

Ante and Post Slaughter Defects of Hide and Skin in Ethiopia

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Abstract: Ethiopia has 56.71 million cattle, 29.33 million sheep, and 29.11 million of goats. Besides, hide and skin has a large contribution to the leather industry in the country. Archaeological studies have shown that hide and skins have been used since antiquity as clothes, vessels, bedding, and possibly structurally in ancient dwelling places. Hides are broadly defined as the external integuments of large animals, while skins are the outer coverings of small stock (goats and sheep). The best sources of hides and skins from domesticated animals are cattle, and sheep and goat respectively. Hide and skin defects are classified under ante-slaughter defects and post-slaughter defects. Ante-slaughter defects are those created or acquired during the life of the animal such as: mechanical damage (brand marks, bruises, scars/wound and scratches), natural defects, parasitic infestation, skin diseases (fungal disease, bacterial disease, and viral disease) while post-slaughter defects are those occur during and after slaughtering of animals, which consist of flay cut, knife damage, bad bleeding, poor pattern, preservation, storage and transportations defects. Among the most significant problems during ante-slaughter defects, external parasitic infestation accounts for about 65%. While flaying cuts due to improper using of tools as well as lack of flaying skill, storage and preservation are the commonest post-slaughter problems. The main objective of this seminar paper is therefore; to indicate the major ante and post slaughter defects of hide and skin in Ethiopia.

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Key words: Ante-Slaughter, Ethiopia, Hide, Post-Slaughter, Skin.

1. Introduction

Archeological studies have shown that hide and skins have been used since antiquity as clothes, vessels, bedding, and possibly structurally in ancient dwelling places (Arugna, 1995). According to the report of (FAO, 2010), skin of cattle, camels, and buffaloes is called hide and that of goat and sheep is known as skin. Skins could be obtained from fish, shark, crocodile, birds and reptiles as well as wild and domesticated animals (Abaineshe, 2014).

Ethiopia has 56.71 million cattle, 29.33 million sheep, and 29.11 million of goats (CSA, 2014/15). These numbers illustrate a considerable potential for the production of hide and skin in the country. For instance, its potential was estimated at 3.78 million cattle hides, 8.41 million sheep skins and 8.42 million goatskins in 2012/13 (CSA, 2013). In Ethiopia, hides and skins contribute much to the export earnings from the livestock sector. In addition, it has a large contribution to the leather industry in the country. 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 (Zelege, 2000).

The leather industry is one of the fastest-growing economic sectors in Ethiopia (Bayou, 2007). Currently about 33 tanneries in Ethiopia produce all forms of hides and skins and finished leather and leather

products for the domestic and export markets (LIDI, 2015). The capacity to process hides and skins, particularly for raw sheep and goat skins greatly exceeds domestic supply. These tanneries have an average daily soaking capacity of 107,850 pieces of sheepskin, 51,550 pieces of goatskin and 9,800 hide (USAID, 2013). However, they are not working to their full capacity, as the hides and skins become available only when meat is needed and are not supplied for sustained leather processing (Bisrat, 2013).

Though Ethiopia has very good potential to produce substantial quantities of hide and skins, the quality of the hide or skin is to a large extent related to the amount of damage to the grain (or outside) surface (ESGPIP, 2009). In this regard it is estimated that about one quarter to one third of all the skins processed at tanneries are unsuitable for export due to various defects (Ahmed *et al.*, 2016). Skin defects occur as a result of a variety of causes in the life of the animal, during ante slaughter and post slaughter (ESGPIP, 2009). The hides and skins are important source of export income and its contribution to the national economy may be far below the expected potential. This is because the quality of hides and skins were damaged due to different factors. The damage may be due to skin parasites and skin diseases that affect the live animal, related to husbandry

practices on the farm or in transport of the live animal (branding, scratches, bruising, or dirt contamination); it may be due to damage during post slaughter or removal of the hide and skin, inappropriate handling (transportation) and inadequate preservation techniques. Besides management practices and processing techniques, skin quality is also affected by the genotype and environment or natural (Teklebrhan *et al.*, 2012).

In this regards, there exists a paucity of research output in identifying the hide and skin down grading problems, causes of rejections, and the measures to be taken under different agro ecologies. Most of the study was on impact of sheep and goats ecto parasites on the tanning industry (Kebede, 2013; Yacob, 2013).

Generally, understanding the ante and post slaughter defects of hide and skin helps us to improve the productivity that we gain from these animal products. Therefore, the objective of this paper is:

➤ To indicate the major ante and post slaughter defects of hide and skin in Ethiopia.

2. General Account about Hide and Skin

2.1. Nomenclature of Hide And Skin

Hides are broadly defined as the external integuments of large animals, while skins are the outer coverings of small stock (goats and sheep). The best sources of hides and skins from domesticated animals are cattle, sheep and goat respectively. However, hides and skins may also be obtained from other species of domesticated and non-domesticated animals (hides from, buffalo, camel, elephant etc.) and (skins from, pig, rabbit, mink, crocodile, ostrich, shark etc.) (Alemnesh, 2015).

2.2. General Structure of Hide and Skin

Hide and skins in their raw state consist of three layers, the epidermis or thin outside layer, a second thicker layer known as the corium, and a third layer of adipose tissue or flesh (figure 1). In the process of tanning, the first and third layers are removed. The epidermis is made up of cells an under layer of living epithelial cells and an outer layer of dead cells. This outer layer consists mostly of an insoluble protein, keratin, and affords surface protection to the body (Baily, 2003). The aesthetic value of leather comes from the grain layer. The corium layer gives leather its strength and resiliency. It is rich in the protein collagen. Individual collagen molecules combine together in the corium to form very small fibrils that are in turn bound together to form collagen fibers, which are visible under the microscope. The strength of the skin and of leather is due to cross weaving of these fibers (Behailu, 2015).

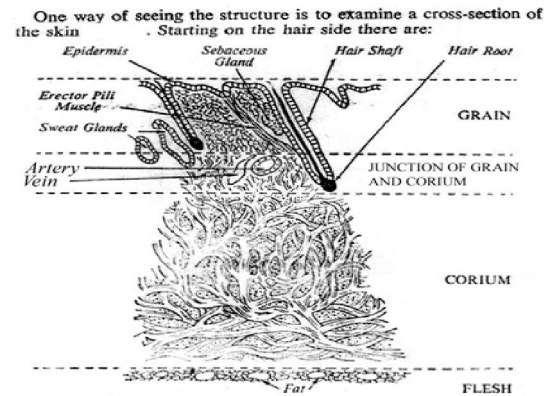


Figure 1: Cross section of the skin

Source: <http://www.assignmentpoint.com/wp-content/uploads/2013/10/Cross-section-of-the-skin.png>

3. Ante Slaughter Defects of Hide and Skin

Ante 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 (Berhe, 2009). In Ethiopia many hides and skins are discarded soon after slaughtering, but the major losses occur among materials which have been damaged before, during or after collection. Most hide and skin are affected by ante slaughter defects accumulating during the life of the animal. The commonly observed ante slaughter defects can be, natural (poor nutrition, age, sex, breed and climate effects), mechanical damage (brand mark, scratches, horn rake, yoke mark etc.), or defects due to skin diseases and external parasitic infestation (Teklay, 2010).

3.1. Mechanical Damage

3.1.1. Branding

Branding is used to identify animals especially cattle due to the prevalence of cattle rustling. Unfortunately most branding is done using hot irons on areas of hides, example, on the back and rumps, which have high value and spoils leather like wounds. 10-40% of the value of the hide is lost by the unsightly and irreparable damage caused by branding (Ahmed *et al.*, 2016). Defects on raw hides and skins are important in the domestic as well as in the export marketing of hides and skins, because they persist throughout the course of tanning and therefore affect the production and quality of marketed semi-processed and finished leather goods (Nyamrunda, 2007). Branding costs the leather industry large amounts of money due to the wasted portions of the hides (Alemnesh, 2015). The loss of value is dependent on the placement of the brand (Patterson and Loren, 2000).

Pastoralists brand their livestock with hot irons for identification (as livestock rustling is a common practice among pastoral communities) and as cure for

various diseases. Unfortunately, this is done indiscriminately and branding marks are made on the larger part of the body destroying the hide (Wayua and Kagunyu, 2012).

3.1.2. Bruises and wounds

Bruises and Wound commonly referred to as Pre-slaughter defects. Most bruises and wounds are inflicted on animals due to severe beating especially for draught animals and during transportation on trucks for slaughter (Abaineshe, 2014). Although wounds could be healed, they leave a permanent damage on hides and skins which remain visible in the final leather (Mwinyihija, 2010).

3.1.3. Scratches and Horn Rakes

Scratches are amongst the most common mechanical damages found on both hide and skins in Africa including Ethiopia and causing permanent marks. On cattle hides horn rakes are a general problem as animal husbandry practices in the countries discourage dehorning (Mohammad *et al.*, 2002).

3.2. Environmental/Natural Defect

Fine wool sheep breeds, such as Merino, produce skins that are thin, have pinhole grain and are extremely ribby. These skins produce only the cheapest type of leather. The skins of hairy sheep have a high proportion of fat in the upper part of the corium and on the flesh side of the skin. Skins from goats in the highlands are poor in substance, and open grained. The small size of skin yielded sheep of tropical and mountain area origin is not considered a drawback because of the skin's superior quality of high tensile strength, compact fiber structure and excellent grain. But small size skins that are downgraded due to poor quality are unwanted by tanneries (ESGPIP, 2009).

The breed of animal is of course important, the best hides for leather purposes usually coming from those animals which are bred for beef production, i.e. those which develop carcasses with a high proportion of lean meat in a reasonably short time under conditions of economic feeding. These hides, available from all the beef-producing countries of the world, are very tough and firm, fairly uniform in thickness and having a "square" form, since breeding programs are designed to produce a body conformation with minimal amounts of tissue in the neck, leg and belly regions (Calcutta *et al.*, 2008).

3.2.1. Age and Sex

The skins from male goats and sheep will be heavy with a coarse grain. Female skins will have better tensile strength. The skin structure of young animals tends to be fine, compact and have tight grain patterns. As animals grow older, the grain surface becomes tougher and coarser grained. Also with age animals accumulate more scars from brands, diseases, parasites, scratches and other injuries (ESGPIP, 2009).

3.2.2. Climate

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, whereas 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 (Teklay, 2010).

3.2.3. Poor Nutrition

Poor nutrition causes an animal to be smaller and also causes the skin to be thinner, poorer in substance and producing leather which lacks elasticity (ESGPIP, 2009). On the other hand, fat animals can cause too much fat content in the hide, which prevents curing agents from penetrating the hide (Behailu, 2015). Poor nutrition predisposes the skin to low febrile condition where the weight and final quality of leather is affected irrespective of the subsequent efforts of other condition being optimized. The resulting condition is referred to as "papery leather" which is a common problem experienced in the areas where poor or unavailability of pastures and forbs is eminent. Hence animals in such areas are of dilapidated condition affecting subsequently the final quality of leather (Mwinyihija, 2006).

3.4. Defects of Skin and Hide due to Infectious Disease

A considerable portion of the ante-slaughter defects that accounts for about 65% are directly related to skin diseases caused by the ecto-parasites; or to the secondary damage that occurs when the animal scratches itself to relief the itching. Skin diseases are known to affect the quality of skin. As many as one quarter to one third of all skins processed at tanneries have various defects and are unsuitable for export purposes (Ahmed *et al.*, 2016).

3.4.1. Fungal Disease

3.4.1.2. Ringworm (*dermatophytosis*)

Ringworm is a fungal infection of the skin that can affect animals of all age and common in many animal species. It occurs in cattle, sheep and goats but not with great frequency. Lesions are most commonly seen on the head, ears, neck, shoulders and often circular with hairless areas and the development of a thickened and crusty skin (ESGPIP, 2009). A fungus *Trichophyton*, which is easily spread from animal to animal through spores, causes ringworm. Lesions develop on the animal and begin to spread in all directions. Loss of hair and thickening of the epidermis mark the location of the lesion. Lesions show up in the leather produced from infected animals and appear as smooth, shiny spots. Therefore, ringworm's influence on the hide or skin reduces the value of the leather (Wesley and Wright, 2002).

Drugs available to treat (ringworm) dermatophytosis in animals include topical antifungal creams or shampoos, and systemic antifungals. Topical drugs are unable to eliminate dermatophytes from within hairs and hair follicles, but they may be effective against organisms in superficial sites, and they can decrease contamination and transmission to others. Systemic antifungals are rarely used in large animals, due to the cost of these drugs and self-limited nature of the disease. To prevent infected animals from transmitting dermatophytes to others, they should be isolated until the infection has resolved as well as the premises should be cleaned and disinfected (CFSPH, 2005).

3.4.2. Bacterial Disease

3.4.2.1. Dermatophilosis

Is a common bacterial disease such *D. congolensis* and causing suppurative lesions which break out spontaneously or become hardened and resulted damage to the hide and skin. These cause blemishes on the superficial grain tissues (Zafar, *et al.*, 2015). *D. congolensis* in sheep appearing in the inguinal region, in goats appear especially on the face and on the ears, probably because of goats get infected when feeding on contaminated bushes, at the same time being hurt by the thorn. In cattle the lesion commonly seen on the dorsal part of the body. In sheep when the lower legs are affected the condition is generally referred to as strawberry foot rot (Nigussu, 2014).

The most aspect of treatment and control of Dermatophilosis involves removal of factors predisposing to infection. Most conditions that result in cutaneous maceration must avoid giving the skin an opportunity to dry out. The area where the infected animals have been kept should be either disinfected or abandoned. For cattle, with the disease that occurs in temperate areas Tetracycline 5mg/kg body weight repeated weekly as required is recommended and long acting oxy-tetracycline 20mg/kg body weight in one injection is recommended (Roger and Weaver, 2011). With the disease that occurs in tropical areas and associated with tick infestation parenteral treatment with antibiotics, can be used and should be used in conjunction acaricides. Antibiotics that are effective include procaine penicillin combined with streptomycin (Gebreyohannes and Gebresselassie, 2013). with.

3.4.3. Viral Disease

3.4.3.1. Papillomatosis (warts)

Warts are growths that emerge as black or brown elevations on the skin. They can cause the tanner problems in several ways. They can drop off, or disrupt the unhairing operation. In the area where warts were on the skin, the leather produced is weak and considered worthless (Wesley and Wright, 2002).

Treatment intervention for this virus is using of autogenous vaccine prepared from fresh papilloma on the animal body (Zafar *et al.*, 2015).

3.4.3.2. Lumpy skin disease

It 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 (Roger and Weaver, 2011).

Import restrictions can help prevent the introduction of lumpy skin disease. This disease is mainly spread to new areas by infected animals, but it could also be transmitted in contaminated hides and other products. Infected insects are suspected to have spread lumpy skin disease virus to new areas during some outbreaks. Outbreaks can be eradicated by quarantines, depopulation of infected and exposed animals, proper disposal of carcasses, cleaning and disinfection of the premises and insect control. This virus can survive for long periods in the environment: up to 35 days in desiccated scabs and for at least 18 days in air-dried hides. Antibiotics are used to control secondary infections (OIE, 2016).

3.4.3.3. Sheep pox and goat pox

Sheep or goat pox is a viral disease of sheep and goats which is highly contagious. Pox virus belongs together with the lumpy skin disease virus to the genus *Capri pox virus* are antigenically closely related. Healing of the skin affected by pox virus is slow and permanent scars can be left. This causes huge economic losses in the tanning sector (Behailu, 2015).

There is no treatment for sheep and goat pox, but topical antiseptic treatment of bad or deep sores and use of antibiotics to prevent secondary infection may help animals to recover. For controlling of this virus annual vaccination with sheep and goat vaccine produced at the national veterinary institute are indicated. The vaccine gives protection for at least one year (Sileshi and Desalegn, 2008).

3.4.4. Defects due to external parasite

Defects due to parasitic damage particularly cockle (ekek) lesions has increased dramatically in the past 10-15 years and is currently holding number one position as a cause for skin down grading and rejection (table 1) (Yacob, 2013). According to (Hagos *et al.*, 2013), cockle lesions caused by many ecto-parasites seriously affect skin qualities.

3.4.4.1. Demodectic mange

Demodex species enters the hair follicles and sebaceous glands producing a chronic inflammation with proliferation and thickening of the epidermis, loss of hair and has been reported in sheep (*Demodex ovis*), goats (*Demodex caprae*) and (*Demodex bovis*) in cattle. Studies in Ethiopia have indicated that it is one of the major skin diseases of sheep and goats (Molu, 2002).

The highest prevalence was 6.8% in goats by (Mulugeta *et al.*, 2010) in and around Mekele, followed by 2.83% by (Asnake *et al.*, 2013) in southern Ethiopia. It can be easily detected at the raw material stage as well as a major cause of downgrading hide and skin quality at the tanneries (ESGPIP, 2010). In bovine demodicosis the most important effect is the formation of many pea-sized nodules, each containing caseous material and several thousand mites which is ruptured to cause hide damage and economic loss. Though these nodules can be seen in smooth coated animals, they are often undetected in rough coated cattle until the hide has been dressed (Roger and Weaver, 2011).

Skin damage resulting from these ruptured nodules can cause defects in raw leather and significant economic losses to the tanning industry in the form of diminished quality of processed cattle hides (Mullen and Durden, 2009). Demodectic mange lesions can be detected fairly easily by examining the flesh side of air dried skins, noting the round “cheesy” yellow spots. During early tanning process this cheesy mass is washed out leaving empty pockets, thus, producing a pitted and scared grain surface (Molu, 2002).

3.4.4.2. *Sarcoptic mange*

This is chronic mange that may affect large areas of the body and it is more commonly seen in goats than in sheep. The skin lesions are wide spread and can cover the whole body. There is itching, loss of hair, the skin becomes thickened and folded in affected areas as well as scales and crusts develop on the skin surface. As the skin becomes more damaged it loses its power to protect the animal against secondary bacterial infections (ESGPIP, 2010). The highest prevalence of sarcoptic mites observed in sheep and goats were 30.32% in Tigray and 57% in southern Ethiopia (Molu, 2002). This is lower result in comparison with the report of (Hagos *et al.*, 2013) that the prevalence of cockle lesion on sarcoptic mange infested goat pelts in Wukro Sheba tannery was 100%.

3.4.4.3. *Psoroptic mange*

Mites of the genus *Psoroptes* cause psoroptic mange in sheep and goats. In sheep, the condition is known as sheep scab and it causes greater damage in sheep than in goats. It's prevalence is highly decreasing compared to previous studies as reported recently, 2.63% in sheep and 5.13% in goats by (Shibeshi *et al.*, 2013) in Guto-Gida district of Eastern Wollega zone. As with sarcoptic mange in goats, the skin lesions can be widespread and mange cases are often fatal. There is itching and loss of hair or wool as well as the skin becomes thickened and folded in affected areas. Scales and crusts developed on the skin surface, as it becomes more damaged it loses its power

to protect the animal against secondary bacterial infections (ESGPIP, 2010).

3.4.4.4. *Chorioptic mange*

Chorioptic mange mites are common in cattle and the condition is often referred to as leg mange or foot mange because of the distribution of the lesions, which are usually limited to the lower limbs extending up the limbs to affect the scrotum in males or udder in females (ESGPIP, 2009). This type of mange is characterized by the production of crusts, matting of hair, rubbing and flaking especially on the backs of the feet which result the damage as well as downgrading of skins and hide to the tanneries (Taylor *et al.*, 2007).

Treatment and controlling of mites are almost similar for all species of mites and which is infected sheep should be dipped with acaricide and ivermectin injection is also effective. Newly introduced animals are the main sources of infection for a flock. Therefore, these animals must be checked carefully and possibly treated before being introduced into the new flock (Sileshi and Desalegn, 2008).

3.4.4.5. *Sheep Keds*

Keds (*Melophagus ovinus*) are a wingless fly that parasitizes sheep and causing skin irritations that results damage to the skin and can produce an allergic hypersensitivity reaction in the skin of sheep. In Ethiopia, keds are considered as major cause of cockle/“ekek” and are visible on the skin surface of affected animals (Tekle, 2008). According to (Enquebahe and Etsay, 2010), the prevalence varies from 1.84 to 19.48% in Tigray regional state. Other reports were, the prevalence of cockle lesion on *Melophagus ovinus* infested group of sheep pelts in Wukro, Sheba tannery, Tigray Region was 92.5% (Hagos *et al.* (2013).

The shearing of wool sheep greatly reduces the infestation, not only because of the removal of the keds with the wool, but also exposing those remaining on the skin to the environment and this greatly reduces their development. Spraying or dipping with insecticide after shearing also will destroy keds. Keds and lice can also be controlled by organophosphorous dips, certain synthetic pyrethroids and other pour-on products (Merck veterinary manual, 2016).

3.4.4.6. *Warble flies*

Warble flies occur in dry, arid regions and are generally absent in moist regions. This is due to the fact that moist soil is not conducive to the growth of larvae into flies. Hairy goat breeds with short and drooping ears are often attacked by these insects. Vaccination of cattle using larval extracts has reduced both the number of warbles in back and the number of larvae that could pupate. Systemic insecticides like organophosphorus or ivermectin are used to kill migrating larvae, but infections and allergic reactions

may occur when the larvae die (Roger and Weaver, 2011).

3.4.4.7. Blowfly strike (*cutaneous myiasis*)

Myiasis is the infestation of the organ or tissue of the host animal by the larval stage of dipterous flies, usually known as maggots or grubs. Myiasis may be caused by screwworm flies and in most cases occur in cattle, goats and sheep. Blowflies, flesh flies and botflies are the three major categories of flies commonly responsible for causing myiasis (Roger and Weaver, 2011). Screwworms are transmitted when a female fly lays her eggs on a superficial wound of an animal and can infest a wide variety of wounds (e.g. tick bites, dehorning or branding wounds, wire cuts, and other injuries) and eggs laid in the wound will hatched into larval screwworm, which feed on the living tissue of the animal. The larvae cause great damage to the hides and skin of livestock and affect the appearance of the final leather as well as have the potential to cause death in affected animals (CFSPH, 2006).

3.4.4.8. Lice infestation

Lice are small, flat-bodied insects with legs modified for grasping hairs. There are two types of lice affect ruminants, biting (chewing) lice and sucking lice (*Lignonathus* species). Biting lice produce itching, irritation and possible hair loss, whereas sucking lice suck blood and can contribute to anemia as well as skin irritation. Heavy infestation of lice on sheep can lead to “ekek”/cockle defect, which is an allergic skin hypersensitivity reaction to lice in processed sheep skins (Chaudhry *et al.*, 2011). There are reports of a seasonal pattern to the occurrence of “ekek”; being higher during or just after the wet or rainy season (Tadesse *et al.*, 2011).

According to (Sertse and Wossene, 2007), study in Amhara region *Bovicolaovis* and *Linognathus* species are the two species with prevalences in sheep of 38.5% and 2.4%, respectively, where as in goats *Linognathus* species has prevalence of 28.3%. Nowadays, pediculosis is a serious health problem of small ruminant in Ethiopia. The highest prevalence was recently reported in sheep from Assela by (Hailu, 2010), who identified *Linognathus* species (75.5%) and *Bovicolaovis* (67.1%). Other reports were *B. ovis* in sheep 15.3 and 27.9% in goats, *Linognathusovillus* (27.9%) from Tigray by (Mulugeta *et al.*, 2010). However, this is a lower result when we compared to the report of (Hagos *et al.*, 2013) that the prevalence of cockle lesion on *Bovicolaovis* infested group of sheep pelts in Wukro, Sheba tannery, Tigray Region was 100%. Lice infestation in Ethiopia is the most frequently reported and the most important skin disease of ruminants, this is because lice are found to be the cause of cockle. Keds and lice are considered a major cause of cockle and are visible on the skin

surface of affected animals (Kidanu, 2001). It is a defect which 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 incurred on the processing after which the damaged skins have to be rejected or downgraded (Kassa, 2006).

Spraying or dipping with acaricide is effective and should always be carried out twice as a treatment and control for lice. The first time to kill the lice currently on the body and the second, 14 days later, to kill lice hatching from eggs present at the first treatment. The eggs are not affected by insecticides (Tekle, 2008).

3.4.4.9. Ticks infestation

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 the tropics and sub tropics regions of the world. They adversely affect animal health as well as their product like hide and skin, especially in the tropics. About 80% of the world cattle population of approximately 1.24 billion at risk from tick and tick borne diseases (Tadesse *et al.*, 2011). Reports from different areas of Ethiopia indicated that highest overall prevalence of ticks infestation are, 16% in sheep and 29.7% in goats from Tigray region (Mulugeta *et al.*, 2010) and 57.6% in goats from three agro-ecological zones of southern rangeland of Ethiopia (Asnake *et al.*, 2013).

The defect due to tick infestation has the shape of tiny holes or unhealed scar. The hole can be seen on the grain surface of the finished leather resembling tiny spot and hollow. The small hole and more or less healed scars mark the smoothness of the grain and detract from the appearance of the finished leather (Teklay, 2010).

Ticks are treated and controlled with acaricides only where ticks are present in large numbers. If tick numbers are not large, do not use acaricides, in this case, it is possible to kill them by hand using a needle or thorn. Shear the animal's hair and then use an insecticide such as Amitraz and solutions can be sprayed on the animal, used as a dip or pour-on. Knapsack spraying is the most practical method if more intensive control measures are needed for a small number of animals. Acaricides are toxic to people as well as animals and care should be taken to prevent any possibility of dip fluid being drunk, or contaminating ground water (Sileshi and Desalegn, 2008).

Table 1: Proportions of the major Ethiopian sheep and goat skin defects.

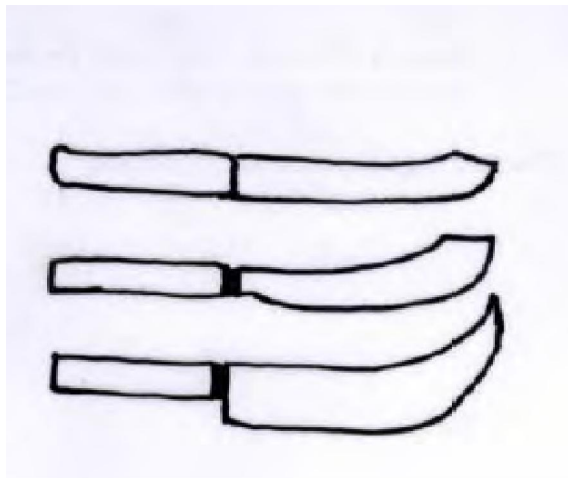
Defect Type	% on Sheep skin	% on Goat Skin
Parasitic	85	86
Scratch and Scars	80	75
Flay Cuts	35	28
Putrefaction	22	19

Source: (Yacob, 2013)

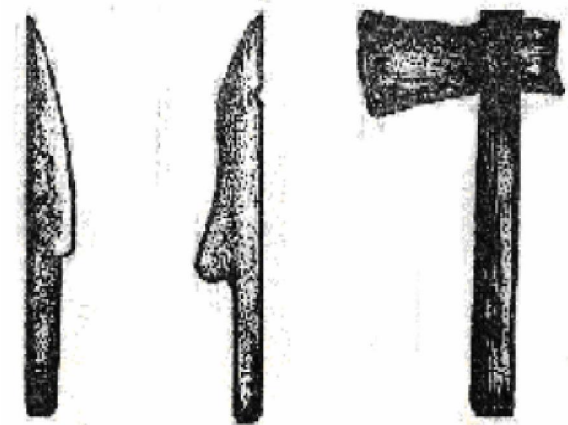
4. Post Slaughter Defects of Hide And Skin

Post-slaughter defects comprise of inadequate bleeding, gouge marks, flay cut, putrefaction, poor pattern, etc. which are directly related to flaying operation, transportation, preservation and storage of the materials (Kidanu, 2001).

4.1. Knife Cut and Flaying Defects



A



B

Figure 2: Proper ripping and flaying knives (A); improper knives used in flaying (B)

Source: (Tekle, 2008).

Damage caused by careless use of a knife during flaying, sometimes cutting through the skin. Complete perforation of the hide or skin accidentally made by knife. Flay cut, gouge marks and scores are caused during flaying period through use of sharp pointed knives (figure 2b). This subsequently reduces the quality and use of leather (Behailu, 2015).

Flay defects are very common in Ethiopia because of flaying operation of animals is conducted traditionally and by unskilled persons or without experience (table 2). 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 common problems on hides and skins (Koloka and Morek, 2010).

Table 2: Number of defects (%) observed in raw hide in two woredas of east Arsi zone, Ethiopia.

Types of defects/parasites observed	Number of hides with defects (N=386)	Percent
Flay cut	283	73.3
Gouge mark	260	67.4
Dirt	167	43.3
Skin parasite and disease (lice, ticks, mange, LSD)	25	6.5
Poor pattern	23	6.0
scar/wound	15	3.9

Source: (Behailu, 2015)

4.2. Defects from Bad Bleeding

If carcasses are not bled out properly at the time of slaughtering, blood remains in the vessels and capillaries of the hides and skins. This blood supplies ideal condition for the growth of bacteria and favors putrefaction along the blood vessel (Tekle, 2008).

4.3. Defects from Poor Pattern

It is meant, the shape or outline of the flayed hide when it is spread out flat. A regular pattern is very important to the tannery, because it enables them to get the best cuts and the most useful part of the raw material. Poor pattern that is asymmetric shape of the hide and skin is considered as a defect, as far as cuts or scores are concerned and this is commonly caused by incorrect line of ripping (Terefe, 2004). The bleeding cuts must be directly at the center of the throat. If the legs are not ripped open properly, the proportion of the hide in the shoulder and belly section is not proper. Thus belly hide that should have been part of the belly may be on the shoulder area. "V" cut in the button either side of the tail downgrades the hide, according to the degree of damage to the pattern and it is very important that the bleeding cut, the belly cut, and the leg cut are made as straight (Selamawit, 2015).

4.4. Defect from Preservation and Storage

According to (Feleke and Amistu, 2016) study in wolaita zone the majority of the household respondents (76%) sold hide and skin to market after backyard slaughter in fresh (unpreserved state) whereas the rest respondents practice different types of hide and skin preservation techniques, from which ground drying (57%) and smoking (24%) were common. This is different from the report of (Juhar *et al.*, 2015) that 85 % of hide and skin producers sell unpreserved hide and skin. These techniques of hide and skin curing are worse in maintaining the quality of hide and skin. As reported by the respondents, ease of using and material availability were the common reasons why the households preferred ground drying and smoking as methods of hide and skin preservation. In addition, 75% and 25% of butcheries in the study area sold fresh and salted hide to the market respectively (Feleke and Amistu, 2016).

Many tanneries are not within reach of the farmers and abattoirs. Therefore, hides have to be stored for long periods of time and transported across long distances to tanneries. Various preservation methods are used ranging from short-term to long-term preservation. Use of common salt is one of the traditional methods of curing and is still the most common method of preservation of hides to date (Kanagaraj *et al.*, 2015).

Hides become perishable soon after the death of the animal. The rate of decomposition is much faster in hot and humid environments compared to cold environments (Gudro *et al.*, 2014). Raw skin (green hide) is made up of 60-65 % water, 25-30 % protein, 4 % fat and about 1 % ash (Kuditet *et al.*, 2014). Within 5 to 6 hours after animal slaughter, hides are susceptible to autolytic and bacterial decomposition as they are a good medium for enzymatic and microbial action (Cadirci *et al.*, 2010). The hides decompose if they are kept wet (Thanikaivelan *et al.*, 2004). They contain huge populations of different types of microorganisms derived from the air, water, soil, manure or other types of dirt. These microorganisms secrete proteolytic and collagenolytic enzymes which degrade the hide (Orlita, 2004).

4.5. Defects due to Transportation

Inefficient transport may cause delays in arrival to tanneries or preservation centers as a result of which green or salted hide and skins deteriorate in quality. Poor handling during loading and unloading may damage quality of hide and skin (Kassa, 2006). 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 (Selamawit, 2015).

5. Economic Importance of Hide and Skin Defects

Ethiopia has a huge potential in leather and leather products industry as it stands first in Africa in terms of livestock population (CSA, 2014/15). However, the livestock potential was lagging behind to play its part more in hastening the country's economic development for long. For example, the overall performance of the sector during the first GDP period was lower than its target and it was planned to earn about 496.5 million USD, but the actual earning was 132.86 million USD which is about 2,922,920,000 Ethiopian Birr (Ethiopian Herald, 2016).

Majority of the tanneries state that only 10 to 15% of harvested skins qualify for top grades, with the rest downgraded and rejected mainly by deterioration of skin quality due to ectoparasite, skin diseases and various defects (ESGPIP, 2009). For instance, the economic impact of tick infestations is estimated about 7 billion USD and over 55 thousand USD annual loss was made in the world and Ethiopia respectively due to rejection and downgrading of hides and skins (Tadesse *et al.*, 2011).

According to (Yacob, 2013) tanneries reported that 35% of sheep skin and 56% of goat skin are rejected due to external parasites and skin disease. The estimated economic loss due to this rejection is around 25.8 million USD annually, which is quite a significant loss to the economy.

6. Conclusion and Recommendations

Contribution of skin and hide to the country economy is not as expected despite the large livestock population in Ethiopia. This is due to rampant skin diseases, mechanical defects, backyard slaughtering system and poor marketing system. Skin and hide are the most important items to generate foreign currency for developing countries like that of Ethiopia. However, many as one quarter to one third of all skin processed at tanneries in Ethiopia have various defects and unsuitable for export purpose where most of these defects occur in the ante-slaughter stage of production like from skin disease, external parasitic infestation, mechanical damage and natural or environmental defects. For instance, in Ethiopia losses from tick damage to hides and skin were claimed to be about one million Ethiopian birr per annum. Moreover, defects posed by post-slaughter defects related to poor management and treatment of hide and skin after slaughter are also significant. Slaughter and flaying operation of animals is also conducted in many cases traditionally and by unskilled persons resulted in a number of observed post-slaughter defects.

Therefore based on the above conclusion, the following points are recommended to prevent hide and skin defects:

✎ Continuous public education to livestock owners, local skin and hide traders/collectors, flayers, butchers and abattoir workers is paramount important.

✎ Intensive public awareness about animal husbandry could also have great role in decreasing ante-slaughter defects.

✎ Strategic animal health service should be strengthened to reduce the impact of ectoparasites and other skin diseases.

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