Review on Pre and Post-Slaughter Defects of Hide and Skin in Ethiopia

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Abstract: Agriculture is the most important economic sector in many African countries. Its contribution to GDP is significant and helps to sustain livelihoods through the provision of employments to majority of the Ruler population. Hide and skin are the external integuments of animals include materials derived from birds, fish, amphibians, reptiles and mammals. Ethiopia has huge livestock population which provide draught power, milk, meat, fibre, fuel and fertilizer and they also provide hide and skin which partially processed for export or tanned and finished in the country’s tanning for shoe making and leather goods. Hide and skin defects are classified into two main groups; first group being those created or acquired during the life of the animal (Pre-slaughter defects) and second group being those that occur after slaughtering of animals (Post-slaughter defects). Pre-slaughter defects include: scratches, cockle, brand marks and scars while post-slaughter defects comprise of bruise gouge marks, flay cut, bad bleeding, putrefaction, hair slip and beetle damages. The most significantly problems during pre-slaughter are parasite infestation and secondary self-damages related to parasites. The commonest post-slaughter problems are flying cuts due to improper using of tools and preservation problems. The objective of this seminar paper is therefore, to give an insight on the pre- and post-slaughter hide and skin defects. Finally, There is a strong need to prepare comprehensive training manuals and extension packages on live animal management, such as feeding, housing, slaughtering and post-slaughtering hide and skins managements that can be incorporated with other extension services performed by the District development agents at all levels which can enhance the awareness of the producers and the collectors regarding the hide and skin quality managements.

Key words: Ethiopia • Hide • Pre and Post-Slaughter defect • Skin

INTRODUCTION

Agriculture is the most important economics sector in many African counters including COMESSA (Common Market for Eastern and Southern Africa) member state in east Africa including Ethiopia, Kenya, Burundi, Djibouti, Rwanda, Sudan and Uganda. Its contribution to GDP is significant and helps to sustain livelihoods through the provision of employments to majority of the Ruler population [1].

In Ethiopia, skin from sheep and goat are valuable animal by products for local use as well for export market. In the export market, hide and skin export has got the largest share of animal products next to live animal export. Despite the reports about the deterioration of the quality of leather raw material with an increasing number of reject grades and the appearance of skin disease called ``Ekek`` that is mainly due to lice, keds and mange infestations [2] Ethiopian small ruminant skin especially sheep skin have good reputation for quality in the world leather market due to their fine grain and compact structure [3, 4].

The leather industry sector is one of the forth growing economic sectors in Ethiopia [5]. However, because the sector is constrained by different factors like external parasites, inappropriate management of animals, faults during slaughtering and improper handling of skin before reaching to the tannery, the sector is losing large amount of money due to decline in quality and fall in export price [6]. Up to 65% of the defect that lead to decline of the quality occur in the pre-slaughter stage of production while the animal still alive and a considerable portion of these pre-slaughter defects are directly associated to skin disease initiated by external parasites [7].
Archaeological studies have shown that skins have been used since antiquity as clothes, vessels, bedding and possibly structurally in ancient dwelling places. Skins are renewable and easily perishable resources, their production is dependent on the rearing, management and disposal of the livestock population. The availability of skins through slaughtering or death of livestock is of particular importance to the leather industry. Skins could be obtained from fish, birds and reptiles as well as wild and domesticated animals. The most important sources of skins are sheep and goats [8].

Hide and skin are the external integuments of animals include materials derived from birds, fish, amphibians, reptiles and mammals. Traditionally, most hides (From large animals) and skins (From small animals) have been derived from mammals in general and from a relatively small number of domesticated species in particular. However, materials derived from wild animals (And generally referred to as game skins) may also be significant, particularly in Africa where the ranching and farming of species of antelope, crocodile, ostrich and even some fish, is increasingly important. But, internationally, most hide are derived from cattle (Buffalo in Asia) and most skins from sheep and goats (And to a lesser extent calves). Although there are livestock resources of pigs, horses and donkeys in Africa, they are relatively small in number and will not be considered in the rest of this revised draft report [9].

The potential supply of hide and skin in Ethiopia is depend on the scale of meat production, not on the size of livestock population. Thus, the product, i.e. hide and skin become available when meat is needed, not when it is appropriate for leather processing and so it is not primary agricultural commodity. This means that hide and skin supply does not respond to price change. As result, the industry in the country has tremendous potential for domestic and foreign exchange earnings and the capacity to attract profitable foreign investment. Though Ethiopia has very good potential to produce substantial quantities of skins over the last 10 years, there (556 from sheep, 450 from goat and 400 from cattle) are indications that quality of raw hide and skins supplied has deteriorated with an increasing number of poor grades [10]. The sheep skin have a fine grain and compact structure and goat skins are well known for their quality and international acceptance for producing various leather products [11].

Generally; understanding the pre and post slaughter defects of hide and skin helps us to improve the productivity that we gain from these animal products. Therefore, the objectives of this seminar are

- To give highlight on economic importance of hide and skin in Ethiopia.
- To give an overview of pre and post slaughter defect of hide and skin in Ethiopia.

**Hide and Skin as Commodities:** The global leather supply chain grew tremendously over the period 1981 to 2006, for example its exports, which included raw hide and skin, tanned leather and footwear, expanded by 32.9 percent in nominal terms from an average annual figure of $ 13, 4 billion in the 1981-1983 period to USD 59.8 billion in 2005-6 period. The three main segments namely hides and skins, tanning and footwear contributed 12.06 percent, 30.09 percent and 57.85 percent respectively to the total global export bill. Growth was propelled by rapid expansion in the exports of light bovine leather, which increased by 70 percent from $ 2.0 billion in the base period to $ 16.2 billion average per annum by 2005-2006. Footwear rose by 36.3 percent, from $ 7.7 billion to $ 35.9 billion per annum in the same period. All categories registered growth of above 90 percent, except for the exports of goatskins, which declined by 76.97 percent in the same period; however its retreat was hardly felt in the chain because its share in the exports basket was less than one percent [12].

The development of leather industry requires great quantity of raw materials of various origins, the principal source of which is livestock industry. The products are increasing from time to time, the sector and the country are losing revenue due to a decline in leather quality. A considerable portion of these pre-slaughter defects are directly related to skin diseases or secondary damage that occurs when the animal scratches itself to relieve the itching associated with some of these diseases [3].

From time immemorial, hides and skins have provided humankind with a raw material for the manufacture of a range of useful articles such as garments, footwear, bags and cases. For many centuries, the techniques used to convert a putrescible (Hides and skins) material into a durable article were based on small-scale, traditional, artisanal (Tanning) procedures. In the nineteenth century, scientific and technical developments provided scope for the introduction of large-scale commercial procedures; these now form the basis of most of today’s leather-making technology [13].
Although hides and skins have always been denigrated as a mere ‘by-product’ they are more valuable than some of the ‘primary’ products of livestock production (Namely meat or milk). And, to try to improve their status, efforts have been made to re-classify hides and skins as ‘co-products’ or even commodities. Commodities are primary goods; raw or partly processed materials whose main cost are the finding, gathering or harvesting them. They are traded for processing into finished goods. Typical examples of conventional commodities include foods (Grains, oils, tea, coffee, cocoa, fruits, meat and eggs), raw materials such as fibers (Wool, jute and sisal) and base metals (Tin, lead zinc and copper). Most are typically produced away from where they are used [14].

Ethiopian highland sheepskins in particular, remain highly competitive in international markets for some natural characteristics of clarity, thickness, flexibility, strength and compact texture which make them especially suitable for making of high quality gloves, sport equipments and garments. Goatskins, originating from Wollo in Ethiopia and classified as Bati-genuine and Bati-type are characterized by thick, highly flexible and clean inner surfaces and are in high demand for the production of fashion leathers [15].

Considering the development potential and economic importance of hides and skins, in the last few decades the government has launched different development programs aimed at increasing the supply and improving the quality of the raw material. Despite these development interventions, hides, skins and the leather industry are still constrained by the quality of raw materials, lack of an efficient market structure, a weak extension service, and a lack of price incentive for production of good quality raw material [4].

**Pre Slaughter Defects of Hide and Skin:** Skins and hides defects are classified into two main groups. First group being those created or acquired during the life of the animal (Pre-mortem defects) and second group being those that occur during and after slaughtering of animals (Post-mortem defects) [16]. Pre slaughter period covers the greater part of the animal's life, from its birth to about the time it is collected for delivery to the butchery [17].

The pre-slaughter operations that affect the quality of the hides and skins available to the tanning industry are principally the result of the quality of the husbandry applied by those who looked after the animals-herders, farmers, ranchers, feedlot staff, veterinarians, hides and skins merchants and transport operators. In some circumstances, domesticated animals may receive almost no attention throughout their lives. These are the animals left to graze or forage (Sometimes in open grassland), which may only be handled immediately before dispatch to the abattoir. By way of contrast, some dairy animals kept under intensive systems may be subject to almost continuous scrutiny. In between these two extremes there exist large ranges of animals' production systems, which can present more or less of a hazard to the quality of the animal's hide or skin [18].

**Mechanical Damage:** Mechanical damage is primarily the problem on cattle skin that Related to farming and handling practices. Most noticeable defects on hides and skins like brand marks, scratches, scars and bruises are caused by mechanical means. Scratches are very common types of lesion caused mechanically by thorns, barbered wires and horns [16].

Branding is widespread and indiscriminate practice of branding cattle with hot irons causes high losses in the hide and leather industry. Anything from 10-40 percent of the value of the hide is lost by the unsightly and irreparable damage caused by branding. The practice of branding is common due to prevalence of cattle rustling and farmers use prominent branding in order to identify their animals. There are also pastoral tribes who use branding as treatment method for certain diseases especially by applying hot irons on glands. Unfortunately most branding is done on areas of hides, e.g. on the back and rumps, which have high value [4].

![Fig. 1: Branding on the different parts of the animals. Source: [19](image)](image)

The final part of the pre-slaughter operations involves the supply and transportation of the animal to the market and ultimately the butchery. Special attention
is required at this stage since any damage to the animal will not have time to heal before the animal is slaughtered, so any defect will remain on the hide or skins as an open wound. The range of different problems that can occur at this stage is extensive and many others associated with improper transportation [20]. Hides and skins supplied to the tanning industry generally come from two different sources, controlled slaughter in designated establishments and slaughters and deaths elsewhere. The latter includes the significant quantities of hides and skins sometimes available from special festivals [21].

Skin Diseases: A considerable portion of the pre-slaughter defects that accounts for 65% are directly related to skin diseases caused by the ectoparasites; or to the secondary damage that occurs when the animal scratches itself to relief the itching. [7].

The disease that affects skin and hides quality include bacterial disease (Dermatophilosis), viral disease (Lumpy skin disease pox, warts, foot and mouth disease), parasitic disease (Lice, keds, mange ticks) [22]. But, the most common cattle skin disease reported in Ethiopia are dermatophylosis, lumpy skin disease, dermatophytosis, pediculosis, acariasis, photosensitivity and warts [23, 24].

Bacterial Diseases: Bacterial disease is one of the causes of the pre slaughter skin and hides defects. They included; Dermatitis the disease which is characterized as an exudative dermatitis. Lesions usually begin on the animals back. Early signs include matting of the hair or wool into clumps due to sticky secretions exuding from the affected skin. Streptothricosis is a common disease causing supportive lesions which break out spontaneously or become hardened. These cause blemishes on the superficial grain tissues [22].

*Dermatophilus congolensis* infection is a pleomorph bacterium which belongs to *dermatophilaceae* of the order *Acetinomycetales*, lumpy wool of sheep (Dermatitis of sheep) and strawberry foot root of sheep are also caused by *D. congolensis*, is a common disease causing suppurative lesions which break out spontaneously or become hardened. These cause blemishes on the superficial grain tissues. The disease in sheep called lumpy wool disease (Dermatitis of sheep) appearing in the inguinal region, in goats appear especially on the face and on the ears, probably because goats get infected when feeding on contaminated brushes, at the same time being hurt by the thorn. In cattle the skin lesion seen on the ventral area of the body such as axillae, brisket, inguinal area, scrotum and udder. In sheep when the lower legs are affected the condition is generally referred to as ‘strawberry foot rot. Transmission is by direct contact or through vehicle example by tick (*Amblyomma varigatum*) [25].

Viral Disease: Viral disease are among the disease that degrade the quality of hide and skin. Example Lumpy skin disease (LSD); is a viral disease that affects the skin of cattle. The characteristic gross pathological findings are the skin nodules which sometimes are also found in the subcutaneous tissue. The biggest economical loss is the loss of condition and permanent lesions of skin [25]. Bobble also considered being a viral disease prevalent in sheep skins. In raw skin, the lesions are generally visible on the flesh side as round spots but after unhearing, they become more prominent on the grain side. Bobble lesions have permanent stains on both the chrome and vegetable tanned leathers and render them unsuitable for quality leathers. Dermatitis is a virus disease characterized by the appearance on the hair side all over the skin of circular mushroom shaped elevated nodules robbery in consistency and on the flesh side as slightly depressed circular spots. Both goat and sheep skins are affected by dermatitis [26].

Fungal Disease: Ringworm is a fungal infection of the skin that is common in many animal species. It occurs in sheep and goats but not with great frequency. Lesions are most common seen on the head, ears, neck and shoulders. The lesion is often circular with hairless areas and the development of a thickened and crusty skin [27].

Parasitic Infestations: Ectoparasites are the major causes of skin diseases that hamper small ruminant production in many areas of Ethiopia. Studies conducted in different parts of the country in the past three decades have revealed that the occurrence and spread of skin diseases have been shown to correlate with feed scarcity host, poor husbandry, climatic factors and inadequate veterinary services including absence of national control strategies [28]. Ectoparasites also have transmission ability for many infections due to blood sucking habit. Skin damage is the most important cause of losses in livestock industry. Some example of them are; Mange mites, Sarcoptic Mange, Psoroptic Mange (Sheep Scab), Demodectic Mange, Pediculosis, Sheep Ked (*Ekék*) and Tick infestation [29].
In Ethiopia, keds and lice are considered a major cause of cockle and are visible on the skin surface of affected animals. It is an allergic skin hypersensitivity reaction due to lice infestation and this defect appears on the grain side of semi-processed and crust leather after pickling that cannot be detected when the skin is examined raw or unprocessed. It results in huge economic loss to tanneries and the country at large since the damage is recognized after a lot of cost is incurred on the processing after which the damaged skins have to be rejected or downgraded [7, 30].

Sheep keds are wingless flies brown in color. They are found on goats but are more commonly seen in sheep. Keds suck blood and can cause anemia as well as skin irritation. Sheep ked *Melophagus ovinus* is more prevalent in highlands than midlands and no cases yet recorded in lowlands in the country. Infestation of sheep with *Bovicola ovis* and *Melophagus ovinus* leads to the development of “Ekek” and causes higher proportion of skins to fall into the lower grades [31].

Ticks belong to Arthropod phylum and to the class of Arachinidae sub class *Ixodidae*, for domestic animals they are the most dangerous and most wide spread of ectoparasites and disease vectors. Tick occurs in the temperate as well as in to the tropics and sub tropics regions of the world. They adversely affect animal health especially in the tropics. The losses have been estimated in the range of USD 7 billion, annually, with 80% of the world cattle population of approximately 1.24 million at risk from tick and tick borne diseases [29].

**Hide and Skin Defects from Natural and Livestock Husbandry Practices:** Pre-mortem defects may arise from natural or acquired causes. The various affecting factors and causes include; Age, Sex and Breed of the Animal: these have significant effect on quality of the leather. The skin of sheep breed types of Ethiopian highlands and goats from some parts of low lands of Ethiopia, are considered to have fine grain with strong fiber structure. Climate and Feeding Variations in climate and feeding of animals are major factors in determining quality of skins. Animals with poor nutrition yield skin of poor substance and lesser area than well fed healthy animals. Climate has also sizable impact on quality of the skin with respect to substance of skins and exposure to parasitic, damage, highland skins are a bit thinner, less greasy and much stronger in fiber structure than skins from lowlanders [32].

There is little documented information on the correlation between qualities of livestock nutrition and the quality of raw hides and skins. However, it must be appreciated that poor animal nutrition affects adversely the production of all animal products, i.e. meat, milk. It is therefore unlikely that hides and skins quality remain unaffected. For example, animals from the commercial sector produce better quality hides because of better breeds as well as better nutrition. Zebu cattle from the communal sector fattened for supplying to the abattoirs also produce better quality hides than those produced by pastoral cattle, indicating that nutrition plays a role in improving both meat and hide quality [4].

The climate on which an animal is raised has an effect on substance of the skin and on the grain of the leather. Animals raised in warm climate have a short hair and leather produced has superior substance, smoother and finer grain patterns, where as animal raised in cooler climate or higher altitude grow longer wool or hair and especially on substance is more pronounced on sheep and goat skin than on cattle hide [33].

The Age also affects the hides and skins in two different ways. Younger animals have good tight grain patterns, but they are damaged easier. Older animals have tougher and coarser grain patterns. Also, the older an animal is the more exposed to scars, brands and scratches it tends to accumulate. Younger animals have the better hide quality [34]. The older the animal, the more the vulnerable to injuries and diseases and other defects from the bad management practices, like shearing and branding could play a role in the occurrence of skin defects. The older the animal, the more the vulnerable to injuries and diseases and other defects from the bad management practices, like shearing and branding could play a role in the occurrence of skin defects [35].

The issue of housing and fencing is a management problem and therefore requires appropriate steps to reduce damages to the hide/skin of an animal. Some of such damages include pricking, scratches, drag marks and dunging. Indeed these damages affect the grain layer (Leather surface of the corium layer) which after tanning, lowers’ the quality of leather grades and utility in resultant leather goods processing. In particular dunging predisposes the hides or skin to microbial action serving as a good medium for microbiological activity eventually destroying the final quality of the leather surface [36].

**Post Slaughter Defects of Hide and Skin:** Post-mortem defects comprise of inadequate bleeding, gouge marks, flay cut, putrefaction, hair slip and beetle damages, etc. [32]. Which are directly related to transportation, preservation and storage of the materials and hence are the product of poor management and treatment.

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Flay defects are very common in Ethiopia because of lack of knowledge and experience of people who perform the job. The type of flaying equipment also plays a major role in the production of good quality skins and hides. Almost all slaughter facilities except some modern abattoirs use hand flaying. As a result, flay cuts and gouges are a common feature on hides and skins [37].

Knife Cuts Defects: Defects which are caused due to unnecessary use of knife, insecure position of the carcass and bad lighting. If the ripping line is not properly cut, the final shape will not be symmetrical and may affect the usefulness of the skin for commercial production of quality leather, ultimately affecting the value of the leather itself. Improper fleshing allows fatty tissues to remain on the skin, resulting in poor curing both by salting and air drying. Inadequate bleeding causes rapid development of bacteria along the blood vessels as a result of bacterial spread from the blood vessels, skin fibers in the vicinity are destroyed and open channels following the course of the blood vessels are formed through the skin surface [38].

Post Flaying Defects: Bacterial and enzymatic breakdown results rotting hide and skin. Hide and skins should be preserved within short period of time, after removed from the carcass to avoid bacterial growth and decomposition of the skin that downgrade the quality of hide and skin. Hair slip is the first sign of putrefaction, if hair slip is not checked putrefaction starts from both the grain and flash side leading to decomposition of the grain layer and the flesh side and in advanced cases complete disintegration of the corium may occur [39].

Preservation Defects: Preservation methods such as salting or frame drying are not practical fully by farmers, collectors and traders of hides and skins, as a result of which hides and skins suffer from hair slips, mould and bacterial attacks. Delays in cleaning, drying or curing cause damage through putrefaction [40]. Rubbing, wetting, vermin damage and insect damage are also damages that occur due to incorrect storage of skins [41, 42].

Storage Defects: Even after the hides are properly dried or cured they may still suffer damage by careless handling. Inadequate strapping when the hide is baled can damage loose shanks and edges getting torn. Outside hide of loosely packed bales have been almost torn in half when being moved and thrown about during transportation. Excessive pressure by baling presses will cause tearing of the edges and cracking at the folds and attempts should be made to place protective materials underneath the straps. Wet salted stocks can suffer damage by abrasion if baled singly hair side out [4].

Transportation Defects: Inefficient transportation may cause delays in arrival to tanneries or preservation centers as a result of which green or salted hides and skins deteriorate in quality. Poor handling during loading and unloading may damage quality of hides and skins [41]. 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 surface by adequately covering them with hessian or gunny sacks [43].

CONCLUSION

Skin and hides are the most important items to generate foreign currency for developing countries like Ethiopia. Many as one-quarter to one-third of all skin processed at tanneries in Ethiopia have various defects and unsuitable for export purposes where most of these defects occur in the pre-slaughter stage of production while the animals are alive. Moreover, impacts posed by post-slaughter defects related to poor management and treatments of skins after slaughter are also significant. Slaughter and flaying operations of animals is also conducted in many cases traditionally and by unskilled persons resulted in a number of observed post-slaughter defects.

Based on the aforementioned conclusion the following recommendations are forwarded;

- Awareness on the importance and values of hide and skin among the communities should be created.
- Accessibility of veterinary service should be distributed to the whole areas of Ethiopia to prevent skin and hide defects.
- There is a strong need to prepare comprehensive training manuals and extension packages on live animal management, such as feeding, housing, slaughtering and post slaughtering hide and skin managements.
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