LEATHER VALUE CHAIN: OPPORTUNITIES AND CHALLENGES

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PREFACE

This Handbook is written as a Compendium for any person/business engaged in the leather sector and those that would wish to join especially SMEs on how to handle hides and skins at the different stages of the value chain in order to reap maximum benefits from leather and leather products. It can also serve as introductory point of reference to researchers who desire to delve deeper into value addition in leather and leather products.

The cradle of this handbook is the COMESA/LLPI. Years of experience, working with the leather sectors in various countries, both within the COMESA region and outside Africa, brought COMESA/LLPI to realize that the region was losing significant amounts of income due to the production and export of poor quality raw hides and skins. LLPI was motivated to develop this manual because of the potential the leather sector holds in the area of employment creation, foreign currency and income earnings.

The material covered herein is divided into six Chapters that span across the entire value chain:

- **Chapter One**; the pre-slaughter stage deals with aspects at the farm level that affect the animals and therefore the resultant quality of the hides and skins, such factors as diseases, poor nutrition, improper branding.
- **Chapter Two**: the peri-slaughter stage entails the period of slaughtering and flaying of animals. Practices such as improper slaughtering, bleeding and flaying, poor handling of the hide after flaying, contribute to the production of poor quality hides and skins.
- **Chapter Three:** covers the post-slaughter stage: all activities that take place after completing the flaying process. This is the stage that deals with the preservation, transportation of hides and skins to collection centres of tanneries.
- **Chapter Four**: outlines the stages and different methods of tanning and their costs depending on the quality of hide/skin, the economic costs of tanning different quality hides and the losses incurred by exporting a hide/skin at different stages of tanning vis-a-vis exporting finished leather or even better, leather products.
- **Chapter Five:** is a fairly detailed account of how footwear and other leather products are made, with special emphasis on how to make shoe uppers. Also included is an analysis of the financial implications if one intends to engage in such an enterprise.
- **Chapter Six**: centers on waste management, briefly how tannery waste can be recycled into gelatin – a huge source of foreign exchange- and or disposed of to minimize pollution.

This Manual was developed by a Team of Public, Private and Academia Sectors Experts drawn from Ethiopia, Kenya, Uganda, Zambia and Zimbabwe who have a wealth of experience of the leather sector and a passion to transform it into a multibillion dollar industry in Africa.

As the COMESA/LLPI, we hope that this Handbook will provide a necessary resource to advocate for best practices in the leather value chain, get Governments to take keen interest in the sector in order to boost performance and encourage investors, both large and small, to invest in the sector.

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EXECUTIVE SUMMARY

The Common Market for Eastern and Southern Africa, Leather and Leather Products Institute (COMESA/LLPI)'s mandate is to spearhead the development of the leather sector in the COMESA region.

The overall objective of this Manual is to demonstrate empirically the challenges the leather sector is facing while at the same time illustrating the opportunities which can be tapped by addressing the identified problem areas. In short, this manual builds a compelling case for National Governments, development partners, financial institutions, academia and entrepreneurs to invest in the leather value chain given its untapped potential in the COMESA region. Implementation of supportive policies, projects, research and investment would unleash growth in real output estimated to reach a minimum level of USD 5 billion, 365,000 direct jobs and intra and extra trade growth. The spillover effects would also spur the growth of accessories production and trading, which include glue, soles, cutting dices, lasts, laces and insole boards.

The leather value chain spans from livestock production to marketing of various leather products. The regional leather sector has the potential of creating jobs, income and foreign currency. The tapping of these opportunities are constrained by a plethora of issues in various segments of the chain from pre-, peri- and post-slaughter, processing and leather products manufacturing levels.

It is within this context that the COMESA/LLPI has developed this "Hand Book" through a participatory process that involved the consultation of pertinent public and private sector professionals from its Member States.

Most of the essential aspects of hides and skins improvement from pre- and post- slaughter stages, which impact on the production of quality hides and skins, the leather production process, up to the manufacture of leather goods are covered in this Handbook with some illustrations. It is expected that the publication of this Manual would contribute to the improvement in policy formulation and investment decisions with regard to the sector.

Also Included in the Handbook is an economic assessment of the losses which are being incurred as a result of low collection levels of hides and skins, poor pre-peri and post slaughter practices and limited value addition in the COMESA region. The losses were quantified in monetary terms, to demonstrate the potential opportunities which could be realized if the identified issues are addressed, through public, private and academic sector interventions.

CHAPTER I: PRE-SLAUGHTER STAGE

1. Introduction

The Pre-slaughter handling of livestock has a bearing on the quality of hides and skins, thus, it is an area of interest especially to hides merchant; tanners and other subsequent chain actors such as footwear and leather goods manufacturers. The quality of hides and skins is compromised in the pre-slaughter stage; mainly due to wide-spread livestock health constraints, traditional husbandry practices, sub-optimal nutrition and other problems. The losses attributed to pre slaughter stage defects, exceeds those associated with peri- and post slaughter stages combined. A study in Ethiopia showed that the pre-slaughter defects might take the share of up to 65% (References from the region) of all damages and defects. The significance of this observation is that the primary producer (livestock owner) has an important function to play in eliminating this problem.

In order to stimulate the desired improvement in the quality of the raw materials, it is, therefore, important to enhance the understanding of the primary producer regarding losses associated to quality defects and, concepts and issues of good animal husbandry. The efforts of farmers in their endeavor to alleviate pre-slaughter defects should be reinforced by economic incentives to reward farmers when they market their livestock. It is important to note that efforts to address this matter over the years have failed to yield a standard acceptable method of rewarding farmers for ensuring that the quality of the skin of their live animals is kept in good condition. This is because the principle of livestock buying and selling does not take into account of the fifth quarter.

1.1. Common Challenges in Animal Husbandry

Animal husbandry is the science of looking after and breeding animals. The subject covers a wide range of activities that involve nutrition, livestock health and management.

Nutrition - Poor nutrition has negative effects on the growth and size of the animal and causes the skin to be thinner, and the leather to have poorly elasticity. The feeding management could be broadly categorized into intensive and extensive systems.

Intensive systems - In most intensive systems, animals are kept with the main objective of achieving the highest production levels possible of different animal products. This system has the following characteristics:

- A lot of feeds are purchased, including concentrates.
- High efficiency breeds are mostly targeted.
- Farm nutrient cycles are often not closed; manure turns to be a waste product instead of a fertilizer.
- Large numbers at high stocking rates are kept, with limited space for exercise and exhibiting other innate behaviors.

Extensive systems - Most of the COMESA region's livestock, particularly ruminants in pastoral and extensive mixed systems suffer from permanent or seasonal nutritional stress. Providing adequate feeds to animals, in terms of both quality and quantity, all year round is the major outstanding problem of livestock husbandry in the tropical region. The state of poor nutritive

feed quality often lasts longer during the year than the period of forage abundance and high nutritive quality.

Preservation of feed in periods of abundance and dissemination of information from early warning systems and drought prediction will help to better manage the complex interactions between herd size and feed availability. Supplementation is also a possible means to meeting the daily nutrition requirements for the animals. Supplementation of concentrates with good quality roughage has the greatest effect on production; however, high yielding animals have a better response than low yielding animals to supplements.

1.2. Livestock Health and Management

Housing - Livestock housing conditions have a substantial impact on the health of livestock and the ensuing quality of the hides and skins. Poorly maintained stock pens may be responsible for scratches, bruising, and/or dirt contamination. Good housing and layout of the farm can improve hides and skins quality, by reducing stress and disease hazards, and also makes management easier. Housing facilities and materials used for barn interiors should be easy to clean and sanitize. Regular cleaning of the animal housing units, feeding and watering troughs and the surrounding environment assist to reduce health risks and the chance of prolonged contact of the animal with dung that leads to irritation to the skin and grain damage.

All materials used in animal husbandry such as racks, fences, walls, gateways, flooring materials should not have loose nails, projections and/or abrasive surfaces. Passages, pens and stalls should be constructed so that animals can enter them and move about freely without physical obstruction, andfloor surfaces must provide solid, non-slip footing for the animals. Keeping animals clean is an essential part of hides and skins quality improvement activity.

Breeding - Livestock producers in the region at present give more consideration for the number of stock as wealth status symbol. Other than keeping economically non-viable animals, they further aggravate the feed shortage problem by keeping animals beyond the carrying capacity of the environment. This does have a bearing on the quality of the hides and skins as with such problems that ensue from crowding, as scratches, lack of adequate feeds, foot rot and others come hides and skins that are light and or with many damages. Payne (1963) suggested that it should be possible on “good humid tropical pasture” to maintain five dairy cows per hectare.

It is important to influence this attitude towards more business oriented approach in order to make them keep lesser number of animals but with higher productivity and socioeconomic benefits.

Pastoralists/ livestock farmers within the region tend to give priority to numbers of livestock kept rather than their quality, implying that they usually keep more than the carrying capacity of the space in which they farm.

It is a fact that the structural quality of hides and skins differs from breed to breed and that the quality of offspring can highly be improved through deliberate cross-breeding. However, a prevalent problem on many farms in the region is that, either due to ignorance exacerbated by inadequate extension services and/ or the lack of financial capacity, animals are left to mate amongst themselves, causing inbreeding which leads to smaller sized animals. It is thus possible to improve hides and skins quality through well planned breeding programs.

Animal Handling - Physical and mechanical defects are generally referred to as "carelessness defects" because they are preventable. Injury to the animal due to poor handling or exposure to abrasive materials such as barbed wire, passages and gateways with pointed edges result in injury and trauma. Scratches resulting from such actions like trauma from whipping, thorn cuts, brand marking and others result in considerable loss to the leather industry. In Kenya, a study showed that 21 % of hides and skins had scars resulting in a loss of US$ 12.2 M[1].

1.2.1. Ecto-Parasites

Ticks: are very common external parasites in the tropics, attacking nearly all types of animals. The economic impact from tick infestation and due to the disease they transmit is enormous. The damages to the leather caused by tick infestation are generally considerable with persistent scars. Ticks cause an estimated loss of US$ 500,000 directly attributed to downgrading of hides and skins and contribute up to 65% of major visible defects of hides and skins in the Eastern part of Ethiopia (Bekele, 2002). The global (in the world) loss associated to ticks and tick-borne diseases in cattle is estimated at US$13.9–18.7 billion (de Castro, 1997,http://www.fao.org/docrep/012/i0680e/i0680e05.pdf)

Mange: is a name given to a group of parasitic disease organisms primarily affecting animal's skin with the principal ones being Demodex, Psoroptic and Sarcoptic manges. Demodicosis is the most common skin disease followed by Ring worm, Sarcoptic and Pseroptic mange. A 14% prevalence of Demodicosis was observed in goat skins. In Uganda, the prevalence level was 27.6% and in Southern Sudan, 34.3% in the same species.[2]

Cockle: is a lice and ked infestation associated allergic dermatitis of skin with a clinical presentation of itching. The lesions are visible only after processing the skin at tannery. According to Bayou, (1998), Cockle is responsible for over 50% of the rejections or downgrading of hides and skins. In Ethiopia among the skins rejected, 100% had cockle. Another study in Ethiopia showed that 49.2% fresh pickled skins were affected with cockle.

Endo Parasites: Endo-parasites (protozoa, worms/helminthes, and arthropods) are organisms that, in their developmental or adult stages, live in animals called hosts. They can invade nearly all organs of the animal.

1.2.2. Common Diseases Affecting Hides and Skins

Due to the tropical nature of the COMESA region's environment, a number of important epizootic diseases of livestock easily thrive. The high prevalence of disease organisms combined with insufficient feeding and poor housing conditions led to heavy morbidity and mortality of animals. Thus disease control is a vital aspect of animal husbandry.

A survey study done in Kenya showed that financial losses to hides and skins trade, due to diseases, were greater than that caused by other factors; disease-caused defects represented 25% of all hides produced in Kenya (CFC, 2005). In the present Manual, only few viral, bacterial, fungal and parasitic diseases, with major importance to hides and skins sub-sector, are considered.

[1] Dr. M. Mwinyihija (****)
[2] Bayou, (1998), Zenaw and Mekonnen (2012) and Abebayehu Tadesse, Endris, (2011)

Viral diseases: Major viral diseases affecting hides and skins are Lumpy Skins Disease (LSD) in cattle and Pox infection in small ruminants.

- **Lumpy Skin Disease**: The disease has more than half a century of existence in the COMESA region. Morbidity widely variable (3% to 85%) and mortality usually low (1% to 3%) but in some outbreaks could reach 20% to 85%. One study done in Ethiopia (Mebratu et al. 1984) reported a 75-90% prevalence.

- **Sheep pox:** is a highly contagious viral disease of sheep and goats. Morbidity could reach 70% to 90% in indigenous breeds and up to 100% in newly imported ones (Ethiopian Sheep and Goat Improvement Program, http://www.esgpip.org) and causes huge economic loss to the leather industry. Skin lesions involve all the layers of epidermis and dermis. Healing of the affected skin is slow and can leave permanent scars.

Bacterial Diseases: Dermatophilosis, also known as Streptothricosis is an exudative, pustular dermatitis that mainly affects cattle, sheep and horses, but also goats. It is most prevalent in the young and in animals chronically exposed to moisture. Malnutrition and mechanical traumas are also favoring factors for the disease occurrence. The organism grows in the outer layers of the skin. Typically, infection gives rise to the formation of dense scabs on the skin. The disease results in a pinhole appearance on the leather surface. A study done on cattle in the highlands of Ethiopia showed a prevalence level of 15.4% (Woldemeskel and Taye, Trop Anim Health Prod. 2002 34(3):189-94 2002).

Fungal disease: Ringworm is a fungal infection of the skin that is common in many animal species. In affected animals, the skin on the head, ears, neck and shoulder areas, often, shows characteristic circular hairless lesion that becomes thickened and crusty. A study done in Nigeria (Emenuga and Oyeka, American Journal of Infectious Diseases and Microbiology, 2013 1 (6), pp 106-110) reported a 6.3% prevalence of fungal lesions in sheep.

1.3. Summary of Pre-Slaughter Defects

The defects associated with the pre-slaughter stage is summarised in Table 1

Table 1: Defects Associated with Pre-Slaughter Defects

Origin	Category	Type	Examples	Control/ Remediation
Pre-Slaughter	Intrinsic factors	Breed	Robbins in merino sheepskins attributed to weight of fleece causing wrinkles.	None*
		Sex	Excessive thickness in bull hides that provide weak grain splits consisting mainly of vertically orientated papillary fibers.	None
		Age	Growth marks on hides of old cattle attributed to age-related wrinkles.	None.
	Husbandry	Intensive	Physical and chemical susceptibility of skins from fast-growing animals attributed to 'immaturity' of skin protein.	Minor revisions to tanning process.
		Extensive	Miscellaneous age-related defects attributed to slow-growing animals raised	None.

* None short term and simple

Origin	Category	Type	Examples	Control/ Remediation
			on ranches.	
		Commercial	Chemical residues (hormones, pesticides etc.) attributed to inappropriate prophylactic and palliative treatments.	Use of approved medicines only.
		Subsistence	Miscellaneous defects such as yoke marks attributed to use of animals for 'non-commercial' purposes.	Use of correct, properly fitted harnesses.
	Diseases	Genetic	Predominance of vertical collagen fibers in hides from breeds such as the Hereford.	None.
		Viral	Lumpy skin disease.	Vaccination
		Bacterial	Streptothricosis	Antibiotics
		Fungal	Ringworm	Fungicides
		Parasitic	Mange	Miscellaneous insecticides (or acaricides), or physical interventions such as shearing.
		Allergies	Hyperkeratosis	Reduced exposure to allergen.
	Physical/ mechanical	External damage	Branding, shearing, cauterization, scarification, abscesses, harnesses, goad etc.	Branding in correct location. Use of correct shearing equipment and techniques etc.
		Miscellaneous	Urine and faeces irritations	Proper animal husbandry.

1.4. Conclusion

CHAPTER II: PERI- SLAUGHTER STAGE

2. Introduction

The peri-slaughter stage entails the period or activities associated with the slaughtering and flaying process of livestock. Thus it entails the handling of the animals from the period they enter the slaughter yard until the completion of the flaying process.

The source of hides and skins range from the rural areas at the village level where the slaughtering is done in the backyard of the homestead up to urban markets where the slaughtering is done in modern abattoirs/slaughterhouses. An elaboration of these slaughter facilities and their implication to the quality of hides and skins produced is discussed in this Chapter.

2.1. Types of Slaughter Facilities

Abattoirs - These slaughtering facilities are well organized to meet export standards. Hides and skins are collected immediately after the flaying operation is completed, cooled (washed with cold water), weighed and delivered to curing/preservation premises. Hides and skins produced in these facilities are usually free from peri-slaughter defects and also that 100 percent of them enter the leather value chain. The cost of collection and channeling the hides and skins to tanneries or to export markets is minimal and is highly organized. These hides and skins also earn relatively high prices both in domestic and international markets.

Slaughterhouse - Slaughterhouses are facilities at national level, mostly similar to abattoirs but of smaller operational capacity. Hides and skins are delivered to the curing/preservation shed and the rest of activities like washing and weighing is done at the curing point. Other things being equal, hides and skins produced in these facilities are supposed to be free from peri-slaughter defects. However, as the dominating motive is to slaughter as many animals as possible, and as flayers are paid on the basis of the number of animals they slaughter, there is high incidence of peri-slaughter defects due to overwork and inadequate care to the hides and skins. These facilities are very common in many, if not in all, COMESA countries, and they normally handle the bulk of slaughters.

Slaughter slab - There is lack of proper slaughtering facilities as the carcass is thrown on the killing floor after being made unconscious with a crude weapon before the commencement of flaying operation. The incidence of flaying defects is very high as the possibility of selling hides and skins to merchants is usually low, thus, there is no systematic preservation of hides and skins after slaughter. Thus, hides and skins produced at these facilities usually suffer from peri- and post-slaughter defects. The growth of rural business centres has witnessed a rapid growth of the number of animals slaughtered in these facilities. A large proportion of hides and skins do not reach trading markets and curing centers due to limited knowledge and also because lower returns given the volumes of hides and skins involved.

Backyard slaughtering - Slaughtering is purely done behind homestead and a significant proportion of hides and skins originating from this area are poorly flayed and preserved, associated with low collection ratios.

2.2. Slaughtering Techniques

Stunning gun - The stun gunning is the recommended humane method of paralysis for modern slaughtering technique and is practiced mostly in abattoirs and slaughterhouses which are located in urban areas. Hides and skins from these premises are of good quality because of minimized self-inflicting physical damages and are found acceptable in secondary and tertiary markets.

Axe and hummer - This is a crude method and still practiced in remote areas. The animal is struck with an axe or hammer. There is high possibility of animal struggling wild because of ineffective blow. The struggle inflicts cuts, scratches and wounds to the animal body. Hides and skins originating from this kind of set are of poor quality due to some cuts and wounds.

Rope straining - This method is still done in some parts of interior areas of arid and semi-arid lands (ASALs) and most hides and skins from this region suffer from defect brought by rope marks.

Knife stabbing - This method is still done in some villages behind the homestead and as in 2.2.2 this method is not effective and causes animals to self-inflicted damages; and most hides and skins from this area have cuts, bruises and wounds.

Physical strangulation - This practice is used by old generation in the interior of rural areas on sheep and goats but is being phased out. Hides and skins from this region are always regarded as of low grade due to contamination with soil and blood and are veiny due to poor bleeding.

Electrical shock - This is mostly used to drive the animals through the lairage leading to the stunning box. It does not harm the hide unlike where animals are beaten with crude weapon and in the process damage the hide.

2.3. Slaughtering and Flaying Process

Slaughtering is the severing of the trachea, the main arteries and veins leading to the brain. The knife used must be long, pointed and very sharp. A special knife 18 to 20 inches long is the best and the cut should be long, deep and rapid and not a succession of short, shallow strokes. It must be as near the head as possible and must be cut straight down otherwise the shape of the hide will be impaired. Proper bleeding should be done as any blood which is left in the veins and arteries will act as a medium for the growth of the bacteria which cause putrefaction. In order to bleed the carcass properly, it must be hoisted by the hind legs to allow the blood to flow by the force of gravity.

Ripping cuts (incisions): It is worth noting that the shape of the hide is determined by initial ripping (incision) cuts. To obtain the best optimum shape of the hide, the following basic incisions should be made on large animals-

- One long, straight incision down the mid-line, from the chin to the anus (cuts reaching only to the udder or scrotum are not recommended as the shape of the hide is affected as two unnecessary flaps are left, which have to be trimmed off, thus affecting the shape and size of the hide).

- Two circular incisions on the four legs round the knee,

- Two similar incisions round the hocks,
- Two straight cuts on the inside of the fore-legs from the knee to the fore-end of the breast bone,
- Two straight cuts on the hind legs from the back of each hock to a joint midway between the anus and the scrotum or udder.

After the basic incisions have been made, the proper flaying commences. The flayer should always pull the hide away from the carcass with one hand, while cutting the subcutaneous tissue away with the other hand holding the knife parallel (as far as possible) to the hide. Use of rounded edge knives is recommended to avoid excessive flay cuts.

Cooling of hides and skins - After the flaying is completed, the hides and skins must be washed with cold water and transported immediately in non-metallic containers to the curing premises (Sheds) ready for curing/preservation or to the tannery (where the tannery is within the radius of 3- 4 kilometers) for direct processing.

2.4. Summary of Peri-Slaughter Issues

Origin	Category	Type	Examples	Control/ Remediation
Peri-Slaughter	Physical/ mechanical	External damage	Branding, shearing, cauterization, scarification, abscesses, harnesses, goad etc.	Branding in correct location. Use of correct shearing equipment and techniques etc.
		Miscellaneous	Urine and faeces irritations	Proper animal husbandry.
	Bleeding	Veininess		Proper bleeding.
	Dressing	Ripping	Incorrect pattern/shape	Adherence to standard cutting lines.
		Flay damage	Cuts and perforations	Use of proper tools and techniques.
	Physical/ mechanical	Handling	Abrasion	Proper handling of animals, hides, and skins.

Origin	Category	Type	Examples	Control/ Remediation
		Storage	Heating	Proper storage of hides and skins
Post-Slaughter	Preservation	Autolysis	Generalized deterioration of hides and skins, attributed to self-destructive components in hides and skins. Only prevalent in materials preserved by some physical and chemical methods (other that drying and salting).	Minimization of storage at elevated temperatures.
		Drying	Miscellaneous defects (over-drying, contamination, cracks, abrasions etc., attributed to use of ground (sun) drying.	Use of techniques other than ground drying (suspension drying, salting etc.).
			Casehardening of hides; attributed to over–drying of surface layers during periods of high temperature and low humidity.	Control of wind speed (draught) through drying sheds.
			Putrefaction; attributed to protracted drying during periods of low temperature and high humidity. Putrefied hides/skins result in “hair slip”, looseness of the hair.	Preliminary dipping in a disinfectant to provide short-term protection until hide or skin is dry.
		Salting	Putrefaction, attributed to delays in the initial application of salt.	Prompt and proper application of salt.
			Putrefaction, attributed to use of insufficient salt.	Application of sufficient salt.
			Putrefaction, attributed to activity of salt-tolerant bacteria in salt without supplementary biocides. May develop red spots or “red heat” marks.	Incorporation of auxiliary bactericides into salt used for preservation.

2.5. Conclusion

CHAPTER III: POST- SLAUGHTER.

3. Introduction

The Post Slaughter stage is mainly dominated with the collection and preservation of hides and skins. Curing of hides and skins is done to deter putrefaction of the protein substance (collagen) because of the chance of bacterial infection due to the time lag that might occur from flaying of livestock to processing of hides and skins. It removes the excess water from the hides and skins where water flows from inside because of difference in osmotic pressure. Thus the moisture content of hides and skins get greatly reduced. Various methods are used in the preservation process namely salting, drying and cooling among others. The different types of preservation methods are discussed below.

3.1. Preservation Methods of Hides and Skins

Curing - By curing, we are creating condition whereby the bacteria is made ineffective, as we need very drastic conditions for destroying the bacteria. The choice of a suitable method and its implementation in any particular area depend on climatic and other conditions, as a single specific method cannot be suitable for all areas.

In most areas of tropical African countries, it is advisable to do curing within four hours of flaying because of the high temperatures. The important factors to be taken into account while deciding the type of preservation are:

- The duration of preservation desired, and location of application.
- Method of application and any extra equipment and handling involved.
- The cost-effectiveness of the treatment for the period of preservation.
- The environmental impact of salt has to be taken into account.

Rock, sea or lake salt with a sodium chloride content of 94-95% maybe used for preservation. The suggested size is 0.4-1.0 millimeters for skins and 1.3-3.2 millimeters of grain size for hides. Rock salt is the ideal salt for curing. However, sea salt is most commonly used and the main disadvantages are the formation of red heat, which makes the flesh side of the hide red through the action of halophilic bacteria (salt loving) and other organisms that have salt tolerance.

Wet Salting: The hide or skin is spread on the floor or a wooden pallet and the required salt is uniformly applied on the flesh side with common salt to the extent recommended for the area. The second hide or skin is now spread on the first one with flesh side up and salt applied in the same manner. A pile of about hundred hides may be made or approximately to a height of 1 meter. The salt draws out water from the hides and skins and the brine so formed is allowed to drain out along with brine-dissolved blood, lymph and other soluble proteins.

The pack is allowed to cure for about five days and then it is opened up and put in another pile with top hide going to the bottom. Again, the hides remain for five days in pile. Then, they are taken out, extra salt removed from the flesh side to keep the grain side clean. Two hides kept grain to grain, folded along the four edges, and bundled to dispatch to tanneries.

This method does not destroy the bacteria; however, a condition is created where they become ineffective. Salt draws out about 20% of water from the hide or skin. Some salt is absorbed by the hide to the extent of 13-17% and the rest flows out.

Dry Salting: This technique is very much similar to wet salting but the hides and skins are dried after the initial salting which gives the advantage of both drying and salting. This method is specially suited for preparing stock for export purpose, at the same time overcoming the problems of wet salting. The initial operations are the same as in wet salting and salting has to be done without any delay after flaying. As soon as the brine has drained off, the hides are dried in the air with flesh side up on the pallet.

Therefore, the main requirement is a large drying area. Drying can be done, with advantage, by hanging them on pole or rope. The quantity of salt used is 10% less than the salt required for the wet salting method of preservation. With rains, air-drying of salted hides may present considerable difficulties. In this period, a mixture of one part of common salt to four parts of anhydrous sodium sulfate is very often used to speed up drying.

Butchers or farmers who handle only small number of hides or skins can easily practice quick dry salting. The salt is applied and the hide or skin is folded with flesh side in and bringing in from all four sides where the hide or skin is folded for about five times. The hide or skin remains in folded condition for two days and taken out and dried.

Air Drying: Drying of hides and skins can be accomplished in different ways. The techniques are drying by suspension (frame drying), drying by suspension over cords or wires and tent and parasol drying. Drying depend on the temperature, relative humidity, and movement of air.

The dryness of the air can be expressed in figures, and the unit usually adapted is the" percentage relative humidity," i.e., the amount of moisture in the air at a certain temperature, expressed as the percentage of the amount of water it would contain if fully saturated at that temperature.

Therefore, if the air is dry relative humidity is lower and vice versa. A fresh skin placed in warm surroundings will dry very much more rapidly if the air is moving than it is still. Even if the atmosphere is moist but moving, it will dry a damp skin. It is, therefore, a bad practice to hang up skins in an enclosed space with solid walls where air currents cannot have free access, and this leads to putrefaction. Air currents are always welcome in drying of hides and skins even if it is slightly warmer in the open. If a hide or skin does not dry in 2-3 days, there are chances for putrefaction.

Suspension or Frame Drying: The best results are obtained if frame drying is done under shades which, should be well ventilated.

For hides from larger breeds of cattle, the frame should be 3.0 meters X 3.0 meters and for smaller breeds 2.75 meters x 2.75 meters is sufficient (Fig. 11, 12). The minimum distance between two frames should be one foot/30cm/12 inches to allow air circulation and to permit an operator to pass between two frames. This being the general case, however, the distance between the two frames could be decided according to the environment of the area, where one can increase the distances between the frames as the altitude increases.

Large frames meant for hides can be adopted for skins also, using four skins in the metal/wooden frame. In suspension drying, the orientation of the frames should be east-west

direction to protect the laced hides from direct sun light. Therefore, the would damage the hides and skins, provided the temperature of the hides does not reach the point of degradation of collagen. The advantages of suspension are:

- It allows free flow of air on both sides of the hide or skin.
- The water drains off the surface and does not collect in puddles on the hide.
- The sun's rays strike obliquely not directly.
- It permits the hide to cool off rapidly since heat is lost through surfaces.
- Neither hair slip nor putrefaction sets in, as there are no folds or points of contact between the hide and any solid object.
- Better grading possibilities as every cut, bruise or parasite damages show up better on a dry hide.
- Dried hides and skins can be stored for a longer duration than salted hides.
- Transportation is cheaper as the weight is only half of the salted hides.
- Corrosion is avoided as in the case of salted hides, when the containers and vehicles are corroded.

The main problems are difficulty in soaking back, involving extra cost and often in loosing hide substance leading to holes, uneven shape by improper stretching during drying and loss of area by the cuts for lacing and consequent trimming. One has to make sure the hides and skins are not overstretched as it affects the structure of the hides and skins and the method of stretching and securing to the frame is called lacing. Ropes are commonly used for lacing hides. Often the slits made by knives are very long and much inside the hide or skin, wasting a good percentage of raw materials. It is better to use a punch for lace holes, or small vertical custs instead of horizontal.

Line Drying: In areas where wood for frame is scarce, this method can be used. The skin is suspended symmetrically along the backbone with the hair or wool hanging down, over a cord, or wire not thicker than 0.5 centimeters. In order to prevent the two bellies and flanks from touching each other, another two ropes, with about 15 – 20cm between them, should be stretched at a lower position from the upper one so that every part of the skin is freely open to the air. The drying time is the same as frame drying, if the cord or pole is thick, the portion in contact with the pole will not dry and get putrefied.

Ground Drying: This is the most traditional and simplest of curing techniques and at the same time the most undesirable. Hides and skins are spread on the ground with flesh side up to dry. Pegs or stones used at the edges to keep the hide or skin flat out. In most of the cases, they wrinkle and shrivel. The hair side, touching the ground does not dry together with the exposed flesh side. When they are dry, they are bundled and sent to tanneries. The main defects are blister, taint and hair slips. It shows that free circulation of air on both sides is essential in drying the hides and this method of ground drying is most unsuitable and has to be discouraged.

3.2. Storage and Transportation of Hides and Skins

Storage: Though storage is very critical in the post slaughter process it has not been recognized that storage of preserved hides and skins is as important as the preparation and

preservation. In most local areas, a good percentage of hides and skins are lost during storage and transportation especially during rainy season. A significant loss is due to damages caused by insects while dried hides and skins are stored before sending to tanneries.

In storage shades, the main problems are highly infested stores, leaking roof, storage of hides and skins on a floor without use of slatted platform, lack of insecticide, improper use of insecticide and long storage before sending to tanneries. Bad storage conditions may result in serious damage to the hides and skins.

- All hide and skin stores and drying sheds should be kept clean as this will minimize the multiplication of insects,. The insects and the infested hides and skins may be burnt. The storage places and drying sheds have to be color washed or painted, whichever is possible.

- Repair all the leaking roofs of the stores and drying sheds and in smaller places, provide protections for cured hides and skins from rain or sun.

- Slatted platforms may be provided or improvised with wooden poles for storing of hides and skins properly. Spray or dust the dried hides and skins with insecticides having effective insecticide content. Storage sheds constructed in rural areas with available materials, can serve for the purpose.

Transportation of Hides and Skins: Many forms of transport are used to convey hides and skins from out-stations to the more important markets. Hides and skins are often loaded singly on a lorry transport or tied in loose bundles. Consequently, any movement will make the surfaces rub together and cause considerable damage, especially to the grain folded edges and corners. Rubbing damage caused during normal transportation by road is more or less negligible, but a certain amount of care is required to ensure protection of bales against rubbing and tearing on the outside surfaces by adequate covering with Hessian or gunny, especially in the case of skins.

3.3. Summary of Post Slaughter Defects

Summary of the categories of post slaughter defects are shown in Table 2

Table 2: Post Slaughter Defects

Origin	Category	Type	Examples	Control/ Remediation
Post-Slaughter			Staining, attributed to use of incorrect types of salt.	Use of correct salt.
	Storage	Pests	Reduction in the substance of hides and skins, attributed to infestation by insects (Dermestes) and rodents (rats).	Control of insect and animal pests.
		Moulds	Damage attributed to prolonged storage in damp conditions.	Use of proper storage facilities, with fungicides if necessary.
	Transportation	Abrasion	Damage of the grain layer attributed to incorrect packaging and handling of hides and skins.	Proper packaging of hides and skins.

		Contamination and adulteration	Accumulation of ‘foreign bodies’ of various sorts.	Use of proper storage facilities.

3.4. Conclusion

The pre, peri and post slaughter defects, which have been discussed at length in the Chapters above have far reaching negative impact on the performance of the leather value chain at national, regional and international level. These defects have the effect of down-grading the quality of raw hides, consequently reducing the prices they fetch in both national and international market. The incidence of these defects on a large proportion of hides and skins emanating from Africa has created a negative image of the African hides, which consequently has pushed down their prices globally. This is despite the fact that in the current state the African hides and skins are suitable for certain uses because of their strong grain structure.

In the next Chapter an assessment of the losses, which have been incurred in the COMESA region, with regard to income due to the prevalence of pre, peri and post slaughter defects is undertaken. The main rationale for quantifying these losses in monetary terms is aimed at improving awareness on the benefits associated with the reduction of these defects. Addressing the causes of these defects, would spur net benefits to the leather value chain at country level and the region at large.

CHAPTER IV: ECONOMIC IMPACT OF PRE-, PERI- AND POST-SLAUGHTER DEFECTS

4. Introduction

The pre, peri and post defects have a negative impact on the finished leather yield. Yield relates to the area produced per unit weight or piece input into the tanning process. For instance wounds, scratches, cuts and petrefaction would result in some section of the raw hide being lost during processing. The reduction in the yield has a negative bearing on the production cost and consequently on the profit margins.

The estimated potential losses are based on mathematical formulations, which were generated based on relevant empirical evidence, which is quoted in relevant sections and also through a consultation process of experts, which were drawn from selected COMESA Member States.

4.1. First Level Losses: Losses attributed to pre, peri and post slaughter defects

Gross losses incurred due to the prevalence of pre, peri and post slaughter defects were computed based on equation 1, and the apportionment between pre and peri/post slaughter defects was based on a study by Mwinyihija (), which found out that 48% and 52% of defects are attributed to pre and peri and post slaughter defects respectively. The losses incurred on bovine, sheep and goats skins are based on the same equation. See equation 1 below, which was used in the computations of gross pre, peri and post slaughter defects.

i. Loss due to Pre. Peri, and Post Slaughter Defects

$$= \sum G_1 P_1 - \sum(aTQ P_1 + bTQP_2 + cTQP_3 + dTQP_4 + eTQ P_5 + fTQP_6) \qquad \text{equation 1}$$

Where

- G_1 is 100% first grade
- P_n prices with respect to grades 1 to 6
- a to f: Ratios of grades of hides
- TQ: Total output of hides by a country

ii. Impact of Pre, Peri and Post Slaughter Defects on Bovine Hides and Skins

The total loss attributed to pre, peri and post slaughter defects in the COMESA region in 2011, was estimated at US$ 89.9 million, with peri and post slaughter defects contributing US$ 52.1 million. Whereas the region had the potential of earning approximately US$ 203.7 million assuming all hides produced were of first grade. It is well documented that dealing with pre-slaughter defects is a daunting task and previous efforts/project have failed to alleviate this problem, given the free ranging nature of the African head and also absence of economic incentives for farmers to invest in ensuring that their animals skins are taken good care. Beneficial results in reducing these losses can be achieved by investing in addressing peri and post slaughter defects.

The magnitude of losses being incurred varies from country depending on the livestock size and also the livestock management systems. The average loss per country is *****, with a standard deviation of *****. Countries with the highest losses include Ethiopia, Sudan and Kenya, thus regional efforts to address pre, peri and post slaughter defects should be focused in these three

countries, as this would have higher multiplier effect in the region, than spreading to countries, were the losses are negligible, yet incurring more or less the same level of project overheads. Country specific details are summarized in Table 3 below.

Table 3: Estimates of Pre, Peri and Post Slaughter Defects on Bovine Hides

Countries	Potential Earnings Assuming all Hides are First Grade	Actual Earnings	Loss	Pre-slaughter	Peri and post slaughter losses
				0.42	0.58
Burundi	900,000	514,000	386,000	162,120	223,880
DRC	990,000	565,400	424,600	178,332	246,268
Egypt	34,740,000	19,840,000	14,900,000	6,258,000	8,642,000
Eritrea	1,620,000	925,200	694,800	291,816	402,984
Ethiopia	36,630,000	17,297,500	19,332,500	8,119,650	11,212,850
Kenya	41,130,000	23,992,500	17,137,500	7,197,750	9,939,750
Lybia	450,000	257,000	193,000	81,060	111,940
Madagascar	13,230,000	7,555,800	5,674,200	2,383,164	3,291,036
Malawi	1,800,000	1,028,000	772,000	324,240	447,760
Mauritius	90,000	51,400	38,600	16,212	22,388
Rwanda	2,700,000	1,542,000	1,158,000	486,360	671,640
Sudan	43,291,000	24,723,400	18,567,600	7,798,392	10,769,208
Uganda	10,170,000	5,989,000	4,181,000	1,756,020	2,424,980
Zambia	5,400,000	3,210,000	2,190,000	919,800	1,270,200
Zimbabwe	10,530,000	6,259,500	4,270,500	1,793,610	2,476,890
Total	**203,671,000**	**113,750,700**	**89,920,300**	**37,766,526**	**52,153,774**

Source: Computations based on FAO data.

iii. Impact of Pre, Peri and Post Slaughter Defects on Sheep Skins

The total loss attributed to pre, peri and post slaughter defects in the COMESA region in 2011, was estimated at US$ 28.5 million, with post slaughter peri and post slaughter defects contributing US$ 14.8 million. Whereas the region had the potential of earning approximately US$ 76.4 million assuming all hides produced were of first grade. It is well documented that dealing with pre-slaughter defects is a daunting task and previous efforts/project have failed to alleviate this problem, given the free ranging nature of the African herd and also absence of economic incentives for farmers to invest in ensuring that their animals skins are taken good care. It is our conviction that beneficial results in reducing these losses can be achieved by investing in addressing peri and post slaughter defects, as cuts, gauges and putrefaction cannot be eliminated through the tanning process, whilst on the other hand modern tanning technology can easily deal with pre slaughter defects such as tick bites, scratches etc.

The magnitude of losses being incurred varies from country depending on the livestock size and also the livestock management systems. The average loss per country is *****, with a standard deviation of *****. Countries with the highest losses includes Ethiopia and Sudan, thus regional efforts to address pre, peri and post slaughter defects should be focused in these two countries, as this will have higher multiplier effect in the region, than spreading countries, where the losses are negligible, yet incurring more or less the same level of project overheads. Country specific details are summarized in Table 4 below.

Table 4: Estimates of Pre, Peri and Post Slaughter Defects on Sheep Skins

	Potential Earnings Assuming all Hides are First Grade	Actual Earnings	Loss	Pre-slaughter	Peri and post slaughter losses
Countries/ratio				0.48	0.52
Burundi					
DRC					
Egypt	5,440,000.00	3,555,550.00	1,884,450.00	904,536.00	979,914.00
Eritrea	1,920,000.00	,254,900.00	665,100.00	319,248.00	345,852.00
Ethiopia	27,840,000.00	18,196,050.00	9,643,950.00	4,629,096.00	5,014,854.00
Kenya	8,320,000.00	5,437,900.00	2,882,100.00	1,383,408.00	1,498,692.00
Libya		3,973,850.00	2,106,150.00	1,010,952.00	1,095,198.00
Madagascar	640,000.00	418,300.00	221,700.00	106,416.00	115,284.00
Malawi	320,000.00	209,150.00	110,850.00	53,208.00	57,642.00
Mauritius				0.00	0.00
Rwanda	320,000.00	209,150.00	110,850.00	53,208.00	57,642.00
Sudan	30,080,000.00	19,660,100.00	10,419,900.00	5,001,552.00	5,418,348.00
Uganda	1,280,000.00	836,600.00	443,400.00	212,832.00	230,568.00
Zambia	320,000.00	209,150.00	110,850.00	53,208.00	57,642.00
Zimbabwe					
Total	76,480,000.00	53,960,700.00	28,599,300.00	13,727,664.00	14,871,636.00

Source: Computations based on FAO data.

iv. Impact of Pre, Peri and Post Slaughter Defects on Goats Skins

The total loss attributed to pre, peri and post slaughter defects in the COMESA region in 2011, was estimated at US$ 42.4 million, with peri and post slaughter defects contributing US$ 22.1 million. Whereas the region had the potential of earning approximately US$ 122.6 million assuming all hides produced were of first grade. It is well documented that dealing with pre-slaughter defects in a daunting task and previous efforts/project have failed to alleviate this problem, given the free ranging nature of the African head and also absence of economic incentives for farmers to invest in ensuring that their animals skins are taken good care. It is our conviction that beneficial results in reducing these losses can be achieved by investing in addressing peri and post slaughter defects, as cuts, gorges and putrefication cannot be eliminated through the tanning process, whilst on the other hand modern tanning technology can easily deal with pre slaughter defects such as tick bites, scratches etc.

The magnitude of losses being incurred varies from country depending on the livestock size and also the livestock management systems. The average loss per country is *****, with a standard deviation of *****. Countries with the highest losses includes Ethiopia and Sudan, thus regional efforts to address pre, peri and post slaughter defects should be focused in these three countries, as this will are higher multiplier effect in the region, than spreading countries, were the losses are negligible, yet incurring more or less the same level of project overheads. Country specific details are summarized in Table 5 below.

Table 5: Estimates of Pre, Peri and Post Slaughter Defects on Goat Skins

	Potential Earnings Assuming all Hides are First Grade	Actual Earnings	Loss	Pre-slaughter	Peri and post slaughter losses
Countries/ratio				0.48	0.52
Burundi	1,920,000.00	1,254,900.00	665,100.00	319,248.00	345,852.00

	Potential Earnings Assuming all Hides are First Grade	Actual Earnings	Loss	Pre-slaughter	Peri and post slaughter losses
DRC	5,120,000.00	3,346,400.00	1,773,600.00	851,328.00	922,272.00
Egypt	3,200,000.00	2,091,500.00	1,108,500.00	532,080.00	576,420.00
Eritrea	2,240,000.00	1,464,050.00	775,950.00	372,456.00	403,494.00
Ethiopia	25,920,000.00	16,941,150.00	8,978,850.00	4,309,848.00	4,669,002.00
Kenya	12,480,000.00	8,156,850.00	4,323,150.00	2,075,112.00	2,248,038.00
Lybia	1,600,000.00	1,045,750.00	554,250.00	266,040.00	288,210.00
Madagascar	1,280,000.00	836,600.00	443,400.00	212,832.00	230,568.00
Malawi	6,400,000.00	4,183,000.00	2,217,000.00	1,064,160.00	1,152,840.00
Mauritius				0.00	0.00
Rwanda	1,600,000.00	1,045,750.00	554,250.00	266,040.00	288,210.00
Sudan	48,000,000.00	31,372,500.00		7,981,200.00	8,646,300.00
Uganda	7,680,000.00	5,019,600.00	2,660,400.00	1,276,992.00	1,383,408.00
Zambia	1,920,000.00	1,254,900.00	665,100.00	319,248.00	345,852.00
Zimbabwe	3,200,000.00	2,091,500.00	1,108,500.00	532,080.00	576,420.00
Total	122,560,000.00	80,104,450.00	42,455,550.00	20,378,664.00	22,076,886.00

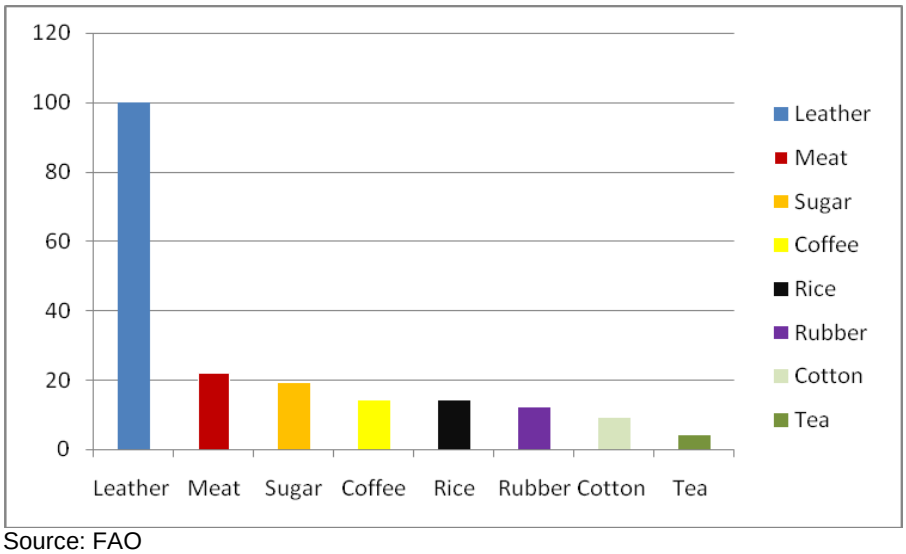
Source: Computations based on FAO data.

The combined pre, peri and post slaughter defects on bovine, sheep and goats skins amounted to US$ 161 million, with peri and post slaughter defects contributing US$ 89 million and the balance is attributed to pre slaughter issues. The highest losses are recorded in bovine, followed by goat and sheep takes the last spot. The total estimated loss could have generated income amounting to US$ 1.9 billion, if these losses had been converted into finished products and other indirect benefits, which could not be easily estimated using a partial equilibrium analysis. This is based on the 12 fold value addition threshold, which has been alluded to based on the empirical findings by Mwinyihija ()

4.2. Second Level Losses: Due to Non-recovery

The second level of losses is associated with hides and skins leakages, that is hides and skins which do not enter the leather value chain and this is attributed to a number of reasons. The main reason being that significant proportions of slaughters in the COMESA region take places in backyards, slaughter poles and slabs. Slaughtering takes place in isolated areas and at times the volumes per slaughter point are negligible to justify a collection system, hence are usually thrown away or used in the production of drums and other traditional artifacts. It has also been argued that the low collection levels are also a function of low prices being offered by hides and skins merchants, which thus discourages households to transport their hides and skins to selling points. During the implementation of a project, which was funded by CFC, which was aimed at improving the collection of hides and skins, one farmer from Zimbabwe, argued that it does not make economic sense to take a single hide to the collection centre, which is 5 kilometers, when the cost of transport is twofold that of the price of the hide.

In a number of COMESA countries the buying and selling of hides and skins is not organized, in contrast with other commodities such as cotton, meat, coffee, tea, just to mention a few. Given the scenario, the marketing of this important commodity is disorganized. A cursory look in the region and across Africa shows a paradox, for instance less important commodities are supported with well organized Quasi Government Institutions. The graph below illustrates the relative importance of the leather value chain versus other commodities.



Source: FAO

Figure 1: Relative Importance of the Leather Value Chain in Global Trade

The losses incurred due to non-collection of hides and skins is based on empirical evidence on studies which were undertaken in a number of countries, using the formula, which is shown below. Note this analysis has not been extended to countries where the collection ratios could not be authenticated by studies, or from inputs from Experts drawn from the given countries.

LNR = (Total number of hides produced – total number of hides entering the leather value chain) * price of hide (∑HP-∑HC)*P

Where ∑HP = total number of hides and skins produced
∑HC = Hides and skins collected
P = Price per hide or skin

Table 6: Losses incurred due to Non Collection of Hides and Skins

Country	Slaughter rates (mlns)			Hides and skins entering the value chain			Estimated losses in US$ millions			Recovery rate of hides and Skins (%)		
	Cattle	Sheep	Goats	Cattle	Sheep	Goats	Cattle	Sheep	Goats	Cattle	Sheep	Goats
Burundi	0.050	0.043	0.262									
DRC	0.070	0.280	1.600									
Djibouti	0.060	0.210	0.190									
Egypt	1.441	2.305	2.615									
Eritrea	0.238	0.643	0.705									
Ethiopia	3.783	8.500	8.000	1.453	7.820	6.912	46.14	2.18	3.48	38.4	92	86.4
Kenya	3.050	2.900	4.300	2.440	2.755	4.085	12.08	0.46	0.69	80	95	95
Libya	0.045	2.050	0.850									
Madagasc	1.300	0.235	0.651									
Malawi	0.300	0.097	2.925									
Mauritius	0.010	0.002	0.010									

Country	Slaughter rates (mlns)			Hides and skins entering the value chain			Estimated losses in US$ millions			Recovery rate of hides and Skins (%)		
	Cattle	Sheep	Goats	Cattle	Sheep	Goats	Cattle	Sheep	Goats	Cattle	Sheep	Goats
Rwanda	0.335	0.162	0.675									
Sudan(For	2.840	14.50	12.00									
Swaziland	0.070	0.002	0.099									
Uganda	0.865	0.666	2.800	0.779	0.500	2.100	1.71	0.53	2.24	90	75	75
Zambia	0.420	0.006	0.725	0.378	0.005	0.653	0.83	0.00	0.23	90	90	90
Zimbabwe	0.453	0.003	1.080	0.385	0.000	0.011	1.35	0.01	3.42	85	1	1

Source: for population figures, Slaughter Rates and Off-take rate: FAO STAT 2011,

The recovery rates in the region for bovine hide ranges from 38% to 90%. However this is an area requiring further investigation to authenticate the figures.

4.3. Conclusion

The economic losses incurred along the leather value chain are mainly caused by the production of low quality hides and skins, export of raw hides and skins, wet blue and crust. The table below shows a summary of the losses that COMESA member states face by exporting hides in a form, which if processed further would tremendously increase earnings.

CHAPTER V: PROCESSING OF HIDES AND SKINS

5. Introduction

Tanning is the process of transforming hides and skins into wet blue, crust and finished leather. The process involves the use of various types of chemicals, and it is capital intensive. Leather tanning is the process of converting raw hides or skins into leather. Hides and skins have the ability to absorb tannins and other chemical substances that prevent them from decaying, make them resistant to wetting, and maintain their reparability, suppleness and durability. The surface of hides and skins contains the hair and oil glands and is known as the grain side. The flesh side of the hide or skin is much thicker and softer. The three types of hides and skins most often used in leather manufacture are from cattle, sheep, and goats.

The tanning process adds value to the hides and skins at every stage of processing, which thus creates numerous economic opportunities for the upstream and downstream industries and also other materials and chemical suppliers. Figure 2 illustrates the value addition incremental process.

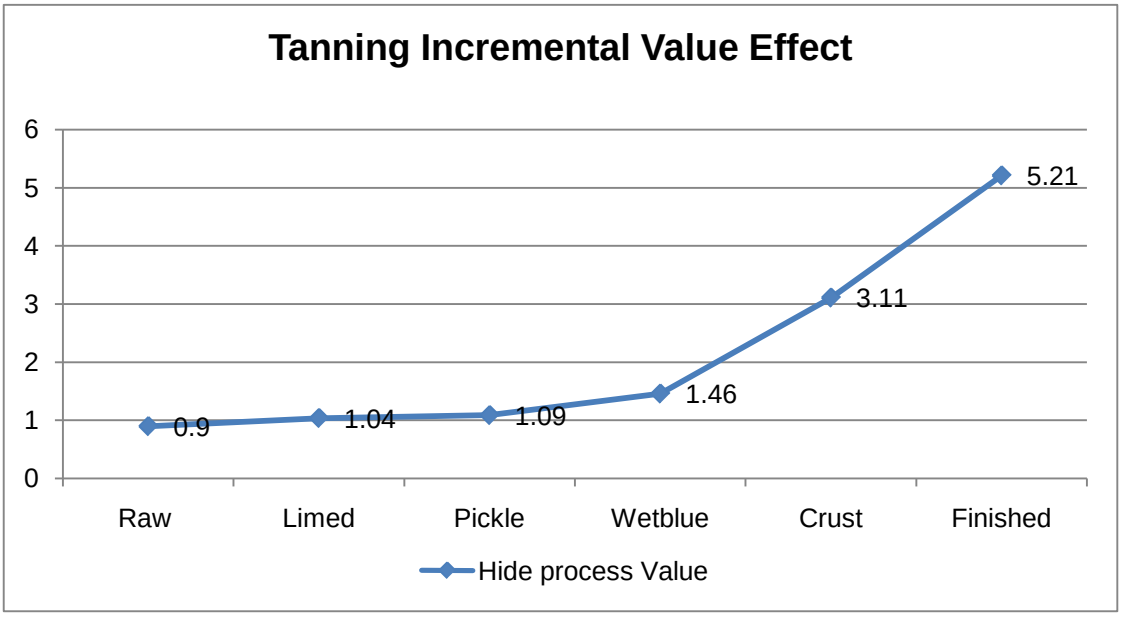


Figure 2: Tanning Incremental Value Effect

5.1. The Flow Diagram of the Tanning Process

The first stage is the preparation for tanning. The second stage is the actual tanning and other chemical treatment. The third stage applies retanning agents and dyes to the material to provide the physical strength and properties desired depending on the end product. This is known as Retanning. The fourth stage is used to apply finishing material to the surface or finish the surface without the application of any chemicals if so desired. This final stage is known as finishing.Figure 3 illustrates in detail the flow diagram of the tanning process.

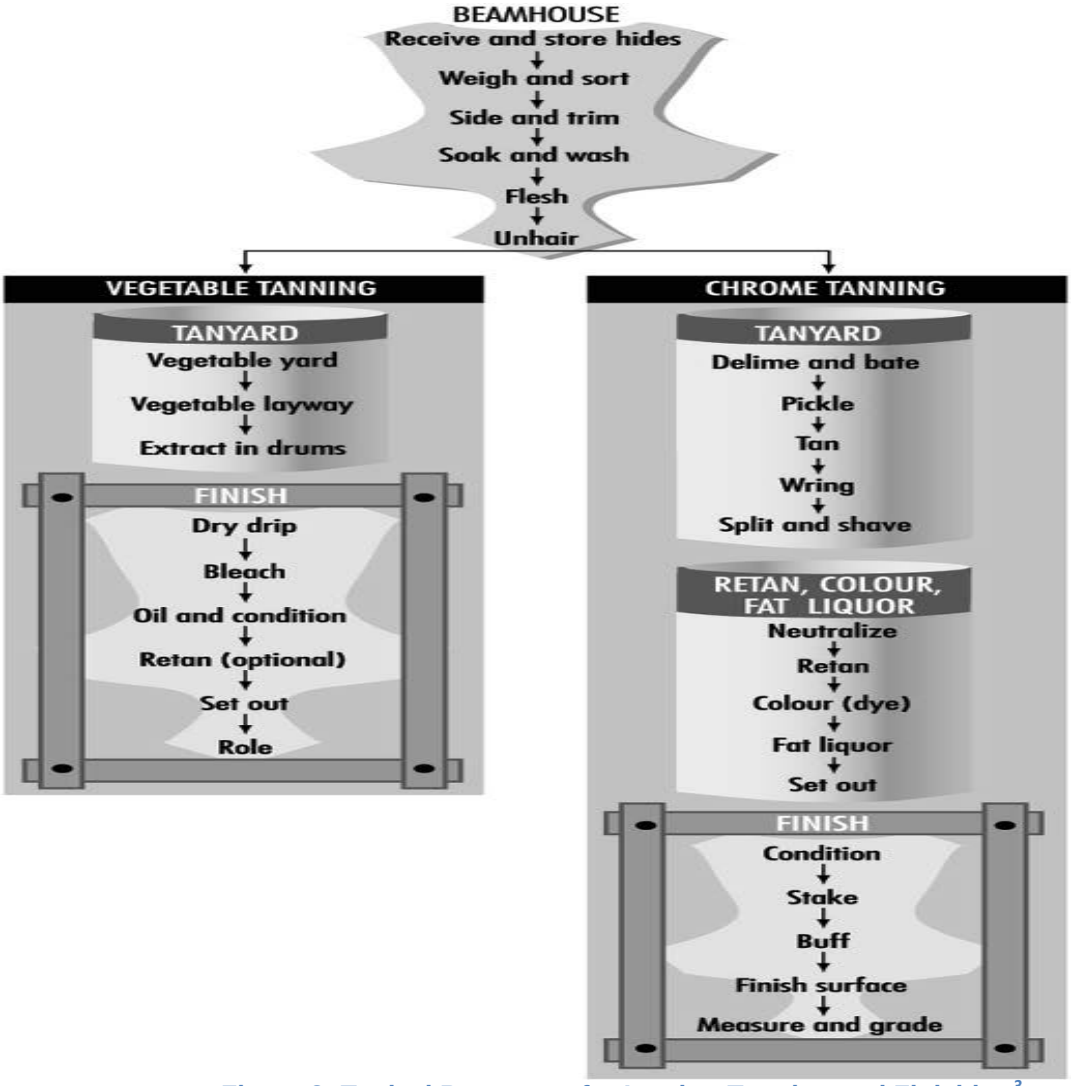


Figure 3: Typical Processes for Leather Tanning and Finishing[3]

5.2. Sorting and selection

Prior to processing, the hides and skins are best put into possible similar groupings based on the following:

- Type – hides separated from skins
- Grade – segregation in terms of quality
- Weight – lights, medium and heavy
- Mode of preservation – Air dried, wet-salted, dry salted, (fresh)

This provides for easy and efficient physical and chemical handling during processing

[3] ILO Encyclopaedia of Occupational Health and Safety (http://www.ilo.org/oshenc/part-xiv/leather-fur-and-footwear/item/872-tanning-and-leather-finishing)

5.3. Beam house Processing

The cured hides and skins are prepared for tanning by several operations, collectively referred to as beamhouse operations. First the hides are sorted, trimmed and then washed in vats or drums. Disinfectants such as bleaching powder, chlorine and sodium acid fluoride in the water prevent putrefaction of hides. Chemicals such as caustic soda, sodium sulphide and surfactants are added to the water to accelerate soaking of dry-salted or dried hides. The beamhouse operations are further elaborated below:

Soaking - Restoration of natural moisture and removal of dirt and curing agents. When the hide or skin is taken off the animal it is generally preserved using a salt-dehydration method. Most of the water in the hide is lost and that reduces bacterial activity in the hide, allowing the hide to be kept in storage for many months. To commence chemical interactions the hide is rehydrated. This is achieved by putting hides into vessels and adding water and small amounts of detergents. Once the hide is supple and soft it is then allowed to proceed to the next operation. Table 7 illustrates the three approaches, which are maybe used in the soaking process, the soaking duration and the dangers associated with each method.

Table 7: Options in the Soaking Process

State of raw material	Pit	Paddle	Drum
Wet-salted			6hrs
Dry salted		2 days	6hrs
Air dried	3 days	2 days	6hrs
Process	Static	Agitation	Motion
Dangers	Skin degradation, Disintegration, kiss marks	High water consumption	High speed too early leads to loose structure

Liming – The object is to remove the hair and open the fibre structure. Hair is removed off the hide using sodium sulphide in an alkali medium. The process breaks down the hair follicle allowing the hair to pull out of the hide and dissolve in the alkali medium. The process is associated with the following issues:

- Liming process releases heavy toxics into the environment
- Options: Hair-shave, less sulphide dosage, recycling, alternative chemicals, enzyme unhairing

The hide is now identified as the limed pelt. To avoid lime blast the pelt is kept under water or properly covered with plastic sheeting.

Fleshing - The pelt is fleshed to remove excess flesh and fats in preparation for improved penetration and absorption of subsequent tanning chemicals.

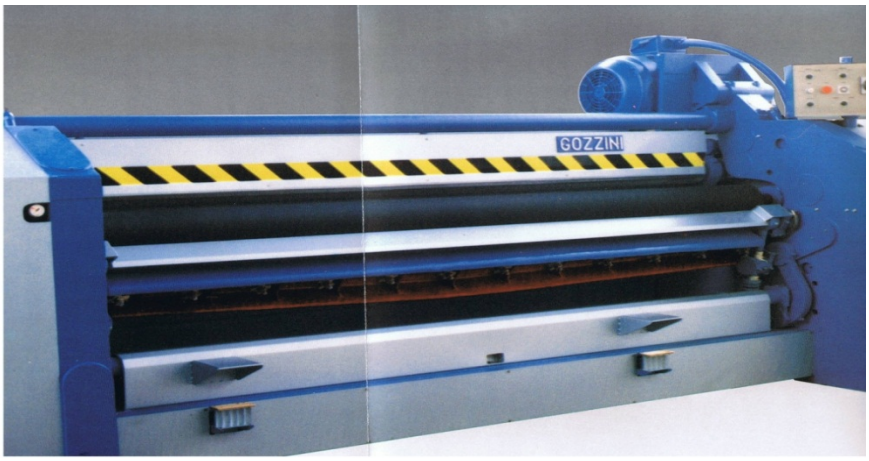


Figure 4: Fleshing Machine

Lime Splitting - This stage of process requires higher competence, and machinery must be well maintained. The main objective for this stage is to achieve the following:

- Prepares the limed pelt for efficient penetration and absorption of chemicals in subsequent processes
- Resultant two or more layers offers optional tannage or trade route

5.4. Tan yard

The tan yard encompasses several stages, which are elaborated in this section in summary. Various substances may be used for tanning, but the main distinction is between vegetable and chrome tanning.

Deliming–Lowering of the alkalinity of the fleshed limed pelt using weak acids from approximately pH 14 to about 8 in preparation for bating.

- **Bating** – Enzymatic removal of non-structured collagen and other proteins. Has a profound effect on the opening of the resultant leather. Bating is sensitive to pH, temperature and time.

- **Pickling** – The objective is to prepare the delimed pelt for tannage by creating an acid environment that allows the penetration of tanning materials.

It is worth to note that pickled pelt can be exported or traded offering clients different kinds of tanning. The common methods of tanning are briefly elaborated below:

- Mineral tannage is:
    - Cr^{3+}(Trivalent chrome) widely used
        - Bluish-green in colour
        - Shrinkage temperature of 95-100^{o}C (Boil test)
        - Non filing - produces relatively empty leathers

- Ferric, aluminium, titanium, zirconium can also be used

- Vegetable tannage - extracts used from polyphenolic compounds of
    - leaves
    - wood
    - bark
    - fruit
    - roots
  - Shrinkage temperature of 70^{o}C
  - Fuller heavier leathers for sole, belting, harness
  - Good embossing properties

- Wet-white
  - Organic tannage
  - Metal free tannage
  - Environmentally accepted
  - Favoured by the automotive industry

  - Combination
  - Oil

Ageing – Tanned leather is piled or horsed overnight to give chance to cross-linking and fixation of tanning bonds.

Sammying–Removal of unbound water in preparation of next mechanical action (splitting and shaving) or grading and packaging for sale. The wetblue leather is sammyed with an option to sort for marketing or further processing.

Siding – Where the shaving and splitting machines are not whole-hide wide, the hides are cut down the backbone from neck to tail into two sides

Sorting/selection – The hides and skins are graded to their potential quality or against a defined quality specification (order demand)

Splitting-Cutting the leather into two or more layers to predetermined thickness (based on the finished leather substance)

Shaving – Smoothening/levelling of the split thickness taking note of the customer specification giving allowance for loss or gain in subsequent operations like retan, plating, buffing etc

Trimming – Economic removal of ragged folded edges to maintain credible shape and facilitate easy and safe machine handling. Important to be done as and when it is necessary. Recommended to be cautious and control extent of trimming to avoid excessive decimation of revenue. To be done by experienced operators whose results are to be continually monitored.

5.5. The Relationship between the Cost of Tanning and Hides and Skins Grades

The cost of tanning a kilogram of hides and skins increases with the declining in the hides and skins processed. For example it cost a US$8 and US$16 to tan grades I and VI respectively. Table 8 illustrates the tanning cost for all hides and skins grades.

Table 8: The Relationship between the cost of tanning and Hides and Skins Grades

Tanning Cost On Grade						
Grade	I	II	III	IV	V	VI
Tanning Cost kg raw	$8	$10	$11	$13	$16	>$16
% Yield	90-100	80-90	70-80	60-70	50-60	<50

5.6. Retanning and Crusting

After tanning, most leathers except sole leathers, undergo colouring (dyeing). Generally, colouring is performed in a batch mode; and re-tanning, colouring and fat liquoring operations are all performed in sequence in the same drum with intermediate steps of washing and drying. Three major types of dyes are used: acid, basic and direct. Blends of dyes are used in order to obtain the exact shade desired, so the composition is not always known except by the supplier. The purpose of fat-liquoring is to lubricate leather to give it strength and flexibility. Oils, natural fats, their transformation products, mineral oils and several synthetic fats are used. The various processes under retanning are further elaborated below:

Neutralisation- pH adjustment of the chrome leather in preparation for the application and penetration of anionic tanning materials, fatliquors and dyes. Depth and extent of neutralisation determine how far the syntans, dyes and fatliquors penetrate the chrome leather and influence the character of the resultant crust leather

Filling – The selection and application of

- Synthetic organic tanning compounds
- Vegetable tannins
- Resins
- Mineral tanning agents

To modify the leather character desired by customers include:

- Tightness and break
- Buffing
- Embossing
- Water repellence / proofness

Fatliquoring – Application of fat and oil emulsions in the Retanning bath or new float to soften and lubricate the leather to achieve the desired feel.

- This operation is temperature and pH sensitive
- Care should be taken to keep the emulsion stable least it splits and grease the leather surface

Dyeing – Giving colour to the leather as per customer specification. Anionic and cationic dyestuffs and liquid dyes are employed. Care should be taken to meet light and wash fastness of the resultant colour as required by the client.

Fixing – The dyes, fatliquors and syntans are fixed to the leather by application of a weak acid thus lowering its isoelectric pH and raising its cationic nature.

Ageing – The retanned leather is horsed or piled overnight to encourage further fixing of the anionics to the leather.

5.7. Drying – Reducing the water content in the leather to about 14%

Setting out – Squeezing out excess water either by machine or by hand slicking leaving the leather stretched flat.

Vacuum drying – set out leather is spread on a hot table (75^{o}C) and a partial vacuum (1 bar) is created allowing the water to evaporate from the leather at a lower temperature and under suction.

Vacuum drying

Hang dry – Set out and also vacuum dried leather is hung in drying rooms or tunnels either stationery or in motion on rail – air drying. There is possibility of area loss, however, the resultant leather is soft with a round feel, a preferable characteristic of garment leather.

Toggle dry – Drying leather under tension on perforated frames holding it in place with toggle pins. Used for sensitive leathers like upholstery and lining.

Sun dry – Leather is spread outside on dust-free surfaces. Sunlight sensitive dyes and fats tend to alter the colour of the leather.

Conditioning – Uniform restoration of moisture in the leather to about 20% achieved by spraying water on the flesh side and piling it overnight under plastic or canvas cover.

Toggle – short term tension application on the leather to regain area and flat-set it ready for finish application.

Staking – Mechanical softening of leather. Care is needed to set the machine and avoid excessive mulling of the fibres that can lead to tear, cracks and or loose grain.

Crust sorting- Dried conditioned leather is checked for, among others

- Firmness
- Colour
- Substance
- Surface blemishes
- Break

Buffing – Production of desired nap or correcting surface defects such as scratches by using an abrasive paper wrapped on a revolving cylinder. Skilled selection of buffing paper and operation of the well maintained buffing machine are a pre-requisite.

5.8. Finishing

After drying, vegetable tanned leather is subjected to mechanical operations (setting and rolling) and given a final polish. The finishing process for chrome leather includes a series of mechanical operations and, normally, the application of a covering layer to the leather surface. Staking is a mechanical beating operation used to make the leather soft. To improve the final appearance, the grain side of the leather is buffed using a sanding drum. This process generates a tremendous amount of dust.

A final surface finish is applied, which may contain solvents, plasticizers, binders and pigments. These solutions are applied by pads, flow coating or spraying. Some tanneries employ hand labour to apply the finish using pads, but this is usually carried out by machines. In flow coating, the solution is pumped into a reservoir above the conveyor carrying the leather and flows down onto it. In most cases, painted or sprayed leathers are not dried in ovens, but on trays on shelves. This practice provides a wide evaporating surface and contributes to air pollution. The sub processes of this stage are elaborated briefly below:

Finish Application – The viscosity, volume and effect of the finish determines the suitability of machinery application. The following are the finish application methods:

- Rollercoating – application of finish using roller transfer system. Different rollers with varying size of groove designs deliver continuous pigment film mixes to the leather surface.
- Padding – Handmade pads covered with absorbent cloth are used to transfer finish mixes from holding troughs to the leather surface by brush strokes.
- Curtain coater – Machine created weir of finish resin under which leather is passed and drenched wet by the curtain. Heavy deposit of finish per square foot.
- Spraying – Application of finish by spray guns. Mainly used for intermediate and top coats.

Impregnation – Application by curtain coater, roller machine or airless spray of suitable resins to leather to hold looser structures of leather and avoid loose grain making it tighter and firmer.

Stucco – New trend in finishing that bears innovation in uplifting the poor leather grades due to scratches from those that emanate from extensive livestock management systems. Uses specially formulated resins to fill the scratches by hand or roller coat or combination of both.

Basecoat – The bottom coat of finish that anchors the whole finish and bears characteristics to the adhesion of the finished leather.

Pigment coat – The intermediate coat(s) provides the covering colour to the leather. Colour matching is determined by the customer.

Intermediate coat – Special coat that carries crosslinking auxiliaries to affix the top coat to the colour coats.

Topcoat–The protective film of the leather with special additives to determine its aesthetic appeal of final presentation and handle

The type of finish applicable to a leather is dependent on the quality of the crust as illustrated in the Table 9.

Table 9: The Relationship between Grain Damage and the Type of Finish

Grade	Grain Damage Extent	Type of finishing
I	< 10%	Transparent (Aniline) finish
II	10-30%	Semi aniline
III	30-50%	Full cover pigment
IV	>50%	Corrected embossed
V		Suede Split finish
VI	No leather use	Fallen heroes gelatin

Lower grades (III,IV,V) demand more coats (higher chemical consumption per unit area)than higher grades (I,II) as illustrated in the Table 10. It is thus imperative to note that production of poor quality hides and skins raises the cost of finishing leather taning process.

Table 10: The Relationship between the Hides Grade and Amount of Pigment Used

COATS	Impregnation	Filler	Base coat	Base coat	Base coat	Base coat	Pigment	Aniline	Top
I									6g/sqft
II								8g/sqft	
III						10g/sqft	8g/sqft		
IV	24g/sqft	8g/sqft	15g/sqft	12g/sft	10g/sft				
V									

Drying– In-between coats the leather is sent in for drying through drying tunnels or hanged on sticks or hangers in motion.

Plating and embossing – Hot plating encourages plasticising flow and adhesion of finish coats. Embossing also facilitates the meeting of specific designs as per customer specification.

Milling–Running leathers in drums without float. The mechanical heat and friction causes leather to break and relax creating a softer feel. Garment, upholstery and softee upper leathers are best handled this way.

Trimming – This stage of trimming is final, making leather presentable to the client. All precautions observed to avoid excessive decimation of area of leather.

Grading – Quality checks against specifications spelled by the customer among others

- Colour
- Substance
- Break
- Blemishes

Measuring – The hides and skins are bought per graded piece or kg but finished graded leather is sold per area with the exception of some vegetable tanned leathers like sole, kips. Electronic measuring equipment is available and appreciated as it can stamp valuable traceable product reference codes. However traditional methods and equipment still play a major role especially under SMEs.

5.9. Packaging –A very sensitive stage as it can destroy all the effort.

Packaging of finished leather should be undertaken with care, as poor packaging may destroy or damage the leather. Illustrations of the packaging of different types of leather are summarized in Table 11.

Table 11: Packaging Requirements for Different Types of Leather

Product	Packaging Requirements
Finished leather	• Leather is rolled grain outside to maintain the break. • Leather is piled grain to grain on pallets. • Individual leathers are allowed to breathe as moisture can ruin the finish.
Pickle pelt	• Packaged in acid resistant materials • Kept away from direct heat and sunlight (under shed) as even under low temperatures and direct sunlight, pickle pelt can gelatinise
Wetblue	• Folded • Stacked on pallets • Strapped • Sealed under plastic sheeting to avoid moisture loss
Crust	• Rolled bundles • Packed in plastic bags

5.10. Tannery Waste Management

The leather production process generates solid, liquid and gaseous waste, which may have negative impact to the environment. It is therefore imperative that the emission of such waste should be managed in a systematic way that lessens its negative impact. Some of the waste materials generated in the tanning process are as follows:

- Lime
- Chrome shaved waste

- Process waste scraps from chrome tanned hides e.g. shavings, buffing and trimming should not be burnt for the fear of hexavalent formation through oxidation of trivalent chrome

- Buffed waste
- Trimmings

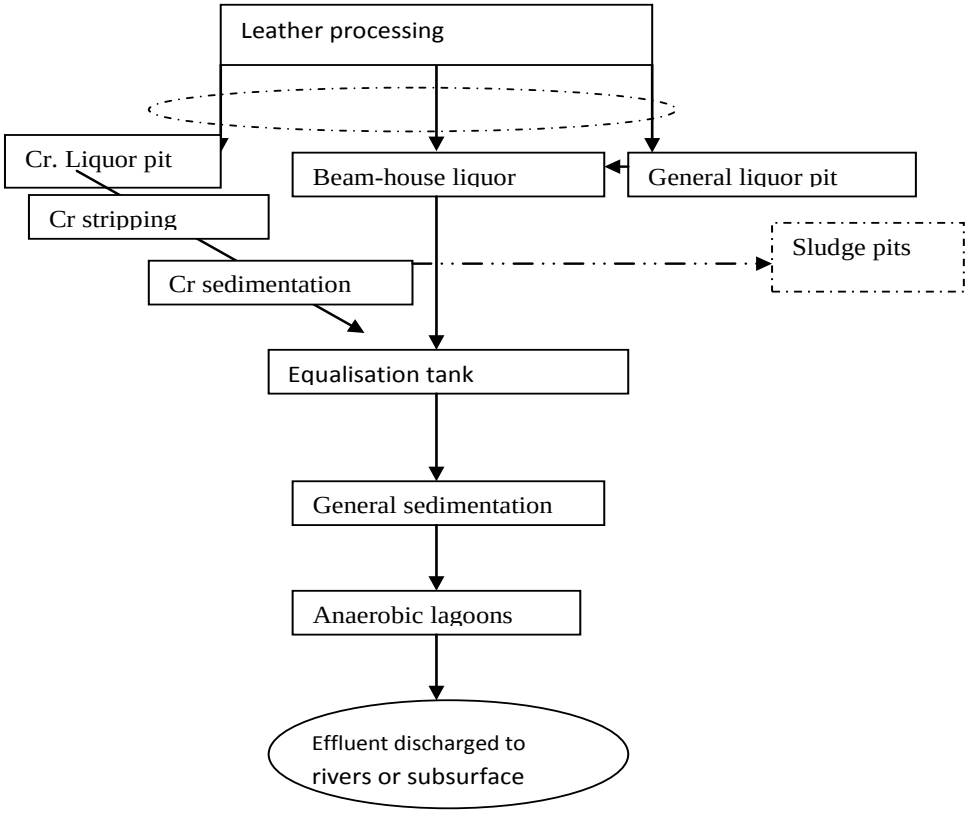


Figure 5 summarises the waste management process of the tannery waste.

5.11. By-products from the Tanning Process

A by-product is a secondary product derived from a manufacturing process or chemical reaction. It is not the primary product or service being produced. In the context of production a by-product can be defined as the 'output from a joint production process that is minor in quantity and/or net realizable value (NRV) when compared to the main products'[4] Because they are deemed to have no influence on reported financial results, by-products do not receive allocations of joint costs. By-products, also by convention are not inventoried, but the NRV from by-products is typically recognized as 'other income' or as a reduction of joint production processing costs when the by-product is produced[5]. A by-product can be useful and marketable or it can be considered waste. The leather production process generates waste, which can be used to produce high value added products such as gelatin, fertilizers and leather boards

[4] Wouters, Mark; Selto, Frank H.; Hilton, Ronald W.; Maher, Michael W. (2012): *Cost Management: Strategies for Business Decisions*, International Edition, McGraw-Hill, p. 535
[5] World Trade Organization (2004): *United States - Final dumping determination on softwood lumber from Canada*, WT/DS264/AB/R, 11 August 2004

among others. A summary of some of the products, which can be produced from tannery waste are elaborated below.

Gelatine is a translucent, colourless, flavourless, solid substance (brittle when dry) derived from collagen obtained from bovine hides and skins. The production process of gelatin entails the following stages: rejects hides not suitable for leather production, head masks and trimmings before tannage make the bulk source of gelatine related to leather industry's waste products; it is obtained by boiling bovine hides and skins trimmings with water after alkali pre-treatment to remove hair and inter-fibrilmucor proteins. Some of the uses of gelatin are:

- Gelatine is used in the food industry as an emulsifier and stabiliser in foods such as jellied meats, soups, candies, moulded desserts, ice cream, marshmallows and mixtures of oils or fats with water.

- Gelatine is used in pharmaceutical products such as capsules, cosmetics, ointments, lozenges and plasma products

Leather boards: Leather waste such as shavings, trimmings and off-cuts is shredded and ground into fine powder, stirred and mixed into a special adhesive to form a leather paste. The general production process includes the following stages:

- The paste is poured into moulds and hydraulic pressed to squeeze out excess adhesive.
- The solid sheets are dried
- The sheets are rolled smooth. The surface is coated with special finishes to impart colour and fastness properties like water repellence

The sheets are used in fabrication of ceiling; partitioning; car boards; footwear and leather goods components. Figure 6 shows the wet blue shavings, which are normally used in the production of the boards.

Figure 5: Wet-blue of Wet blue Shavings

5.12. Conclusion

CHAPTER VI: ECONOMIC IMPACT OF LOW OR NO VALUE ADDITION

6. Introduction

The export of raw hides, wet blue and crust entails forgone opportunities with regard to value addition, which could have been attained in the region. Put simply the export of raw hides means the exportation of jobs, foreign currency earning opportunities and other indirect benefits, which could have been generated in the economy such as increased consumption of water, electricity, transport and other industry support services. In this Chapter only direct losses are computed, as the partial equilibrium approach was used, and does not take into account the indirect and other feedback outcomes.

6.1. Loss from export of raw hides instead of wet-blue

Most of the countries in the COMESA region export all or a significant proportion of their hides and skins in raw state to Europe, India and the Far East. In recent years, however a number of countries have come up with a draft of policies to discourage the export of raw hides and skins. These policy instruments range from outright bans, for example in Zambia to moderate and punitive taxes. Uganda, Kenya and Zimbabwe operate similar export tax regime, which are based on specific duty rates, whereas Ethiopia applies a punitive ad valorem tax of 150% on the export of raw hides and skins. The countries, which are using a specific duty method, were motivated by the need to mitigate against the possibilities of transfer pricing of hides and skins by enterprises, which have the potential of making ad valorem taxation ineffective. The success in the implementation of these policies is mixed, however one aspect that stands out is that these policies can only be successful if they are supported by efficient institutions, and other policies to support the national tanning capacities.

The estimates of the losses incurred due to the export of raw hides is based on the following formulation, Equation 3

$L_{RH} = (0.8 * RH_w)*P_{wb} – (RH_w *P_{RH})$ (Equation 3)
Where:

- L_{RH} is the loss to the economy when Raw hides are exported instead of wet-blue
- 0.8 is the conversion ratio, from raw hide to wet-blue in terms of weight (kgs)
- $(0.8* RH_w)$ wet blue by weight
- RH_w is the raw hide by weight
- P_{wb} price of wet-blue per kg
- P_{RH} price of raw hide per kg

The export of bovine raw hides and skins instead of wet blue, resulted in the region losing approximately US$ 76 million dollars in total across all the hides and skins grades. The highest loss was incurred in the export of third grade hides and skins amounting to US$ 25 million and the least loss was incurred in the export of fifth grade hides and skins at US$ 5 million. The average loss per country stood at US$ 5 million with a standard division of US$ 6.8 million implying that these losses are not evenly spread across the Member States. Sudan, Kenya, Ethiopia and Egypt recorded the highest losses, with the lowest loser in this group recording a loss of US$ 12.6 million. There is a positive correlation between the number of livestock or hides and skins produced and the amount of losses incurred. This implies that regional project aimed at tannery modernization should focus on principle losing countries, as the multiplier effect from

such an intervention would generate magnified positive impact regionally with regard to employment creation, industrialization and intra trade. For details see Table 12:

Table 12: Loss incurred when exporting raw bovine hides vs. wet blue (US$)

Countries	Proportion of Losses by Grade					Total Loss
	I	II	III	IV	V	
Burundi	(38,920)	(103,787)	(118,613)	(64,867)	(24,093)	(350,280)
DRC	(42,812)	(114,165)	(130,475)	(71,353)	(26,503)	(385,308)
Egypt	(1,502,312)	(4,006,165)	(4,578,475)	(2,503,853)	(930,003)	(13,520,808)
Eritrea	(70,056)	(186,816)	(213,504)	(116,760)	(43,368)	(630,504)
Ethiopia	(2,262,920)	(3,017,227)	(3,017,227)	(2,514,356)	(1,885,767)	(12,697,497)
Kenya	(1,270,460)	(4,517,191)	(5,081,840)	(4,234,867)	(846,973)	(15,951,331)
Libya	(19,460)	(51,893)	(59,307)	(32,433)	(12,047)	(175,140)
Madagascar	(572,124)	(1,525,664)	(1,743,616)	(953,540)	(354,172)	(5,149,116)
Malawi	(77,840)	(207,573)	(237,227)	(129,733)	(48,187)	(700,560)
Mauritius	(3,892)	(10,379)	(11,861)	(6,487)	(2,409)	(35,028)
Rwanda	(116,760)	(311,360)	(355,840)	(194,600)	(72,280)	(1,050,840)
Sudan	(1,872,052)	(4,992,139)	(5,705,301)	(3,120,087)	(1,158,889)	(16,848,468)
Uganda	(628,280)	(1,675,413)	(1,256,560)	(523,567)	(209,427)	(4,293,247)
Zambia	(166,800)	(593,067)	(889,600)	(370,667)	(111,200)	(2,131,334)
Zimbabwe	(325,260)	(1,156,480)	(1,734,720)	(722,800)	(216,840)	(2,131,334)
Total	**(8,969,948)**	**(22,469,319)**	**(25,134,166)**	**(15,559,970)**	**(5,942,158)**	**(76,050,795)**

Source: Computations based on FAO data

The export raw sheep skins instead of wet blue, resulted in the COMESA region incurring losses amounting to US$ 47 million, with the second grade posting the highest losses of US$ 14.6 million and the fifth grade recording the least loss of US$ 5.9 million. The average loss per country is US$ 4.3 million, with a standard deviation of US$ 6.2 million reflection a very wide dispersion of the losses. These losses are only concentrated in two countries namely Ethiopia and Sudan, who are contributing approximately 70% of the losses, which the region is incurring. For details see Table 1.

Table 13: Loss incurred when exporting raw sheep skins vs. wet blue (US$)

Countries	Proportion of Losses by Grade				Total Loss
	I	II	III	IV	
Egypt	(809,200.00)	(964,750.00)	(952,000.00)	(388,960.00)	(3,114,910.00)
Eritrea	(285,600.00)	(340,500.00)	(336,000.00)	(137,280.00)	(1,099,380.00)
Ethiopia	(4,141,200.00)	(4,937,250.00)	(4,872,000.00)	(1,990,560.00)	(15,941,010.00)
Kenya	(1,237,600.00)	(1,475,500.00)	(1,456,000.00)	(594,880.00)	(4,763,980.00)
Libya	(904,400.00)	(1,078,250.00)	(1,064,000.00)	(434,720.00)	(3,481,370.00)
Madagascar	(95,200.00)	(113,500.00)	(112,000.00)	(45,760.00)	(366,460.00)
Malawi	(47,600.00)	(56,750.00)	(56,000.00)	(22,880.00)	(183,230.00)
Rwanda	(47,600.00)	(56,750.00)	(56,000.00)	(22,880.00)	(183,230.00)
Sudan	(4,474,400.00)	(5,334,500.00)	(5,264,000.00)	(2,150,720.00)	(17,223,620.00)
Uganda	(190,400.00)	(227,000.00)	(224,000.00)	(91,520.00)	(732,920.00)
Zambia	(47,600.00)	(56,750.00)	(56,000.00)	(22,880.00)	(183,230.00)
Total	**(12,280,800.00)**	**(14,641,500.00)**	**(14,448,000.00)**	**(5,903,040.00)**	**(47,273,340.00)**

Source: Computations based on FAO data

Export of raw goat skins instead of wet blue, saw the COMESA region losing US$ 60.8 million, with the second and third grade contributing around US$18 million apiece. The fifth grade scored the least loss of US$ 7.6 million. The average loss per country is US$ 3.2 million, with a standard deviation of US$ 6.4 million reflecting a very wide dispersion of the losses. These losses are only concentrated in two countries namely Ethiopia and Sudan, who are contributing approximately 60% of the losses, which the region is incurring. For details see Table 14.

Table 14: Loss incurred when exporting raw goat skins vs. wet blue (US$)

Countries	Proportion of Losses by Grade				Total Loss
	I	II	III	IV	
Burundi	(247,860.00)	(294,000.00)	(291,840.00)	(118,560.00)	-952,260.00
DRC	(660,960.00)	(784,000.00)	(778,240.00)	(316,160.00)	-2,539,360.00
Egypt	(413,100.00)	(490,000.00)	(486,400.00)	(197,600.00)	-1,587,100.00
Eritrea	(289,170.00)	(343,000.00)	(340,480.00)	(138,320.00)	-1,110,970.00
Ethiopia	(3,346,110.00)	(3,969,000.00)	(3,939,840.00)	(1,600,560.00)	-12,855,510.00
Kenya	(1,611,090.00)	(1,911,000.00)	(1,896,960.00)	(770,640.00)	-6,189,690.00
Libya	(206,550.00)	(245,000.00)	(243,200.00)	(98,800.00)	-793,550.00
Madagascar	(165,240.00)	(196,000.00)	(194,560.00)	(79,040.00)	-634,840.00
Malawi	(826,200.00)	(980,000.00)	(972,800.00)	(395,200.00)	-3,174,200.00
Rwanda	(206,550.00)	(245,000.00)	(243,200.00)	(98,800.00)	-793,550.00
Sudan	(6,196,500.00)	(7,350,000.00)	(7,296,000.00)	(2,964,000.00)	-23,806,500.00
Uganda	(991,440.00)	(1,176,000.00)	(1,167,360.00)	(474,240.00)	-3,809,040.00
Zambia	(247,860.00)	(294,000.00)	(291,840.00)	(118,560.00)	-952,260.00
Zimbabwe	(413,100.00)	(490,000.00)	(486,400.00)	(197,600.00)	-1,587,100.00
Total	**-15,821,730.00**	**-18,767,000.00**	**-18,629,120.00**	**-7,568,080.00**	**-60,785,930.00**

Source: Computations based on FAO data

6.2. Exports of Wet-blue Instead of Crust

Most tanneries, which were established more than 40 years ago in the COMESA region have been stuck in the production of wet blue. This has been attributed to a number of factors ranging from policy, inadequate capaital, technology and skills and also the assertation that Africa's market for finished leather is still in its infancy. The last factor is also linked to the argument that the leather industry is a fashion industry, in which the colour, texture and specs of leather required change rapidly globally, and African enterprises, cannot match with that kind of dynamics.

In this section we estimate the amount of lost value, which the COMESA region has incurred because of exporting crust instead of finished leather. This process is based on the mathematical formulation given as Equation 4 and also supported by expert knowledge drawn from experts who are currently operating in the given countries.

$$L_{WB} = (2.07 * WB_w)*P_C – (WB_w *P_{WB}) \qquad \text{(Equation 4)}$$

- L_{WB} is the loss to the economy when wet-blue hides are exported instead of crust
- 2.07 is the conversion ratio, from wet-blue per kilo to crust in square feet
- $(2.07 * WB_w)$ crust in square feet
- RH_w is the raw hide by weight
- P_c price per square foot of crust
- P_{wb} price of wet-blue per kg

The export of bovine wet blue instead of crust, resulted in the region losing approximately US$ 231 million dollars in total across all the hides and skins grades. The highest loss was incurred in the export of second grade hides and skins amounting to US$ 72 million and the least loss was incurred in the export of fifith grade hides and skins at US$ 17 million. The average loss per country stood at US$ 15 million with a standard diviotion of US$ 18 million implying that these losses are not evenly spread across the Member States. Sudan, Kenya, Ethiopia and Egypt recorded the highest losses, with the lowest loser in this group recording a loss of US$ 37.6 million. Cumulatively the four countries contribute 75% to the loss incurred in the export of wet blue instead of crust. There is a positive correlation between the number of livestock or hides and skins produced and the amount of losses incurred. This implies that regional project aimed tannery modernization should focus on principle losing countries, as the multiplier effect from such an intervention would generate magnified positive impact regionally with regard to employment creation, industrialization and intra trade. For details see Table 15:

Table 15: Loss incurred when exporting bovine wet blue vs crust (US$)

Countries	Proportion of losses according to grades					Total Loss
	I	II	III	IV	V	
Burundi	115,430)	(307,813)	(351,787)	(192,383)	(71,457)	(1,038,870)
DRC	(126,973)	(338,595)	(386,965)	(211,622)	(78,602)	(1,142,757)
Egypt	(4,455,598)	(11,881,595)	(13,578,965)	(7,425,997)	(2,758,227)	(40,100,382)
Eritrea	(207,774)	(554,064)	(633,216)	(346,290)	(128,622)	(1,869,966)
Ethiopia	(6,711,430)	(8,948,573)	(8,948,573)	(7,457,144)	(5,592,858)	(37,658,578)
Kenya	(3,767,965)	(13,397,209)	(15,071,860)	(12,559,883)	(2,511,977)	(47,308,894)
Libya	(57,715)	(153,907)	(175,893)	(96,192)	(35,728)	(519,435)
Madagascar	(1,696,821)	(4,524,856)	(5,171,264)	(2,828,035)	(1,050,413)	(15,271,389)
Malawi	(230,860)	(615,627)	(703,573)	(384,767)	(142,913)	(2,077,740)
Mauritius	(11,543)	(30,781)	(35,179)	(19,238)	(7,146)	(103,887)
Rwanda	(346,290)	(923,440)	(1,055,360)	(577,150)	(214,370)	(3,116,610)
Sudan	(5,552,183)	(14,805,821)	(16,920,939)	(9,253,638)	(3,437,066)	(49,969,647)
Uganda	(1,863,370)	(4,968,987)	(3,726,740)	(1,552,808)	(621,123)	(12,733,028)
Zambia	(494,700)	(1,758,933)	(2,638,400)	(1,099,333)	(329,800)	(6,321,166)
Zimbabwe	(964,665)	(3,429,920)	(5,144,880)	(2,143,700)	(643,110)	(12,326,275)
Total	**(26,603,317)**	**(66,640,121)**	**(74,543,594)**	**(46,148,180)**	**(17,623,412)**	**(231,558,624)**

Source: Computations based on FAO data

The export of wet blue instead of crust, resulted in the COMESA region incurring losses amounting to US$ 68.9 million, with the second grade posting the highest losses of US$ 21.4 million and the fifth grade recording the least loss of US$ 8.4 million. The average loss per country is US$ 6.2 million, with a standard deviation of US$ 9.2 million reflecting a very wide dispersion of the losses. These losses are only concentrated in two countries namely Ethiopia and Sudan, who are contributing approximately 70% of the losses, which the region is incurring. For details see Table 16.

Table 16: Loss incurred when exporting wet blue vs crust (US$)

Countries	Proportion of losses according to grades				Total Loss
	I	II	III	IV	
Egypt	(1,179,120.00)	(1,409,300.00)	(1,402,432.00)	(555,152.00)	(4,546,004.00)
Eritrea	(416,160.00)	(497,400.00)	(494,976.00)	(195,936.00)	(1,604,472.00)
Ethiopia	(6,034,320.00)	(7,212,300.00)	(7,177,152.00)	(2,841,072.00)	(23,264,844.00)
Kenya	(1,803,360.00)	(2,155,400.00)	(2,144,896.00)	(849,056.00)	(6,952,712.00)
Libya	(1,317,840.00)	(1,575,100.00)	(1,567,424.00)	(620,464.00)	(5,080,828.00)
Madagascar	(138,720.00)	(165,800.00)	(164,992.00)	(65,312.00)	(534,824.00)
Malawi	(69,360.00)	(82,900.00)	(82,496.00)	(32,656.00)	(267,412.00)
Rwanda	(69,360.00)	(82,900.00)	(82,496.00)	(32,656.00)	(267,412.00)
Sudan	(6,519,840.00)	(7,792,600.00)	(7,754,624.00)	(3,069,664.00)	(25,136,728.00)
Uganda	(277,440.00)	(331,600.00)	(329,984.00)	(130,624.00)	(1,069,648.00)
Zambia	(69,360.00)	(82,900.00)	(82,496.00)	(32,656.00)	(267,412.00)
Total	**(17,894,880.00)**	**(21,388,200.00)**	**(21,283,968.00)**	**(8,425,248.00)**	**(68,992,296.00)**

Source: Computations based on FAO data

Export of wet blue instead of crust, saw the COMESA region losing US$ 46.8 million, with the second and third grade contributing around US$ 14 million apiece. The fourth grade scored the least loss of US$ 5.9 million. The average loss per country is US$ 3.3 million, with a standard deviation of US$ 5.9 million reflection a very wide dispersion of the losses. These losses are only concentrated in two countries namely Ethiopia and Sudan, who are contributing approximately 60% of the losses, which the region is incurring. For details see Table 17.

Table 17: Loss incurred when exporting wet blue vs crust (US$)

Countries	Proportion of losses according to grades				Total Loss
	I	II	III	IV	
Burundi	(190,740.00)	(225,000.00)	(226,560.00)	(92,040.00)	(734,340.00)
DRC	(508,640.00)	(600,000.00)	(604,160.00)	(245,440.00)	(1,958,240.00)
Egypt	(317,900.00)	(375,000.00)	(377,600.00)	(153,400.00)	(1,223,900.00)
Eritrea	(222,530.00)	(262,500.00)	(264,320.00)	(107,380.00)	(856,730.00)
Ethiopia	(2,574,990.00)	(3,037,500.00)	(3,058,560.00)	(1,242,540.00)	(9,913,590.00)
Kenya	(1,239,810.00)	(1,462,500.00)	(1,472,640.00)	(598,260.00)	(4,773,210.00)
Libya	(158,950.00)	(187,500.00)	(188,800.00)	(76,700.00)	(611,950.00)
Madagascar	(127,160.00)	(150,000.00)	(151,040.00)	(61,360.00)	(489,560.00)
Malawi	(635,800.00)	(750,000.00)	(755,200.00)	(306,800.00)	(2,447,800.00)
Rwanda	(158,950.00)	(187,500.00)	(188,800.00)	(76,700.00)	(611,950.00)
Sudan	(4,768,500.00)	(5,625,000.00)	(5,664,000.00)	(2,301,000.00)	(18,358,500.00)
Uganda	(762,960.00)	(900,000.00)	(906,240.00)	(368,160.00)	(2,937,360.00)
Zambia	(190,740.00)	(225,000.00)	(226,560.00)	(92,040.00)	(734,340.00)
Zimbabwe	(317,900.00)	(375,000.00)	(377,600.00)	(153,400.00)	(1,223,900.00)
Total	**(12,175,570.00)**	**(14,362,500.00)**	**(14,462,080.00)**	**(5,875,220.00)**	**(46,875,370.00)**

Source: Computations based on FAO data

6.3. Losses Ensuing from the Export of Crust Leather instead of Finished Leather

The plethora of factors alluded to above has created a conviction in the region among enterprises, and this has been reinforced by international experts, who proxy the market of interests of global tanning houses that Africa, can never break into the fast and dynamic industry of producing finished leather. This scenario has thus discouraged policy makers to come up with policies and financial support to reinforce the value addition process beyond the production of wet blue. Enterprises have also responded by not investing in technology and human skills development to move up the value chain. It should be noted also that the tanning industry is capital intensive, the issue of knowledge is of paramount importance in leather tanning, especially finishing. There is great body of evidence, which shows that countries which have embraced hardware and software technology have greatly advanced in producing high quality finished leather using wet blue produced in Africa, from hides and skins, which have been branded to be of poor quality by international markets. Ethiopia has come up with policies to discourage the export of intermediate products up to finished leather, this has been complimented by the rapid growth of footwear and leather goods production.

In this section we estimate the amount of lost value, which the COMESA region has incurred because of exporting crust instead of finished leather. This process is based on the mathematical formulation given as Equation 5 and also supported by expert knowledge drawn from Experts who are currently operating in the given countries.

$L_C = (2.17 * C_w)*P_F – (C_w *P_C)$ (Equation 5)

- L_C is the loss to the economy when crust leather is exported instead of finished leather
- 2.17 is the conversion ratio, from crust per square foot to finishd leather in square feet
- $(2.17 * C_w)$ finished leather in square feet
- C_w is the crust leather in square feet
- P_c price of crust per square foot
- P_F price of finished leather per square foot

6.3.1. Bovine Hides and Skins

In the COMESA region, Egypt and Ethiopia are the only two countries that are processing close to 100% of their crust into finished leather, however, the majority is exporting most of their materials in either raw state, wet blue or crust. In this scenario it is assumed that the rest of the countries are exporting crust serve for Egypt and Ethiopia, as the potential loss of exporting raw hides or wet blue were computed in the previous chapters. See details of the potential loss by country and the total in the COMESA region illustrated in Table 18.

Table 18: Estimated Losses for Exporting Bovine Crust Vs Finished Leather (US$)

Countries	Proportion of losses according to grades					Total Loss
	I	II	III	IV	V	
Burundi	(147,210)	(392,560)	(448,640)	(245,350)	(91,130)	(1,324,890)
DRC	(161,931)	(431,816)	(493,504)	(269,885)	(100,243)	(1,457,379)
Egypt	(5,682,306)	(15,152,816)	(17,317,504)	(9,470,510)	(3,517,618)	(51,140,754)
Eritrea	(264,978)	(706,608)	(807,552)	(441,630)	(164,034)	(2,384,802)
Ethiopia	(8,559,210)	(11,412,280)	(11,412,280)	(9,510,233)	(7,132,675)	(48,026,678)
Kenya	(4,805,355)	(17,085,707)	(19,221,420)	(16,017,850)	(3,203,570)	(60,333,902)

Libya	(73,605)	(196,280)	(224,320)	(122,675)	(45,565)	(662,445)
Madagascar	(2,163,987)	(5,770,632)	(6,595,008)	(3,606,645)	(1,339,611)	(19,475,883)
Malawi	(294,420)	(785,120)	(897,280)	(490,700)	(182,260)	(2,649,780)
Mauritius	(14,721)	(39,256)	(44,864)	(24,535)	(9,113)	(132,489)
Rwanda	(441,630)	(1,177,680)	(1,345,920)	(736,050)	(273,390)	(3,974,670)
Sudan	(7,080,801)	(18,882,136)	(21,579,584)	(11,801,335)	(4,383,353)	(63,727,209)
Uganda	(2,376,390)	(6,337,040)	(4,752,780)	(1,980,325)	(792,130)	(16,238,665)
Zambia	(630,900)	(2,243,200)	(3,364,800)	(1,402,000)	(420,600)	(8,061,500)
Zimbabwe	(1,230,255)	(4,374,240)	(6,561,360)	(2,733,900)	(820,170)	(15,719,925)
Total	**(33,927,699)**	**(84,987,371)**	**(95,066,816)**	**(58,853,623)**	**(22,475,462)**	**(295,310,971)**

6.3.2. Export of Sheep Skins Crust Instead of Finished Leather

The assumptions expressed in 6.3.1 holds, and the COMESA region cumulatively is losing approximately US$ 92 million for export of sheep skins in crust instead of finished leather. See Table 19, for the estimated loss per Member States.

Table 19: Estimated Losses for Exporting Sheep Crust Vs Finished Leather (US$)

Countries	Proportion of losses according to grades				Total Loss
	I	II	III	IV	
Egypt	(1,577,940.00)	(1,854,700.00)	(1,845,248.00)	(762,008.00)	(6,039,896.00)
Eritrea	(556,920.00)	(654,600.00)	(651,264.00)	(268,944.00)	(2,131,728.00)
Ethiopia	(8,075,340.00)	(9,491,700.00)	(9,443,328.00)	(3,899,688.00)	(30,910,056.00)
Kenya	(2,413,320.00)	(2,836,600.00)	(2,822,144.00)	(1,165,424.00)	9,237,488.00)
Libya	(1,763,580.00)	(2,072,900.00)	(2,062,336.00)	(851,656.00)	(6,750,472.00)
Madagascar	(185,640.00)	(218,200.00)	(217,088.00)	(89,648.00)	(710,576.00)
Malawi	(92,820.00)	(109,100.00)	(108,544.00)	(44,824.00)	(355,288.00)
Rwanda	(92,820.00)	(109,100.00)	(108,544.00)	(44,824.00)	(355,288.00)
Sudan	8,725,080.00)	(10,255,400.00)	(10,203,136.00)	(4,213,456.00)	(33,397,072.00)
Uganda	(371,280.00)	(436,400.00)	(434,176.00)	(179,296.00)	(1,421,152.00)
Zambia	92,820.00)	(109,100.00)	(108,544.00)	(44,824.00)	(355,288.00)
Total	**(23,947,560.00)**	**(28,147,800.00)**	**(28,004,352.00)**	**(11,564,592.00)**	**(91,664,304.00)**

Source: Computations based on FAO data

6.3.3. Export Goat Skins Crust Instead of Finished Leather

The assumptions expressed in 7.3.1 holds, and the COMESA region cumulatively is losing approximately US$ 78 million for export sheep skins in crust instead of finished leather. See Table 20, for the estimated loss per Member States

Table 20: Estimated Losses for Exporting Goats Crust Vs Finished Leather (US$)

Countries	Proportion of losses according to grades				Total Loss
	I	II	III	IV	
Burundi	(316,200.00)	(380,400.00)	(369,600.00)	(154,284.00)	(1,220,484.00)
DRC	(843,200.00)	(1,014,400.00)	(985,600.00)	(411,424.00)	(3,254,624.00)
Egypt	(527,000.00)	(634,000.00)	(616,000.00)	(257,140.00)	(2,034,140.00)
Eritrea	(368,900.00)	(443,800.00)	(431,200.00)	(179,998.00)	(1,423,898.00)

Ethiopia	(4,268,700.00)	(5,135,400.00)	(4,989,600.00)	(2,082,834.00)	(16,476,534.00)
Kenya	(2,055,300.00)	(2,472,600.00)	(2,402,400.00)	(1,002,846.00)	(7,933,146.00)
Libya	(263,500.00)	(317,000.00)	(308,000.00)	(128,570.00)	(1,017,070.00)
Madagascar	(210,800.00)	(253,600.00)	(246,400.00)	(102,856.00)	(813,656.00)
Malawi	(1,054,000.00)	(1,268,000.00)	(1,232,000.00)	(514,280.00)	(4,068,280.00)
Rwanda	(263,500.00)	(317,000.00)	(308,000.00)	(128,570.00)	(1,017,070.00)
Sudan	(7,905,000.00)	(9,510,000.00)	(9,240,000.00)	(3,857,100.00)	(30,512,100.00)
Uganda	(1,264,800.00)	(1,521,600.00)	(1,478,400.00)	(617,136.00)	(4,881,936.00)
Zambia	(316,200.00)	(380,400.00)	(369,600.00)	(154,284.00)	(1,220,484.00)
Zimbabwe	(527,000.00)	(634,000.00)	(616,000.00)	(257,140.00)	(2,034,140.00)
Total	**(20,184,100.00)**	**(24,282,200.00)**	**(23,592,800.00)**	**(9,848,462.00)**	**(77,907,562.00)**

Source: Computations based on FAO data

6.4. Cumulative Losses

Cumulative losses takes into account the losses that is incurred from the export of raw hides and skins upto the export of crust instead of finished leather. The region is estimated to be losing approximately US$ 465 million per annum.

6.4.1. Bovine Hides and Skins

For bovine hides and skins the region is losing approximately US$ 603 million and for each country loss see details in Table 21.

Table 21: Estimated Cumulative Losses for Exporting Bovine Raw Hide and Skins instead of Finished Leather (US$)

Countries	Raw Vs Wet-Blue	Wet-blue Vs Crust	Crust Vs Finished	Total
Burundi	(350,280)	(1,038,870)	(1,324,890)	(2,714,040)
DRC	(385,308)	(1,142,757)	(1,457,379)	(2,985,444)
Egypt	(13,520,808)	(40,100,382)	(51,140,754)	(104,761,944)
Eritrea	(630,504)	(1,869,966)	(2,384,802)	(4,885,272)
Ethiopia	(12,697,497)	(37,658,578)	(48,026,678)	(98,382,753)
Kenya	(15,951,331)	(47,308,894)	(60,333,902)	(123,594,127)
Libya	(175,140)	(519,435)	(662,445)	(1,357,020)
Madagascar	(5,149,116)	(15,271,389)	(19,475,883)	(39,896,388)
Malawi	(700,560)	(2,077,740)	(2,649,780)	(5,428,080)
Mauritius	(35,028)	(103,887)	(132,489)	(271,404)
Rwanda	(1,050,840)	(3,116,610)	(3,974,670)	(8,142,120)
Sudan	(16,848,468)	(49,969,647)	(63,727,209)	(130,545,324)
Uganda	(4,293,247)	(12,733,028)	(16,238,665)	(33,264,940)
Zambia	(2,131,334)	(6,321,166)	(8,061,500)	(16,514,000)
Zimbabwe	(2,131,334)	(12,326,275)	(15,719,925)	(30,177,534)
Total	**(76,050,795)**	**(231,558,624)**	**(295,310,971)**	**(602,920,390)**

Source: Computations based on FAO data

6.4.2. Sheep Skins

For sheep skins the region is losing approximately US$ 208 million and for each country loss see details in Table 22.

Table 22: Estimated Cumulative Losses for Exporting Sheep Raw Skins instead of Finished Leather (US$)

Countries	Raw Vs Wet-Blue	Wet-blue Vs Crust	Crust Vs Finished	Total
Burundi	-	-	-	
DRC			-	
Egypt	(3,114,910.00)	(4,546,004.00)	(6,039,896.00)	(13,700,810.00)
Eritrea	(1,099,380.00)	(1,604,472.00)	(2,131,728.00)	(4,835,580.00)
Ethiopia	(15,941,010.00)	(23,264,844.00)	(30,910,056.00)	(70,115,910.00)
Kenya	(4,763,980.00)	(6,952,712.00)	(9,237,488.00)	(20,954,180.00)
Libya	(3,481,370.00)	(5,080,828.00)	(6,750,472.00)	(15,312,670.00)
Madagascar	(366,460.00)	(534,824.00)	(710,576.00)	(1,611,860.00)
Malawi	(183,230.00)	(267,412.00)	(355,288.00)	(805,930.00)
Rwanda	(183,230.00)	(267,412.00)	(355,288.00)	(805,930.00)
Sudan	(17,223,620.00)	(25,136,728.00)	(33,397,072.00)	(75,757,420.00)
Uganda	(732,920.00)	(1,069,648.00)	(1,421,152.00)	(3,223,720.00)
Zambia	(183,230.00)	(267,412.00)	(355,288.00)	(805,930.00)
Zimbabwe		-	-	0.00
Total	**(47,273,340.00)**	**(68,992,296.00)**	**(91,664,304.00)**	**(207,929,940.00)**

Source: Computations based on FAO data

6.4.3. Goats Skins

For goats skins the region is losing approximately US$ 176 million and for each country loss see details in Table 23.

Table 23: Estimated Cumulative Losses for Exporting Goat Raw Skins instead of Finished Leather (US$)

Countries	Raw Vs Wet-Blue	Wet-blue Vs Crust	Crust Vs Finished	Total
Burundi	-952,260.00	(1,038,870)	(1,324,890)	(2,714,040)
DRC	-2,539,360.00	(1,142,757)	(1,457,379)	(2,985,444)
Egypt	-1,587,100.00	(40,100,382)	(51,140,754)	(104,761,944)
Eritrea	-1,110,970.00	(734,340.00)	(1,220,484.00)	-3,065,794.00
Ethiopia	-12,855,510.00	(1,958,240.00)	(3,254,624.00)	-18,068,374.00
Kenya	-6,189,690.00	(1,223,900.00)	(2,034,140.00)	-9,447,730.00
Libya	-793,550.00	(856,730.00)	(1,423,898.00)	-3,074,178.00
Madagascar	-634,840.00	(9,913,590.00)	(16,476,534.00)	-27,024,964.00
Malawi	-3,174,200.00	(4,773,210.00)	(7,933,146.00)	-15,880,556.00
Mauritius	-793,550.00	(611,950.00)	(1,017,070.00)	-2,422,570.00
Rwanda	-793,550.00	(489,560.00)	(813,656.00)	-2,096,766.00
Sudan	-23,806,500.00	(2,447,800.00)	(4,068,280.00)	-30,322,580.00
Uganda	-3,809,040.00	(611,950.00)	(1,017,070.00)	-5,438,060.00
Zambia	-952,260.00	(18,358,500.00)	(30,512,100.00)	-49,822,860.00
Zimbabwe	-1,587,100.00	(2,937,360.00)	(4,881,936.00)	-9,406,396.00
Total	**-56,500,760.00**	**-44,917,130.00**	**-74,652,938.00**	**-176,070,828.00**

Source: Computations based on FAO data

6.5. Conclusion

CHAPTER VII: LEATHER PRODUCTS

7. Introduction

Production of footwear and leather goods is the final stage involved in the production of the final consumer goods. This segment of the industry is labour intensive, however most countries in the region export hides and skins either as raw or wet blue, thereby impacting negatively on the production of high value added products, which has the potential of creating thousands of jobs in the region. Globally this sector is dominated by SMEs, and its capital requirements are low in comparison to tanning.

7.1. Leather Footwear

In summary, footwear manufacturing first involves cutting out the upper components from skins and the linings and insoles from leather or fabric and man-made sheets. Next, the edges of the upper components are tapered, or skived, to reduce the bulk of seams. Upper components are stitched together. The stitched uppers are attached to the insoles through the lasting process, thereafter the sole units are stuck on to the lasted upper. Finally the finishing operations are carried out to give the complete shoe the required finish.

The level of investment in footwear production is largely influenced by the technical choice of the production method. The production method is determined by factors such as the footwear type, quality, durability and scale of output. Other factors are the level of specialization in the shoe parts, availability and cost of imported and locally produced equipment including borrowing capital. Finally, the relationships between wages, skills, productivity of operatives, and the degree of utilization of capital equipment are extremely important considerations.

Footwear production provides various enterprise opportunities for SMEs to embark on to create wealth. Some of these opportunities are categorized as follows:

- Shoe upper production
- Complete shoes production
- Leather sole and insole units production
- Leather shoe lining production
- Shoes accessories production

Table 24: Complete Production Stages of Complete Footwear

Production stages	Operations	Major materials/equipment
Material selection	Inspection of materials	Inspection tools e.g. thickness gauge, Cello tape, Area measuring machine, etc.
	Sorting of materials	Visual expertise.
	Selection of material as per design requirement.	Leather, lining materials, threads, puffs , heel stiffeners, eyelets, trims , etc.
Design and Product Dev.	Last selection, Hand sketching , pattern development, Pattern engineering , Pattern grading, sample making costing	Lasts, leather, lining materials, threads, puffs , heel stiffeners, eyelets, trims , etc.
Upper-cutting	Cutting upper components	Leather uppers and lining materials
Upper preparation	Leather splitting	Splitter

Production stages	Operations	Major materials/equipment
	Lining marking	Marking pencil, patterns
	Stitch marking	Marking pencil, patterns
	Hole punching	Punchers
	Sock embossing	Stamping machine and foil
	Skiving	Skiver
	Edge folding and cementing	Folding machine, hammers, adhesives.
Upper stitching	Stitching of uppers	Stitching machines, threads, tapes
Stitched upper finishing	Seam reducing	Knife, Hammer
	Taping	Tapes
	Eyelet reinforcing	Eyelet machine, eyelet puncher
	Punching and eyelet insertion	Eyelets
	Temporary lacing	String
	General fitting and puff attaching	Trim, puffs
	Upper trimming	Trimming knives
	Stiffener insertion	Heel stiffeners, puffs
	Upper conditioning	Condition machine , steam
Bottom component preparation	Insole preparation	Insole sheeting
Lasting	Insole tacking	Lasts , lasting tacks , hammer,
	Cement lasting (toe and back-part lasting)	Adhesives, brushes, lasting pliers, hammers ,Lasting machines
	Heat setting	Appropriate machinery
	Bottom roughing	Appropriate machinery
	Shank attaching	Shanks
	Bottom cementing	Adhesives
Sole cementing	Sole laying	Sole units, adhesives
	Last removal	Lasting jack, last removal machine
Shoe finishing	Ironing, creaming, polishing, spraying	Spray chemicals , cream, iron
Packaging	Shoe inspection, shoe box preparation, tapping.	Carton boxes, shoe boxes, shoe lift, tapes.

Source: Memorandum 2 Small Scale Manufacture of Footwear- ILO.

Material Selection - Material selection is a step in the process of designing and production of footwear. In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material for a given application begins with properties and costs of candidate materials. The inspection, sorting and selection of materials are done as per design requirement

7.1.1. Pattern Assessment Procedure

Pattern assessment is used to determine the quantity of material that will be required, in order to cut from 100% usable materials, those patterns which combine to form a shoe upper. The material allowance calculation systems used in the footwear manufacturing process are: marking up; graphical; SLM; SATRA Sum and RSM. Each of these systems are elaborated as follows:

Marking up - The Cutting Room Supervisor or a similarly skilled cutting person selects a skin or hide from a bundle of leather that is to be used for the style. The skin is then marked by drawing the patterns onto its surface with due regard to cutting principles and quality requirements. Complete pairs are drawn, as far as possible and an allowance is calculated by dividing the area of the skin by the number of pairs obtained from the mark-up. Sometimes, the skin is marked on the reverse side so that it can be subsequently used without having to clean off the marks from the surface. In this case a percentage is usually added that reflects the amount of waste that would be encountered on the grain side because of flows and blemishes not seen on the reverse.

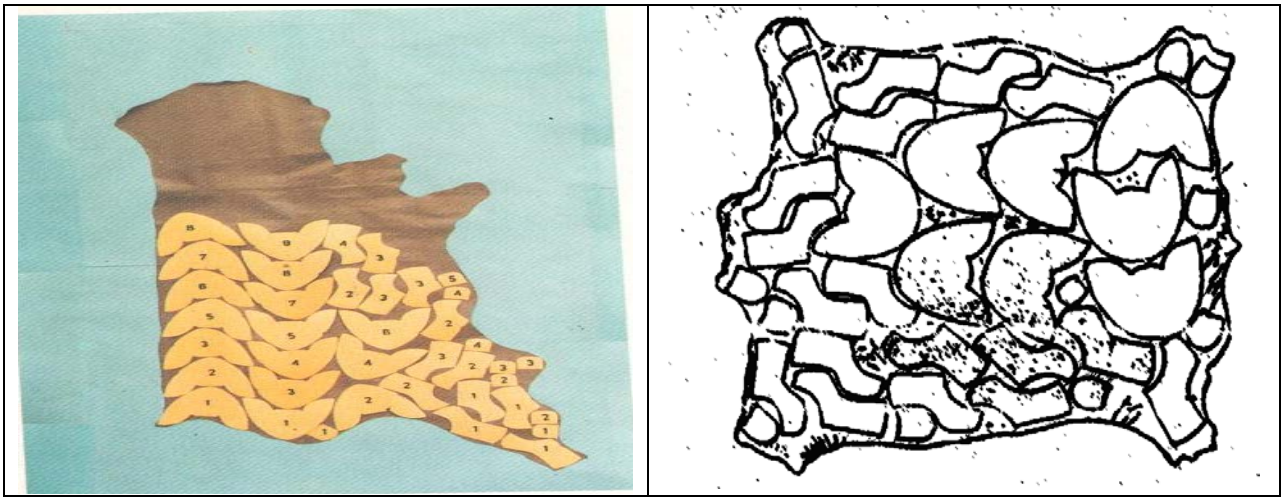


Figure 6: Marking Up Process

The advantages and disadvantages of the of the marking up methodologies in the footwear making process is summarised in Table **.

Table 25: The Advantages and Disadvantages of the Marking Up Process

Advantages	Disadvantages
• There is a permanent record of the cutting method and quality standard • Takes into account cutting principles and unavoidable waste • The allowance calculation can be justified to cutters. • Provided the person who marks the skin is skilled and the skin of the leather is truly representative, then this should be very accurate method	• A skilled trustworthy cutter is required to do the mark-up. • It can be time consuming particularly if there are many pattern items in the shoe set. • It may not truly emulate cutting practice (e.g. a cutter would probably cut more vamps or more quarters from an individual skin rather than cut a complete number of pairs.) • It is usually not linked to a leather grading system, or shoe size adjustment system so individual cutting jobs may yield significantly different results to the calculated allowance.

Graphical Methods: The complete patterns for one pair are laid out in the most compact and economical arrangement onto graph paper. A rectangle is then drawn around the patterns that enclose the set. Sometimes, the lines cut across the patterns to a degree as in the example. This assumes that the parts that protrude could be accommodated in the gaps within the rectangle.

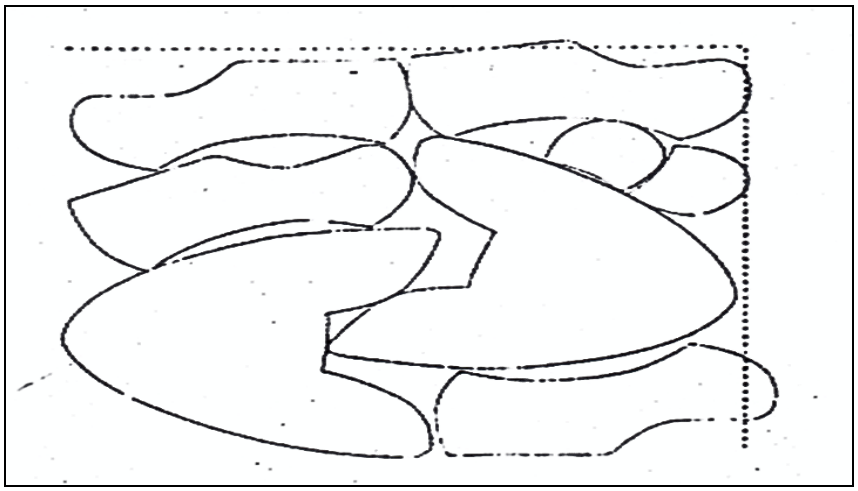


Figure 7: Illustration of the Graphical Methods

The area of the rectangle is calculated by multiplying the length by the width or counting up the number of squares covered. A percentage is applied to this area to calculate an allowance for the pair. The percentage will usually vary according to:

- Material type
- Material quality
- Average pattern area in relation to average material area
- Variations in size and width fitting

These percentages are usually based on previous experience and some companies apply the same percentage for all styles and materials. The advantages and disadvantages of the graphical method are summarised in Table 26.

Table 26: Advantages and Disadvantages of the Graphical Method

Advantages	Disadvantages
• Reasonably quick and easy to use. • Permanent record of the calculation method • The same base area can be used to calculate allowances for different materials, qualities, and sizes (provided previous experience has allowed a build up of appropriate percentage additions). • Less skill is required than the marking-up method.	• It is subjective because the original rectangle area could vary significantly depending on the interlocking skill of the assessor. • The percentages applied are based on previous cutting history which may reflect uneconomical cutting. • There may be no previous experience of particular materials so an estimate has to be made. • The lay-up does not reflect usual cutting practice i.e. vamps tend to be cut together from the butt and backbone areas, quarters from belly, legs, neck area etc.

Scientific Leather Measurement (**SLM) -**SLM was introduced to the shoe industry in the early 1950s. It established very clearly two separate components for allowance calculation pattern assessment and leather assessment. Each pattern in the shoe set is measured separately. The pattern is drawn carefully onto paper and then “blocked off” by drawing straight lines connecting highest points on the pattern perimeter. This gross area is measured and then the most economical interlocks are chosen and drawn into position. The interlocking pattern must be kept parallel or at 180 – to the original.

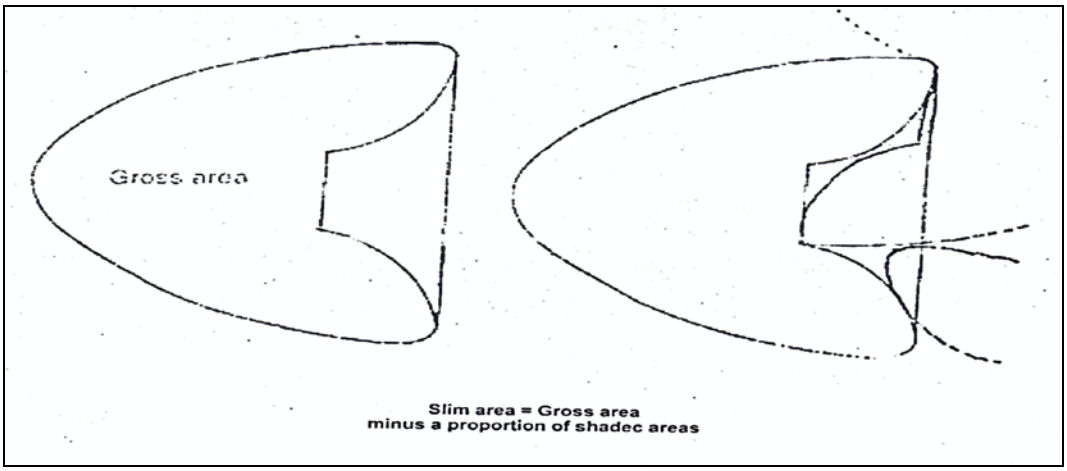


Figure 8: SLM Process

The area of interlocks falling within the gross area is measured, plus any shared waste. And a proportion of this area subtracted from the gross area. The result is known as the “Slim area” and this is used as a basis for allowance calculation.

Star sum - Initially developed by SATRA in the early 1980’s, this system continues to be developed. SATRA Sum has replaced SLM as an industry standard system for material allowance calculation.

RSM - The first serious attempts at establishing a scientific method of arriving at leather consumption allowance resulted in the publication in 1922 of a system by messers W.W. RUSS and F.L. SMALL. A more scientific approach can give adequately accurate results and it is considered that a system of this type posses many advantages

7.1.2. Shoe Upper Production

The term upper refers to the whole of the upper part of shoe as opposed to the bottom. It generally includes some of the following, depending on type of construction**;** the upper, the lining and interlining, the counter and the toe puff. It excludes the Lasting and sole attachment operation involved in making a complete shoe. The upper shoe production goes through the designing, material selection, cutting, preparation and stitching

Other than production of complete shoes, investment can also be made in the production of leather shoe uppers for sale. The capital required for this investment is far much less compared to the investment needed in the production of complete shoes because the equipment involved is minimal. For instance the required equipment comprises of cutting and stitching operations to produce shoe uppers tools or machines.

Depending on the style of the shoe, the upper of a shoe can be cut from a single piece, or can be comprised of many pieces stitched together. Parts of a shoe's upper can include the vamp, the back, the tongue, the quarter, and the lining.

In summary, leather shoe upper production involves cutting out the upper components from skins and the linings. Cutting can be done by hand for smaller production levels and by machine for higher production levels. Next, the edges of the upper components are tapered, or skived, to

reduce the bulk of seams. Upper components are then stitched together. Figure 10 illustrates the cutting stages involved in the production of uppers and a sample of production uppers.

Cutting is also called clicking. The cutting of uppers and linings is the first step in shoe construction and is done in the cutting room of the factory. These parts are cut to a pattern and are later fitted together in much the same way as parts of a suit or dress are cut and then sewn or assembled to provide the finished garment. Most of the cutting today is done by machine. There is still some hand cutting being done in factories. However, this method is used where economy is the factor.

The critical areas of concern at this stage are: Economical cutting of the valuable leather material; effective material management system; Operator skill and performance; Good quality control system and Use of appropriate machinery and equipment.

Common defects that affect the quality of cut components are: Loose and under substance leather; open and drawn grain; fat packets/in sheep upper; Scratches; Shade and color variation; Wrong cutting direction and size; Growth Marks; Poor nap on nu buck and Cuts/flaws.

Figure 9: The Cutting Process of Uppers

Figure 10: Samples of Uppers

Sources: Courtesy of Ace shoes

As seen from the table above Upper leather accounts for the largest single component in footwear production. The possibilities of saving money and reducing costs are greater in this area than on any other single item of cost.

Every shoe producer, large, medium or small scale, needs to predetermine the area of leather required for a particular design. This is necessary for cost purposes and also in relation to the selling price of the upper or complete shoe.

7.1.3. Closing/stitching

As the construction, cost, design, function, material and style of the shoe vary, so too does its upper fitting. The number of different steps included in this group may range from more than 60 to as few as 15. In addition to the progressive assembly of the various upper parts by stitching, other operations may include such things as gimping and perforating the upper for decorative purposes; skiving which reduces the thickness of edges of leather parts that are to be assembled; seam rubbing and taping to remove the bulk of the material to ensure foot comfort, and so forth.

The critical areas of concern at this stage are: Skill of operators; Labour management/ supervision; Selection and sequence of operation; and Use of appropriate machinery and equipment

The common defects that affect the quality of upper component: Improper skiving; Uneven stitching; Seam bursting; Wrinkles; Improper reinforcement; Backers not caught in stitching; Improper fixed Blind/Bold eyelets; and Wrong thread combinations (colour).

7.1.4. Bottom Component preparation

While the upper is being fitted and assembled, other parts of the shoe are being prepared in the stock cutting department. These parts include insoles and outsoles; welting; counter stiffener – which are moulded to the shape of the last and which reinforce the shoe, preserve its shape and serve as protection for the foot; heels, toe puffs, both hard and soft – preserve the shape of the toe of the shoe during wear. Steel toes are used in the production of work shoes and boots.

7.1.5. Lasting

Lasting is a series of operations in which the shoe upper and lining are drawn tightly to the last over which the shoe is made, and then fastened to the insole of the shoe. Lasting is one of the most important parts of the shoemaking process. It is here that shape is built in for the life of the shoe.

The critical areas of concern at this stage are: Skills of hand lasting/ machine lasting; The skill of operators; Proper utilization of adhesives and Use of appropriate machinery and equipment(hand tools).

The common defects that affect the quality of the finished shoe: Back seam and Vamp crooked; Wrong back height; Wrinkles; Poor sole adhesion; Improper roughing; Balance not correct; Insufficient lasting margin; Too many wrinkles in seat lasting; Nails protruding inside the shoe; Incorrect toe spring; Quarters not in line; Medallion on toe falling over toe; Socks not covering insole correctly; Improper stitching Counter with upper and lining; and Improper skiving of counters and toe puff.

7.1.6. Finishing

Finishing of footwear actually starts at the stage of designing, since the designer must know: what type of leather was selected in what colour; what is the information of the tannery on the finish of the selected leather; if there is no information, the finish must be checked ; what type of sole is to be used; finishing should be applied in case of leather sole as well; what type of footwear is to be produced (elegant, casual, sporty).

Shoe finishing gives the shoe its final look, it is the last operation to be carried out, it is the "make-up" to be put on. It is very important to have this make-up property chosen, since this can increase or decrease the price of the footwear. Before the real make up can be applied the shoe must be cleaned, all contamination should be removed from all surfaces. It was stressed earlier that one has to know which finishing material to be used to achieve the best results, e.g. harmony between leather , pattern and the style of the shoe. This information should be known prior to the shoe arriving to the finishing department. The second thing one has to keep in mind is that there is not one single product that can be applied to all sorts of leather. Before finishing can be applied to the footwear , it has to go through the processes of Cleaning and Repairing.

Basically two different types of products can be found for cleaning of the footwear:

- Water based cleaning agents (2-4% solution of a surface active agent or detergent),
- Solvent based product (most frequently a suitable gasoline fraction). After cleaning the shoe one has to ascertain that the cleaned surface is totally dry before further steps can be taken in the finish of the footwear.

Now the shoes are ready for the repairing process. Repairing means the correction of the faults that appear on the upper or bottom of the footwear and is due to the production processes. The following types of repairing material can be found:

- High viscosity, paste – like products based on synthetic resins for deep and rough damages; these must be spread on the surface with a warm knife to fill in the damage area. After it has cooled and is dry a fine sand paper should be used and finally damaged area should be coated with a solvent based paint.
- Repairing pencils (wax based) for smaller rubbed damages.
- Solvent or water based leather paints in the same colour as the upper. These can be applied by brush or by small, fine spray guns.
- Special paints for patent leather.

After the footwear has gone through the above processes then can the finish start. The finish must fill up the grain, which should be equal and smooth. The shoe must obtain a pleasant touch and eventually the aniline character of the leather must be stressed. The finish products of today are is most cases specialized products, developed for the different types of leather, style and the look of the shoe. Obviously, a dress shoe should have a rather high gloss while a sport shoe should have a flat or even fatty surface. A porous leather will need more finish and the effect needed (certainly not a high gloss) cannot be achieved by a single coating. An

open grained leather needs at least two coatings, the first for filling up the grain and perhaps with the second finish you will achieve the needed gloss.

After choosing the right product for the shoe and in particular the leather, the method of applying it is also important . if a spray gun is used, it must be checked whether the right nozzle is in the gun, whether the quantity of the air and the finishing material are in balance during spraying. If the coating is too dry “the right gloss will not be achieved, but if it is,, too wet” drops will appear and run down the surface. Repeated spraying of thin coating is more advisable than a single thick coating.

7.1.7. Inspection and Packing

Inspection is very critical to ensure that a finished shoe has all the details it needs as prescribed at product development stage, including the desired appeal to customer. It is the final stage of the entire process of quality control and production. Product details such as materials used and the codes that describe the product (type of product, size, etc.,) should be indicated.

Footwear stuffing is also needed to aid and retain the appearance of the product during transportation. Stuffing can be done using either tissue paper or and cardboard cone.

When using tissue paper to stuff toes, it should be inserted into the toe area of the shoe. Cardboard cones are also used at this stage. A cardboard cone is cardboard that has been formed into a cone. It is placed into the waist area of the footwear to hold the footwear shape.

7.1.8. Operational-wise cost distribution

According to UNIDO study of April 2007 on Ethiopian Footwear industries, the section wise leather material and labour cost distribution is estimated between 55% and 65% as shown below.

Table 27: Distribution of Costs[6]

Stages	Cost Structure	Comments
Cutting	• Leather cost 55 to 65 % • Labour cost 1 to 2 %	Focus should be given to save material [leather]
Stitching	• Material cost < 15% • Labour cost 4 to 6 %	Labour productivity is important
Lasting and Finishing	• Material Cost < 15% • Labour cost 4 to 5 %	Labour productivity is important and capital/fixed cost or utilization

7.2. Production of Leather Soles

Other auxillary Leather materials which can be produced in Sole Leather Plant are insole and welt. One of the bottom components of a shoe is sole which can be made in wide range of

[6] **ASSESSING THE COMPETITIVENESS OF THE ETHIOPIAN SHOE MANUFACTURING A Practical Benchmarking of Shoe Production: Technical Paper Prepared by UNIDO in cooperation with The Ministry of Trade and Industry of Ethiopia April 2007**

requirements to meet different classic and special applications. A sole is a bottom piece of footwear which is in contact with the ground.

One of the bottom components of a shoe is sole which can be made in wide range of requirements to meet different classic and special applications. A sole is a bottom piece of footwear which is in contact with the ground.
Leather sole is one of the main inputs in the production of shoes, especially leather shoes. The demand for shoe soles is derived from the demand and production of leather shoes. This means that the demand or requirement for leather soles directly corresponds to the amount of shoes to be produced with leather sole.

According to a feasibility study done by the Leather Industry Development Institute (LIDI) in Ethiopia-(production of sole leather) the market study indicates that the unsatisfied demand of leather soles, (men's, ladies' and children's) for the year 2008 in the country was in the order of 64 tonnes. This demand is projected to grow to 444 tonnes by the year 2020. Therefore this positive indicator in one country in the region gives certainty that there is high demand for Leather soles in all the countries of the COMESA region.

Leather is the most desirable material to make **outsole and insole, welt** as well as **counter stiffener**, especially for leather shoes product.

Figure 11: Suitable Leather for Making Soles

Figure 12: Leather Soles

Leather can be improved by tanners to fit different applications which required for soling. Currently it is referred as material for high quality shoes because of its lightness, flexibility, waterproof and capable of transpiring: Transpiration capacity due to a high porosity coefficient; Low specific weight in relation to thickness and surface; Great thermo static power, responsible for foot heat and thermal protection; High resistance to perforation; Insulator; Adherence; Water repellant and Anti- slip.

The major operations involved in the production process are leather cutting, leather sole splitting, roughing, trimming, edge making, stamping and cementing. Required sizes of leather are cut by hydraulic clicking machine. Roughing operation helps to make the surface ready for cementing with the rubber sheet. After cutting the required size the edges of the leather sole are trimmed off by trimming machine. The next operation is edging. Edging operation is the task of improving the edges until smooth and satisfactory finishes are obtained. Stamping and

cementing are the major operations carried out successively. Hence, leather sole pieces that are previously prepared are now fixed together and cemented by using adhesive.

Other auxillary Leather materials which can be produced in Sole Leather Plant are insole and welt. One of the bottom components of a shoe is sole which can be made in wide range of requirements to meet different classic and special applications. A sole is a bottom piece of footwear which is in contact with the ground.

An insole is the foundation of the shoe. Its function in the finished shoe is to take up moisture in the form of perspiration from the foot. An in sole should be soft and comfortable; it should endure the weight of the wearer and the pounding of his feet without affecting its desirable qualities. It should lend itself to shoe making methods, especially cementing, absorb perspiration and be capable of re evaporating it when the shoe is off the foot. It should with stand the physical and chemical depredation of perspiration and whatever else might find it ways into the shoe from time to time, be girth or water. Since the foot acts as a regulator only when the shoe is being worn, it should remain unaffected by temperature extremes and readily available, easily processed and low in cost.

The ideal qualities for an insole are: Moisture absorption and rapid drying; Sufficient durability to withstand friction; Flexibility; Firmness; Uniformity of substance; Light weight ;Adherence and Anti- squeak.

Flexibility - The insole material can be oriented in its production to provide excellent heel to toe flexibility. At the same time, this orientation can provide desirable firmness across the foot. This helps assure comfort by resisting cupping at the ball of the foot.

Structural integrity - The material must be capable of retaining its original shape. It should help the shoe keep its shape, line and comfortably by not expanding or shrinking; it should not harden, crack or warp due to perspiration or other influences.

Inhibit micro- organisms growth -The material should be treated to inhibit the growth of fungi, moulds and bacteria to minimize perspiration odours and promote hygienic conditions.

Non staining – It should not stain socks and remain clean and smooth after long wear

Welt - It is a narrow strip of leather which helps the proper assembly of sole and upper or upper and insole. It is also manufactured from leather.

Lining Leather - Selected from the best fullgrain leather, this material offers high standards of comfort coupled with excellent insulation. It absorbs perspiration and prevents feet from overheating on long walks. The availability of leather lining in the Footwear sector still remains a challenge, but it is a great opportunity for SMEs who can identify with tanneries making lining leather and be able to supply it to the shoe and leather goods, garments manufacturers.

Footwear Accessories- There are a variety of footwear accessories which can be used in the production of shoes. However accessories can be divided into two categories; Accessories to enhance appearance and Accessories to enhance fit and comfort

Accessories to enhance appearance

- Bows and trims
- Buckles
- Rivets, studs and rings

Accessories to provide fit and comfort.

- Heel clips
- Socks
- Shoe horn
- Zippers
- Hooks
- Velcro
- Buckles

The availability of footwear accessories in variety and quality is the challenge to most SMEs, and this becomes an opportunity for business especially for those who do not wish to engage shoe production.

7.3. Main Machines for Footwear Production

The following are some of the basic machines required for a start business. It is important to note that a skiving and clicking machines' functions would be undertaken by hand using a skiving and clicking knives respectively. The detailed list of machines and their estimated prices is presented as Annex 2.

Figure 13: Cutting Knife

Figure 14: Skiving Machine

Figure 15: Clicking Machine

Figure 16: Sewing Machine

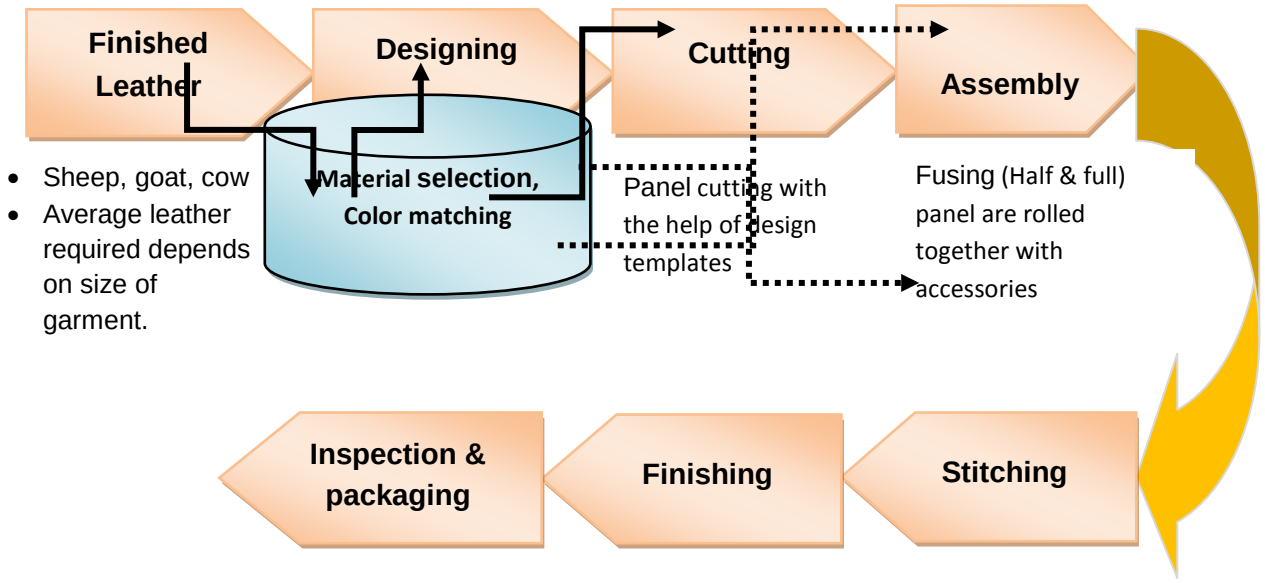
7.4. Leather Garments and Goods

Product description and application - Leather garments include jackets, coats, trousers, over-coats and other garments in different sizes and colors. The products are highly demanded by the middle and higher income section of the population. Moreover, the quality leather garments have a good export potential. Finished leather of different colors is required to produce leather garments.

Production process - The process of leather garment production does not involve complex unit operations. The main operations are pattern making, economical layout of patterns, clicking of components, and skiving, decoration by embossing machine or hand, folding, coloring, assembling, stitching, fitting and finishing.

The machinery and equipment required are simple, and the process required for such operations as preparation of designs and cutting to required sizes, sewing, pasting, button hole making, button fixing and other necessary operations.

The specifications of leather garments to be made are mainly related to the colour of the leather and its colour fastness, softness and resistance to moisture and cold. Other specifications like design and pattern for leather garment to be exported are, in most instances, provided by the buyer.



Cutting - After the matching, the cutter cuts different panels of a jacket with the help of the design patterns and knives. The list of panel includes front, back, collar, sleeves, cuff etc. Generally, design patterns made of cardboard are used in cutting process.

In case single type/design garments are to be manufactured in large quantities, then press machines with metal dyes can also be used. Average wastage of leather in cutting process ranges between 15 to 25 percent. On average, a cutter can cut 15 to 20 jackets per day per shift in 8 hours.

Assembly - After the cutting process, fusing is added to different panels of the garment, as per design requirement. Fusing machines or electric irons are used for this purpose. Generally, half fusing is done on the end area where stitching is to be done and full fusing is applied on front and back panel for providing garment outlook. Fusing reduces stretch ability and adds stiffness to the leather making it convenient for the stitcher to stitch. In this process, accessories are added and rolled together for stitching. Major accessories include lining (cotton, viscose, satin), zippers (metal, nylon), padding, wadding, shoulder pads, buckles, buttons, labels and thread.

Stitching - Next to assembly is the stitching of different panels of the garments by using sewing machines. Two stitching methods, depending upon the quantity produced, are currently being employed in the industry.

- One stitcher one garment
- Chain process (Assembly Line)

In the first method, one stitcher stitches together all the panels of the garment. It is mainly used by the small units. All the allied processes, folding etc. required during stitching are also performed by one person. Depending upon the garment type and size, on an average, output per stitcher per shift is between 1 to 2 garments, mainly used in large units.

The second method is more efficient and average productivity level per stitcher in some cases rises between 4 to 8 garments per day. In the chain process, an assembly line is made in which each stitcher is assigned one specific process, out of the total processes required for garment manufacturing. Ultimately, the stitcher gets specialized by constantly performing one task resulting in production efficiencies and better quality. In each assembly line, there are seven stitchers who perform the following sub-processes: Folding; Lining Stitching; Sleeves; Back; Front; Pocket and Panel Joining.

Finishing - Finishing is the last process in leather garments manufacturing. In the finishing process, buttons/snaps are attached to the garment, extra thread and fibers are clipped off.

After this process garments pass through touching process, in which chipped off and out of matching leather grains are treated to give the garment a good look. The garment then moves to ironing stage after which hangtags, price tickets, etc are attached. The final stage is the quality check by the quality inspectors. Their job is to check the conformance of the manufactured garment to the Customer's specifications. The quality check is followed by the final packing of the garment.

Skills Required - Designing, pattern making, material selection cutting and stitching are the primary skills required. Matching of leather from different skins also requires an experienced matching expert. The success in garment production depends also on knowledge about international trends in fashion and prices.

Machinery and Equipment Required - The following are basic machinery and equipment for leather garments production.

Machine/equipments	USD
Flatbed sewing machine	1,211
Cylinder bed sewing machine	823
Over lock machine	823
Blind stitching machine	649
Button sewing machine	935
Button hole making machine	486
Leather skiving machine	1,405
Cutting machine-straight bed	3,243

7.5. Economic Impact Analysis

A brief economic analysis is made in this section covering break even analysis at firm level and also the opportunities that are forgone at industrial level if the COMESA region exports finished leather instead of producing footwear and leather garments in the region.

7.5.1. Enterprise Level

The break-even level or break-even point (BEP) represents the sales amount-in either unit or revenue terms-that is required to cover total costs (both fixed and variable). Total profit at the break-even point is zero. Break-even is only possible if a firm's prices are higher than its variable costs per unit. If so, then each unit of the product sold will generate some "contribution" toward covering fixed costs[7]

[7] Farris, Paul W.; Neil T. Bendle; Phillip E. Pfeifer; David J. Reibstein (2010). *Marketing Metrics: The Definitive Guide to Measuring Marketing Performance.* Upper Saddle River, New Jersey: Pearson Education, Inc. ISBN 0-13-705829-2.

The entrepreneur will need to understand the following terms in order to to appreciate and communicate the break-even analysis:

- Selling Price (SP) – Represents the price that each unit would be sold at;
- Variable Cost (VC) – Its made of costs that changes in proportion will sales. They normally encompass direct material and labour costs, the variable part of manufacturing operating cost, transportation and sales expenses;
- Contribution Margin (CM) – equal to sales revenues less variable costs or SP-VC;
- Fixed Costs (FC) – these costs do not change within the projected range of sales levels. These can include facilities costs, general and administrative costs, capital interest and depreciation expenses. The FC is usually expressed as a lump-sum in dollars;
- Units (X) – represents the number of items sold or produced. For example the purpose of a break-even calculation, it is assumed that the number of units sold during a period is equal to the number of units produced during the same period.

To calculate break-even, the entrepreneur should determine the variables: FC, SP, and VC. The process of separating the selling price and variable costs is not always straight forward and alternatively a contribution margin is given. The CM can still be used in the break-even calculation, replacing the SP and VC.

To calculate the number of units sold (or produced) at break-even

SP(X) = VC(X) + FC

Alternatively the formula to solve for X, the number of units at breakeven will give you:

X = FC/ (SP – VC) OR X = FC/CM

The formula to calculate the break-even revenue in dollars is as follows:

Break-even revenue ($) = Break-even units x Selling price

It is recommended that all entrepreneurs must undertake break even analysis, as it is critical to determine the number of footwear pairs or garments they should make for them to start to make a profit. Assessment in the COMESA region has shown that over 80% of SMEs operate below breakeven point, and thus to cover their cost some of them overprice consequently driving themselves out of business.

7.5.2. Industry Wide Analysis

Industry wide analysis is based on the assumption that the transformation of finished leather to footwear or leather products result in two-fold increase in value addition. Thus, assuming that all COMESA Member States were producing finished leather, the region would lose approximately *** in forgone value addition. However, because most of the countries are exporting raw hides

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The Marketing Accountability Standards Board (MASB) endorses the definitions, purposes, and constructs of classes of measures that appear in *Marketing Metrics* as part of its ongoing Common Language: Marketing Activities and Metrics Project.

the cumulative loss is based on the fact that transformation of raw hides and skins into finished footwear or products translates into a twelve-fold increase in value addition. For details see Table ***.

7.6. Conclusion

ANNEXURE

Annex 1: Footwear Costing and Pricing Model

Cost Sheet for Upper material

Item	Code no.	Allowance	Price US$	Cost (pair) US$
Upper Leather	100	2.9 sqft	1.00	2.90
Vamp lining	101	0.4 sqft	0.5	0.20
Counter lining	102	0.2 sqft	0.5	0.10
Dupont	103	0.2 sqft	0.10	0.02
Felt bottom piece	104	0.25 sqft	0.10	0.025
Sock	105	0.4 sqft	0.50	0.20
Vamp and Quarter Backer	106	0.6 sqft	0.4	0.24
TOTAL COST OF UPPERS				**3.685**

Cost sheet for bottom materials

Item	Code no.	Allowance	Price US$	Cost (pair) US$
Sole	120	0.5 sqft	0.80	0.40
Insole	121	1 pair	0.20	0.20
Top piece	122	1 pair	0.10	0.10
Heel	123	1 pair	0.50	0.50
stiffener	124	1 pair	0.15	0.15
Shank	125	1 pair	0.10	0.10
TOTAL COST OF BOTTOM MATERIALS				**1.45**

Cost Sheet for Grindery Materials

Item	Code no.	Allowance	Price US$	Cost (pair) US$
Clicking grindery	140	1 pair	0.04	0.04
Clicking adhesive	141	1 pair	0.02	0.02
Closing Grindery	142	1 pair	0.02	0.02
Closing Adhesive	143	1 pair	0.01	0.01
Making +Shoe room Grindery	144	1 pair	0.02	0.02
Making +Shoe Room Adhesive	145	1 pair	0.02	0.02
Toe Puff	146	1 pair	0.03	0.03
Tape	147	1 pair	0.01	0.01
Threads	148	1 pair	0.01	0.01
Box and Label	149	1 pair	0.30	0.30
Tissue paper	150	1 pair	0.01	0.01
TOTAL GRINDERY COSTS				**0.49**

Cost Sheet for Labour Costs

Item	Code no.	Allowance	Price US$	Cost (pair) US$
Clicking Dept.	200	1pair	0.30	0.30
Closing Dept.	201	1pair	0.20	0.20
Closing Dept.	202	1pair	0.25	0.25
Components Dept.	203	1pair	0.20	0.20
Making Dept.	204	1pair	0.20	0.20
Shoe room Dept.	205	1pair	0.10	0.10
TOTAL LABOUR COST				**1.25**

	Factory Overheads	
1	Premises Rent	1,000.00
2	Premises Costs	5,000.00
	a. Cleaning	
	b. Cleaning Equipment	
	c. Security services	
	d. Premises (repairs and maintenance)	
	e. Rates	
	f. Insurance	
3	Electricity	3,000.00
4	Depreciation	2,000.00
5	Management Cost	20,000.00
6	Maintenance	10,000.00
7	Product Development Cost	8,000.00
8	Quality Costs	7,000.00
9	Labour Cost	8,000.00
10	Material Cost	3,000.00
11	Personnel Officer	4,000.00
12	Administration	5,000.00
13	Insurance	5,000.00
14	Post and Telephone	4,000.00
15	Transport	2,000.00
16	Stationery	3,000.00
17	Travelling Costs	20,000.00
18	Interest charges	0.00
	Total	**110,000.00**
	Overheads	
19	Cost of Overheads per month	110,000.00
20	Forecast Footwear Production per month	55,000.00
21	Overhead Cost per Pair	2.00
	Prime Costs per Pair	
22	Total upper cost	3.685
23	Total bottom cost	1.450
24	Total grinding cost	0.490
25	Total labour cost	1.250
	Total price cost	**6.875**
	Total Cost per Pair	6.875
26	Prime Cost	2.000
27	Overheads	8.875
	Total	**9.7535**
28	Wholesale/retail Margin (25%)	2.4387
	Retail Price	**12.1918 (12.1)**

Annex 2: List of Footwear Making Machines and their Estimated Prices

No.	Description of Machine	Cost US$
1	Hydraulic Swing Arm Press Cutting Machine	6,083
2	Travel head cutting machine	6,568
3	Leather Skiving Machine	1,528
4	Stiffener Skiving Machine	870
5	Zig Zag Stitching Machine	940
6	Single Needle Flat Bed	412
7	Double Needle Flat Bed	1,211
8	Single Needle Post Bed	673
9	Double Needle Post Bed	823
10	Thermo Cementing And Folding Machine	7164
11	Heat Setting Machine	7,840
12	Roughing Machine	2,028
13	Cement Re Activator	7,052
14	Vacuum Sole Press	8,721
15	Spraying Machine	2,394
16	Lining stamping machine	486
17	Toe Puff Attaching Machine	6,082
18	Back Part Molding Machine	11,489
19	Toe Lasting Machine	22,978
20	Heel And Side Lasting Machine	39,279
21	Chiller	15,900
22	Moccasin Ironing Machine	2,757
23	Insole Taping Machine	3,676
24	Compressor	1,459
25	Shoe Brushing machine	2,027
26	Eyeleting machie	2,031
27	De Lasting Machine	1,702
	Total	**39,279**