energy conservation in the leather industry

Obviously, if over 90 per cent of tannery energy usage is process-related, any improvements in tannery energyconsumption are going to effect and/or require changes in the process. Substantial improvements can usually be made with minimal effort or impact on the process through the modification of existing equipment.

Energy for process needs

Tanneries usually use expensive and wasteful flow-through washes which are simple, but extremely expensive in terms of both energy and pollution costs. Conversion from batch washing could be the first process modification to be adopted.

The modern tannery process also involves rapid drying techniques, pasting, toggling and vacuum drying. The short drying cycles of these processes have hitherto been obtained at the expense of large energy outlays.

Typically, the pasting unit consumes from two to four times as much energy as is needed for the theoretical evaporation of the water in the leather. Radiation and leakage can also be quite high in an old, badly-maintained unit. The exhaust from a pasting unit is typically 170 and 280 $m^3$/min of air at 54°C. It is a relatively simple procedure to recover this heat, reduce humidity, and reheat with considerable energy savings.

While heat radiation is not high enough to justify adding insulation to existing plants, better insulative qualities should be included on any new units.

Energy for human requirements

Conservation of energy used for comfort heating is a matter of conventional treatment insulation, weather stripping, storm windows, etc., in cold climates, and adequate ventilation in hot climates.

It can be shown that energy conservation in the tannery will reduce the cost of energy by anywhere from 10 to 20 per cent, or more, at minimum effort and expense.[2/] Because tannery energy usage is predominantly process heat, the problem of energy conservation has two aspects: long-term and short-term. Long-term conservation requires that energy requirements be included in any discussion of process change and that existing processes be evaluated to determine how they can be modified to reduce their energy content.

In the short-term, one must look carefully at process wastage, tighten up present operating procedures to reduce it, and take the obvious steps to reclaim as much of this as possible. Changes to more sophisticated technology such as the acetone process could provide savings of up to 90 per cent in energy, but at the cost of higher capital changes to overcome the explosion hazards involved.

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2/ Maire M.S. and Sundgren P.A. "Energy Usage in the Tanning Industry", weekly bulletin, May 25, 1974.

ANNEX II

# PRODUCTION OF LEATHERBOARD FROM LEATHER SCRAP

## Introduction

Leatherboard may be produced from virtually any tanned scrap leather resulting from the production of finished leather or from scrap arising when the leather is being used. Whatever the source, it is essential that the people responsible for collecting the scrap prior to despatch to the leatherboard plant should take every precaution to keep it as clean as possible and free from adulterants. This can be difficult in tanneries where scrap is of little value in relation to the finished leather, and it can be difficult in the factories where the leather is used if, for instance, those factories also use plastic materials designed to resemble leather. This precaution will be underlined in the items about the various grades of scrap.

## Raw materials

### Types of leather scrap that may be used

#### Chrome splits

This is an important raw material; while it is easy to store for long periods with little degeneration, it is more expensive than most to process. Furthermore, if stored for a long time it can become difficult to process as it becomes increasingly dry. As hide prices rise, it is probable that more tanneries will rely on splitting to substance instead of shaving. Although the intention here is to give more usable splits, it seems likely that the ratio of splits as a percentage of the total will increase. Chrome splits are cheap at the time of writing, and are even available in some areas free of charge, if collected.

#### Chrome shavings

The most widely produced and used of the raw materials, shavings are also stable and very resistant to degeneration. They are relatively easy to transport loose in small ships, in sacks or baled and for many years there has been a substantial export/import business from Pakistan, North and South America and also from some European countries to others where leatherboard and other factories have consumed it. Storage in the open

air causes little problem, except in dry countries where it can become adulterated by dust or sand - impurities which have harmful effects on refining machines. Other than that, this product is normally regular in quality, and simple and not unpleasant to use. The best method is to mix supplies from various sources as much as possible to increase consistency.

The world price was stable at a low figure ex-factory until 1973/74. In that period there appeared to be a shortage. This may, however, have been more fancied than real, possibly due to every leatherboard manufacturer budgetting for continued increases in demand and the majority deciding to lay down larger stocks of this stable material. The result was a steep increase in prices. This was reversed in 1975, partly due to general de-stocking by leatherboard plants, and partly due to increased production of leather. Supplies are again available at modest prices ex-factory. Prices in future will depend on how busy the chrome tanners are, how efficient they are at selling the maximum substance of leather as leather instead of shavings, and how many leatherboard and other chrome-consuming factories are available to bid for the scrap. The moisture content of chrome shavings is usually high, in the range 60 - 65 per cent, and it takes long exposure to dry atmospheric conditions to make any significant change. Similarly, the moisture content does not rise a great deal if stored outdoors, providing there is drainage.

Vegetable tanned shavings

This material is the easiest to use since it readily breaks down into its fibres. It is valuable, either when used in a purely "vegetable" board or when blended with chrome. The problem with its use is that normally it has a very short life in its raw state. Except when it is supplied in a very dry state, as some tanners do, it must be used within a short period of production. The period in store decreases as the moisture content increases. When dry, it will keep for some weeks (or even months), but if wet this period is reduced to a matter of days, from production. After that time, it can degenerate into a useless mess and can even burn spontaneously.

Vegetable tanned pieces

Some of this material is produced in the form of splits or trimmings by the tanneries, rather more from the production of furniture, saddlery, etc., but the most important source by far is from shoe factories and component factories producing leather soles, insoles and heels for shoemaking. As a result of the drop in demand for shoes with leather soles (or leather insoles) made from vegetable tanned leather, there has been a steady fall in the world's production of this type of scrap. At the same time, there is a continuing steady demand for leatherboard for which vegetable tanned leather is the principal, or an essential, component. Examples are: boards for counters (because with a high, or exclusive, vegetable content the counters mould and hold their shape much more easily); boards for heels (because the resultant heels much more closely resemble the traditional leather-built heel). Finally, the majority of insoling materials contain at least a proportion, and usually a high proportion, of vegetable leather. This simplifies production when blended with chrome fibre as it greatly assists in the uptake of the latex by the chrome fibres.

The result of this steady demand has been a steady increase in the price, and a steady flow of imports to Europe, mainly from North and South America. The material is normally regular in quality and pleasant to use. It can be stored for long periods if kept dry, even in the open air. Caution must be exercised as to source. Synthetic soling is made usually to resemble sole leather, and if the supplier of the scrap leather also uses quantities of synthetic there is a danger of adulteration. A few small pieces of plastic in the scrap can do untold harm to the finished product by the presence of small crumbs of plastic.

Scrap chrome tanned upper material

Substantial quantities of this material are available as waste from shoe factories and from makers of fancy leather goods, cases, etc. It originates from good grade leather, can be purchased cheaply and can be made into leatherboard, but in fact only a relatively small proportion of that available gets used in this way. It has a number of disadvantages which tend to outweigh the price advantage.

(a) It comes in a mixture of colours and even though plant can be installed to remove the colour in the leather, it is troublesome and expensive, as some coatings resist the treatment.

(b) The fibre resulting from this leather is not as good as other fibres for the purpose of making leatherboard. Paradoxically, this is because it (upper leather) tends to be from the best side of the hide - the grain side - and the fibres there are shorter and so do not make such good leatherboard.

(c) Finally, there is the vexing problem of adulteration. More and more shoe factories use at least some plastic upper material in shoe production. Usually, this type of upper scrap would be purchased from a merchant who would collect from several shoe factories. The sales value is low, so little attention can be given to keeping various scrap separated and at some time plastic may be mixed with the true leather with disastrous results to the finished board.

Other fibres

Most of the leatherboard formulations can be adjusted to use perhaps 10 - 20 per cent cellulose fibre if there is a suitable local source of scrap Kraft or similar high grade material.

Relationship between scrap input and weight of board produced

| Description of scrap | Approximate moisture content | Approximate per cent water solubles | Weight of scrap to give 1 tonne board containing 15 per cent binder, 12 per cent water. |
|---|---|---|---|
| | (per cent) | | (tonnes) |
| Chrome shavings | 65 | Nil | 2.1 |
| Chrome pieces | 50 | Nil | 1.5 |
| Vegetable shavings | 20 - 50 | 25 | 1.8 |
| Vegetable pieces | 15 - 20 | 25 | 1.3 |

The percentage of water soluble substances in vegetable tanned leather can be lower than the 25 per cent suggested. It is necessary to determine the figure for the scrap to be used since, if it is overlooked, confusion can result in attempting to relate the weight of material used to the weight of leatherboard produced.

In making a leatherboard from chrome and vegetable tanned scrap, the soluble faction of the vegetable leather is important as it replaces part, or in some blends all, of the retanning agent which would otherwise be needed.

## Usages of leatherboard and suggested formulae

The bulk of the sales of most leatherboard plants are used in the shoe trade for insoles, counters, heels and socking. For insoles, the raw materials used range from 100 per cent chrome scrap to 100 per cent vegetable scrap, but modern practice is to use as much chrome scrap as possible. This is partly because it is cheaper, but also because insoles made from chrome will give satisfactory results on all shoemaking methods whereas vegetable leather degenerates, or fails immediately, in some processes involving heat. Also, a high percentage of chrome leather gives a board with much higher resistance to damage by perspiration.

The other outlets for leatherboard are in the fields where substantial quantities of thin leather have traditionally been used; that is, for bookbinding, cases and simulated leather goods. Suggested formulae showing the various constituents as a percentage of dry weight are given in the following table.

| Usage | Scrap content | | | Binder | Moisture | Density |
|---|---|---|---|---|---|---|
| | Chrome shavings | Chrome pieces | Vegetable shavings or pieces | | | |
| Insoles | 63 | | 10 | 15 | 12 | 0.8 |
| Insoles | 40 | 18 | 15 | 15 | 12 | 0.8 |
| Cheaper insoles | 63/33 | 0/30 | 15 | 10 | 12 | 0.8 |
| Counters (stiffeners) | | | 76 | 10 | 14 | 0.9 |
| Heels [a] | | | 79 | 7 | 14 | 0.9 |
| Socking and simulated leather, bookbinding | 53 | | 10 | 25 | 12 | 0.9 |

[a] For heels which are to have an opaque black or brown finish, a small percentage of the leather can be chrome.

For stiffeners also a small portion of chrome can be used, but as the percentage increases, so the ability of the stiffener to take the shape of the mould (or to maintain this shape) diminishes. Stiffeners to be used flat can contain chrome to an extent. For all grades, a percentage of high grade cellulose fibre, such as Kraft and feeding bag scrap, can be included.

Relationship of various grades/densities/area per tonne

| Grade | Density | Thickness (MM) | Theoretical area ($M^2$) per tonne | Probable area per tonne [a] |
|---|---|---|---|---|
| Insoles | 0.8 | 1.25 | 1000 | 940 |
| | | 1.5 | 833 | 780 |
| | | 1.75 | 714 | 670 |
| | | 2.0 | 625 | 585 |
| | | 2.25 | 555 | 520 |
| | | 2.5 | 500 | 470 |
| Other grades | 0.9 | 0.5 | 2200 | 2070 |
| | | 1.0 | 1100 | 1035 |
| | | 1.5 | 740 | 695 |
| | | 2.0 | 555 | 520 |
| | | 2.5 | 444 | 415 |
| | | 3.0 | 370 | 345 |

[a] The figures giving the theoretical area per tonne are based on making accurately to the required thickness or on selling sheets which average the required thickness. In practice, the sheets will be on average a little thicker than specified: the customer will complain if he orders, say 1.5 mm and receives 1.4 mm, but will seldom complain if he receives 1.6 mm. The effect of this will be an average delivery approximately 6 per cent above the specified substance (rather higher on thin substances and perhaps rather less on thicker). This gives the figure in the column headed " probable area per tonne".

## The choice between continuous and batch production

### Continuous production

In a "continuous" plant, the leatherboard emerges from the forming machine in a continuous sheet, but it is virtually certain that one or more operations will be of a "batch"nature. These could be dry grinding, wet grinding or refining. It is also quite common for the sheet coming from a "continuous" machine to be cut into sheets for pressing as a batch.

### Intermittent production

In the intermittent process, the pulp is fed to the machine and built up on a making roll to the desired thickness before cutting off. There is then a delay until another sheet is ready.

The process sequence described below is relevant to both batch and continuous production.

## Operations involved in the production of leatherboard

### Dry grinding

This first process step reduces the scrap leather to small pieces acceptable for use in subsequent wet processing. Reduction can be achieved by grinding, chopping, cutting or hammering according to the machinery available.

To prevent machine damage, the leather scrap is usually fed via a conveyor past a separator to remove ferrous and other solid tramp material.

### Wet processing

This is a process in which further size reduction of the leather pieces is controlled to give repeatable fibre length and degree of refining for controlled consistency. The moisture content of the stock material is measured in the laboratory and from this the weight of water to be added to give a desired consistency calculated. At various stages in the process it is normal to add measured quantities of water so the size reduction and refining processes can operate at known and optimum efficiency. As each batch finishes its process, it is normally pumped into a storage chest with other batches and constantly agitated until required.

Formation of sheet of leatherboard

At this stage the pulp is changed from a liquid state with a solids content of 1 - 2 per cent, to a recognizable sheet of leatherboard by dewatering to a solids content of 20 and 35 per cent.

In simple batch production, a dewatering plant is essentially a wire mesh tray on which pulp is spread as evenly as possible. Water is removed by natural drainage or vacuum and then pressed to consolidate. Subsequently, sheets separated by fabric are again pressed.

The process is slow and labour -intensive. It will not make accurate thin sheets, and in the heavier consistencies quality is somewhat variable. However, it will make thicker sheets than other methods with non-directional fibre orientation and of a relatively high standard.

Continuous production is achieved by passing the pulp onto a moving filter of either metal wire or plastic mesh. Initially water is removed by gravity and by table rolls that remove water by surface tension. Final dewatering is normally by vacuum.

With sufficient water removed to achieve a solid content of 30 - 35 per cent, the wire passes between rolls, the pulp adhering to the upper roll on which the desired thickness is built prior to cutting off.

The sheet is cut off either manually or automatically through a slot in the upper roll.

## Binding material, type, percentage and method of addition

### Type

Traditionally, leatherboard has been produced using natural latex as the principal binder. This is a regular product and, in normal times, it is readily available at comparatively stable prices. Treated correctly, it is stable in itself, relatively easy to handle, not unpleasant and readily accepted by the operatives.

Some mills use a quantity of synthetic latex. This is as regular and as easy to handle as natural, perhaps easier, and it is a wise precaution to use a percentage if only to keep in touch in case problems arise with supplies of natural latex.

It is probable that in normal times natural latex is more economical than synthetic. Some years ago there was little difference, but the increases in the price of oil lead to substantial increases in the prices of oil-based products.

Percentage

The binder content can range from 7 per cent for heeling board to as high as 25 per cent for the top grades of product for specialized applications.

Addition of latex

In order to accept the latex efficiently and economically, the pulp needs to contain a sufficient quantity of vegetable tannin agent or one of the substitutes. Vegetable tanned leather contains sufficient of these agents that if mixed with an equal quantity of chrome fibre there is a sufficiently high concentration of tannin in the liquor.

Binder may be added directly to a pulp containing only vegetable tanned leather, but the pH should be stabilized at 4.2. A pulp containing only chrome leather should have an addition of tannin to reach 500 parts/100,000 in the backwater, and the pH should be raised to 5.5.

Prior to entering the board machine, the pulp is mixed with the required amount of latex in a dilute solution. This mix must be agitated for sufficient time to ensure intimate mixing, and dilute alum added to reduce the pH to 4.2, and re-agitate before the pulp is made up into leatherboard.

Other additives

Anti-oxidant

The rapid degeneration of chrome fibre leather board can be prevented by the addition of a small quantity of anti-oxidant with the alum. This treatment is not necessary where mainly vegetable tanned leather is the constituent.

Oil

It is normal, but not universal, practice to add up to 5 per cent sulphonated oil to the pulp before adding the latex. This improves the feel and general appearance of the finished product.

Dye

It is also common, but not universal practice, to add a small quantity of dye. This gives a uniform appearance from raw materials which vary in colour and can achieve a light brown shade readily accepted in many markets.

Dissolved salts

Apart from the beneficial tannins in vegetable leather, all leathers contain other dissolved salts, either in the dry leather or in the liquor which is an inseparable part of chrome scrap as delivered to the mill. The said liquor could contain in the region of:

| | |
|---|---|
| Chlorides | 6,000 mg/litre as sodium chloride |
| Sulphates | 9,000 mg/litre as sodium sulphate |
| Chromium | 300 mg/litre |

Salts are also produced in the reaction between the latex and the alum. If the water were continuously recirculated, these salts would build up to an unacceptable level. Recirculation can be tolerated up to a level of perhaps 1800 parts/100,000 total dissolved solids, but a lower level is preferable.

## Continuous production

At the wet end, this machine is similar to the intermittent machine. As the wire moves along relatively slowly, water is removed by gravity, table rolls and, towards the end, by considerable suction. By the time the pulp reaches the end of the machine it has a solids content of around 30 per cent, is able to support itself for short distances with care and is a true continuous sheet. Whether it stays continuous or is cut into sheets at the end of the machine depends on the pressing and drying facilities.

This type of machine will make sheets in the 0.4 - 2.3 mm range, depending on the speed of the wire. It is more efficient in the lower thicknesses. A further refinement can have two wires producing layers which are combined for thicker substances.

Pressing

On all types of production after forming, the sheet has to be pressed to remove more water and consolidate the fibres. The degree of pressing

depends on the density and quality of the finished material required but normally a sheet leaves the press at about 50 per cent solids.

For the batch or intermittent production, a "press-load" is formed by interleaving sheets of board with sheets of fabric. This press load is put in the press for up to two hours at a pressure between 20 and 30 $kg/cm^2$.

For the fully continuous plant, two methods of drying are available.

(a) The sheet of leatherboard passes through a series of rollers set with narrower and narrower gaps. This has the effect of steadily forcing out water and compacting the sheet. The build-up of pressure has to be progressive since to do it too quickly would deform the sheet.

(b) A length of the sheet enters between the top and bottom plates of a press. The press closes and then re-opens. This method requires a certain amount of calculated "slack" before and after the press to allow for the fact that the forming and subsequent drying operations are continuous, but the pressing intermittent.

Drying

Drying reduces the moisture content from 50 per cent (approximately) as it comes from the press to 11 per cent (approximately), for a board of full chrome tanned leather, or 14 per cent to a board made fully of vegetable tanned leather. At these moisture contents, and in average atmospheres, the board has a stable moisture content and so will not absorb or give up water. This is important in order to keep the board constant in size.

Individual sheets from an intermittent process are either hung on clips or rested on a brattice and then subjected to streams of hot air as they pass through the dryer cabinet. On a continuous plant, the sheet is passed through the cabinet in a series of loops. In both systems, it is necessary to have close control of temperature, humidity and air flow to ensure quality.

Final processing

Before the board is despatched it is treated by one or more of the following processes.

Calendering

The sheet is passed through heavy rolls which improve the appearance, increase the density and make the sheet more regular in thickness.

Spraying

The sheet passes through a cabinet and is spray-painted in a variety of colours.

Embossing

Heavy rolls with a pattern cut on one roll print the surface of the painted board. On the plain board, this can be done at the same time as calendering.

Trimming

Sheets from the intermittent process have four untidy edges. It is normal to trim all these edges so that the sheet is of a regular size and attractive to the customer. At the same time, the sheet can be split into smaller sheets if required.

On the continuous process, the edges are trimmed from the sheet in a roll form before cutting into lengths to form sheets of the required size. These processes are all performed more easily and with less labour on the roll produced by the continuous process.

## Capital cost of leatherboard plants (intermittent and continuous)

In the following table, outputs are based on a working week of 120 hours; costs are approximate, based on £ 1,000s.

| Operation | Intermittent | | Continuous | |
|---|---|---|---|---|
| | Hand cut | Automatic cut | Intermittent drying | Continuous drying |
| Output | 18 | 30 | 60 | 60 tonnes |
| Dry grinding | 15 | 15 | 25 | 25 |
| Wet grinding | 15 | 15 | 30 | 30 |
| Disc mill | 20 | 30 | 55 | 55 |
| Refiner | 15 | 15 | 25 | 25 |
| Dry conveyors, detectors, scales | 15 | 15 | 25 | 25 |
| Wet pumping system and chests | 60 | 80 | 120 | 120 |
| Alum and latex plant | 15 | 15 | 20 | 20 |
| Board machine complete | 175 | 200 | 800 | 800 |

| Operation | Intermittent | | Continuous | | |
|---|---|---|---|---|---|
| | Hand cut | Automatic cut | Intermittent drying | Continuous drying | |
| Output | 18 | 30 | 60 | 60 | tonnes |
| Automatic cut-off and spare roll | | | | | |
| Press | 80 | 80 | 140 | 220 | |
| Dryer | 60 | 85 | 150 | 450 | |
| Vacuum pumps | 15 | 20 | 50 | 50 | |
| Piping | 50 | 50 | 100 | 100 | |
| Electrics | 80 | 80 | 120 | 120 | |
| Stock room (cutting calender, packing, fork lift) | 75 | 85 | 130 | 130 | |
| Laboratory | 15 | 15 | 20 | 20 | |
| Total plant | 705 | 800 | 1,810 | 2,190 | |

Plant

There are a number of expensive items necessary to house and service the leatherboard plant, but without information on situation, site, building regulations, whether isolated or on an existing complex, etc. it is quite impossible to give even estimated costs.

Building

The intermittent plant detailed above will require a building approximately 70 x 20 m; the continuous plant 100 x 30 m.

Items to be included under the general heading of "building" are:

Heating and lighting
Sprinkler system (if required)
Cranes (if installed)
Storage chests for pulp and for liquid latex

For these items, it would be necessary to budget probably £ 40,000 for the intermittent and £ 60,000 for the continuous systems.

Water

Large quantities of fresh water are required. For ease of production, at least 100 $m^3$ per tonne will be required.

(a) the maximum and optimum size for an intermittent machine. (If a higher output is required, it is more practical to consider the continuous process or it is necessary to install more than one intermittent machine); and

(b) the minimum size for a continuous machine. (A smaller machine gives only marginal reductions in the cost of installation and the saving on capital costs would be outweighed by an increase in labour costs which would be virtually unchanged for the smaller plant).

The optimum plant size for a continuous machine is "as big as possible", within the limits of raw material supply and market availability.

Intermittent vs. continuous plants

| | Intermittent | | Continuous | |
|---|---|---|---|---|
| | Hand cut | Machine cut | Intermittent pressing | Fully continuous |
| Capital cost | £ 705,000 | £ 850,000 | £ 1,810,000 | £ 2,190,000 |
| Depreciation (5 per cent) | £ 35,250 | £ 42,500 | £ 90,500 | £ 109,500 |
| Required return on assets (say 15 per cent) | £ 105,750 | £ 127,500 | £ 271,500 | £ 328,500 |
| Labour costs (based on £ 3,000 per head) | £ 108,000 | £ 144,000 | £ 195,000 | £ 165,000 |
| Total | £ 249,000 | £ 314,000 | £ 557,000 | £ 603,000 |
| Budgeted output (46 weeks) | 828 | 1,380 | 2,760 | 2,760 |
| Price per tonne for above items | £ 301 | £ 227 | £ 202 | £ 218 |

The three items listed above represent the biggest differences in production costs by the various methods. Such items as scrap leather, binder, water, electricity and steam are equal, whatever the method.

The continuous plant is less wasteful than any of the others as regards the amount of waste generated in trimming the sheets. This amounts to at least 6 per cent and with leatherboard at approximately £ 500 per tonne this represents a loss of £ 30 per tonne. So, adding this figure to the first three above gives the comparison:

| | | | |
|---|---|---|---|
| £ 331 | £ 257 | £ 232 | £ 218 |

Steam

Approximately 5000 kg of steam at 5 $kg/cm^2$ pressure is required to produce 1 tonne of finished board.

Electricity

Nearly 2000 kWh/tonne of finished board will be utilized.

Effluent

Effluent disposal is a problem but this can be mitigated by siting adjacent to a tannery when common treatment plants can be utilized.

## Labour requirements for the various types of plant

The labour requirement figures which follow are minimum and are based on three shifts working in all the operations concerned with the production of board. No estimate has been made of office staff or craftsmen (i.e. electricians, engineers etc.)

### Personnel required

| | Intermittent mill | | Continuous | |
|---|---|---|---|---|
| | Hand cut | Machine cut | Intermittent press and dry | Continuous |
| Tonnes | 18 | 30 | 60 | 60 |
| Stock preparation | 12 | 18 | 24 | 24 |
| Chemical and latex processing | 6 | 6 | 9 | 9 |
| Making machine, press and dryer | 9 | 12 | 15 | 9 |
| Stock room | 5 | 8 | 13 | 10 |
| Foremen | 4 | 4 | 4 | 4 |
| Total | 36 | 48 | 65 | 55 |

## Minimum and optimum plant sizes for intermittent and continuous production

As a broad principal, the machines suggested in the above example represent:

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