

Producers' Perception and Practices of Hide and Skin Management and Assessment of Defects at Collection Centers in Two Districts of East Arsi Zone, Ethiopia

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Abstract: A cross sectional study was conducted from December 2014 to April 2015 in Dodota and Hitosa Districts of Ethiopia with the objectives of assessing livestock holders' animal management practices affecting hide and skin quality and prevalence of defects on raw hide and skin at collection centers of the study area. Questionnaire survey and observational studies were employed to address the problem. Only, 44% of the respondents have reported to seek help on livestock skin problems. They also listed lack of hide /skin management extension services, inaccessibility of slaughter facilities, inadequate veterinary service, skin diseases, inadequate access to market and unattractive market price as major problems to hide and skin management. Majority of them use muddy floor house to shelter their animals at night. Observations during the study period revealed none of the 1152 hide and skins examined at collection centers were free from defects. Major defects observed on raw hide were horn gouges (cattle), bruising and lesions from diseases at pre-slaughter stage, corduroying, hole, gouge mark and flesh remnants due to improper slaughtering process and contamination with dirt and putrefaction (sheep and goats) originating from faulty post-slaughter hide and skin management problems. The prevalence of skin lesions, bruising, flesh remnants, poor pattern and hole was significantly higher on sheep skin than goat skin ($P < 0.05$). In conclusion, the presence of knowledge gap, faulty hide and skin management practices and prevalence of major pre-, during- and post-slaughter hide and skin defects suggest the need for introducing an effective mitigation strategy if the country has to prevent losses from processing and exporting poor quality products.

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

INTRODUCTION

Ethiopia has 55.03 million cattle, 27.35 million sheep and 28.16 million of goats [1]. This places the country as one of the richest countries in livestock resources. It has a huge potential for production of hide and skins. For instance, its potential was estimated at 3.78 million cattle hides, 8.41 million sheep skins and 8.42 million goat skins in 2012/2013 [2]. About 90 to 95% of the hide and skin

production is derived from urban as well as rural backyard slaughters and the remaining 5 to 10% from major urban slaughter houses and export abattoirs [3].

Foreign exchange generated from exports of live animals, leather and leather products and meat and meat products amounts to USD 147.9 million, 103.8 million and 63.3 million per annum respectively. In this regards, though Ethiopia has very good potential to produce substantial quantities of hide and skins, the quality of the

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hide or skin is being degraded due to several factors [4]. In this regards, the leather industry sector is losing large amount of money due to decline in quality and consequently fall in export price [5, 6]. 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 [6]. Skin defects occur as a result of a variety of causes in the life of the animal, during slaughter and post slaughter [4, 10, 11]. This study aimed at assessing pre- during and post-slaughter hide and skin management practices affecting their quality and identifying defects on the raw materials at collection centers in two Districts of Eastern Arsi zone of Oromya Regional State, Ethiopia.

MATERIALS AND METHODS

Study Area: The study was conducted from December 2014 to April 2015 in two purposively selected Districts of East Arsi Zone (Dodota and Hitosa). Hitosa is one of the 180 Districts in the Oromia regional state, part of the Arsi Zone. The altitude of this District ranges from 1500 to 4170 meters above sea level (masl); mount Chilalo is the highest point. The livestock population of the Hitosa District is estimated as 144, 851cattle, 62, 976 sheep, 44, 819 goats, 3, 842 horses, 27, 973 donkeys' 586 mules and 370, 546 poultry. Dodota is another District in Arsi Zone located in the Great Rift Valley. The altitude of this District ranges from 1400 to 2500 masl. The livestock population of the District is estimated as, 34, 473 cattle, 23, 161 sheep, 17, 200 goats, 1906 horses, 8, 103 donkeys and 30, 566 poultry.

Study Population: For the questionnaire survey, the study population consisted of all farmers that keep livestock in the two Districts. For the raw hide and skin defect assessment, the study population included all hide and skins supplied to major collection centers on the main market days of the weeks within the study period.

Study Design: A cross-sectional study design was employed to study management practices and animal slaughtering process in relation to pre-, during- and post-slaughter hide and skin problems. Furthermore for the identification of defects on raw hide and skins at collection centers a cross-sectional observational study was conducted.

Sample Size Determination and Sampling Method

Questionnaire Survey: For the questionnaire survey, a systematic random sampling technique was used to select

livestock owners from 10 purposively selected Kebeles (Lowest administrative unit) within the two study Districts. Lists of households were generously provided by Kebele (Lowest administrative structure) administrations. The sample size was determined using the formula recommended by Ashram [12] as follows: $n=0.25/SE^2$

where,
n = sample size
SE = standard error,

The required sample size was calculated at a standard error of 5%. Accordingly, 100 livestock owners were incorporated in the questionnaire survey.

Observational Study: For the observational study, sample size of hides and skins required to assess pre-, during- and post-slaughter defects at collection centers was calculated using the formula described by Thrusfield [13].

$$n = \frac{1.96^2 P_{\text{exp}}(1 - P_{\text{exp}})}{d^2}$$

where,
n = required sample size
 P_{exp} = expected prevalence
 d^2 = desired absolute precision

Based on the above formula, with the assumption of 50% expected prevalence as there were no reports for the study sites, 95% level of confidence and 5% desired level of precision, the sample size was calculated as 384 for skins of each animal species. Accordingly, a total of 1, 152 cattle hide, sheep and goat skins were systematically selected and examined.

Data Collection

Questionnaire Survey: One hundred households (50 from Hitosa and 50 from Dodota) were interviewed using a pre-tested structured questionnaire. They were interrogated on livestock husbandry practices and knowledge and practices of hide and skin management during slaughtering and after the skin and hides are removed.

Hide and Skin Observation: Fresh raw hides and skins supplied to collection centers in the study Districts were thoroughly examined for possible pre-slaughter, during slaughter and post-slaughter defects and findings were

recorded on pre-prepared forms. Various forms of skin defects of pre-slaughter included mechanical damages, cockle, pox and lumpy skin disease lesions; those of during-slaughter included holes, poor pattern, gouge-marks and corduroying; and those of post-slaughter included dirt, putrefaction, pests and rodent damages appearing 2.5 cm from the edges towards the center of the skin were registered.

Data Management and Analysis: Data were collected, coded, entered, managed and stored into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS, version 20) software. Descriptive statistics were used to analyze data. The Chi-square (X^2) tests were used to observe the association between species and skin defect and the skin quality of nodular carcass and nodule free skin.

RESULTS

Questionnaire Survey

Socio-Demographic Characteristics: Among the 100 respondents to the questionnaire survey, 95% were males. Their age ranges from 26 to 64 years and 97% of them were illiterate at the time of the study. Majority (91%) of the respondents from both Hitosa and Dodota districts rear oxen for ploughing purposes and cows for producing replacement calves whereas only 9% of them keep cattle for other purposes including milk production. Similarly, 83% of the questionnaire survey participants utilize sheep and goat for both household consumption and income generation whereas the remaining respondents reported to keep small ruminants for either of the two purposes.

Pre-Slaughter Hide and Skin Management Practices:

In the assessment of the awareness and practices of livestock owners, 40% of the respondents from Hitosa and 48% from Dodota stated that they care for the hide and skin irrespective of the purposes for which the animal is raised. Their reasons were to keep their animals healthy and hence the quality improvement of the hide and skin was secondary to this value. Respondents also ascertained that they shelter their livestock in different housing system. Seventy nine percent of them use muddy floor housing whereas the remaining use animal houses with concrete floor. Majority of the latter are located in urban or peri-urban areas and are engaged in cross-breed dairy production. Few respondents from Hitosa (8%) brand their cattle for the purpose of identification and disease treatment whereas this practice is said to be

absent in Dodota district. Seventy-four percent of household respondents from both Districts were aware of the negative impacts of improper management of live animals on hide and skin quality.

Hide and Skin Management Practices During Slaughtering Process:

In both Districts, almost all the respondents practice home slaughter. They slaughter their cattle on the ground without stunning. Sheep and goats are hoisted for finishing after slaughter. All respondents claim to use straight sharp tipped knife for ripping slaughtered animals. On the other hand, 76% of the respondents from both areas use both straight sharp tip and curved sharp tipped knives for flaying while 24% used only curved sharp tipped knife for the same purpose.

Post-Slaughter Hide and Skin Management Practice:

The current study on the post-slaughter hide and skin management practices of survey respondents showed that 27% of them use wet-salting and 14% of them use ground drying whereas the remaining 59% sell hide and skins unpreserved. The latter group of respondents also ascertained that they keep the unpreserved raw materials for different time period until it is sold (Table 1). Accordingly, less than 20% of the hide and skin producers sell fresh unpreserved raw materials within 12 hours of flaying.

Personal observation and discussion with key informants (Responsible experts as well as hide and skin traders). Both districts showed that the hide and skin marketing areas were not shaded and were muddy or full of dust (Figure 1). The purchased hide and skins on major market days stay for a number of hours under direct sunlight until they were transported to collection centers and preserved with salt. Almost all the respondents reported the use of plastic bags, without proper aeration, to transport sheep and goat skin to market places or collection centers. Storage facilities at collection centers were not well ventilated, lack adequate space, cleanness and proper drainage and had poor floor structure. It was noticed that immediate salting after buying was not a common practice by the collection centers. Hence, the hide and skins found in the hands of collectors are often seen putrefied with bad smell.

Constraints on Hide and Skin Quality Management:

During an interview with regards to the prevalence of major constraints on hides and skin management, 99% of the respondents replied that, there were no extension

Table 1: Respondents' practices on time spent between flaying and selling of unpreserved hide and skins

| Duration until the material is sold | % Respondents |
|-------------------------------------|---------------|
| 6 hours | 1 |
| 12 hours | 17 |
| 24 hours | 42 |
| 2 days | 22 |
| More than 2days | 18 |
| Total | 100 |



Fig. 1: Open air hide and skin collection point at Eteya market

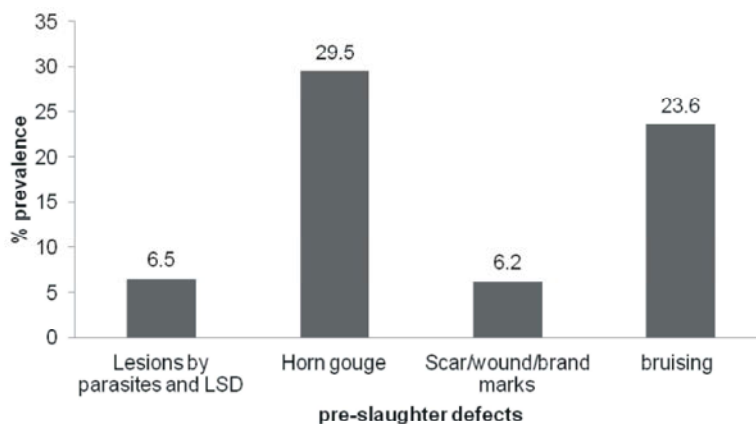


Fig. 2: Pre-slaughter defects observed on cattle hide at collection centers in the study Districts

services regarding pre-and post-slaughter management of hide and skins. Feed shortage and inadequate veterinary services were also mentioned as major constraints that could ultimately contribute to lower hide and skin quality. On focused group discussion and from an inquiry presented to veterinarians in Dodota and Hitosa districts, major skin diseases and ectoparasites of cattle prevalent in order of their importance were lumpy skin disease, lice, ticks, abscess and mange. Similarly, diseases or pests of sheep and goats in order of priority were sheep and goat pox, lice, mange, ticks and abscess which were supposed

to affect the quality of the skin. Author's personal observation showed that there were no slaughtering facility in Hitosa District and slaughtering was done in an open space reserved for this purpose. There was only a small slaughter slab in Dodota District which had cattle hide preservation and storage facility. Respondents listed market inaccessibility, lack of adequate awareness on the significance of hide and skin quality management, unattractive market price etc. which altogether discourages them to sell unpreserved hides and skins without either spoilage or significant delay.

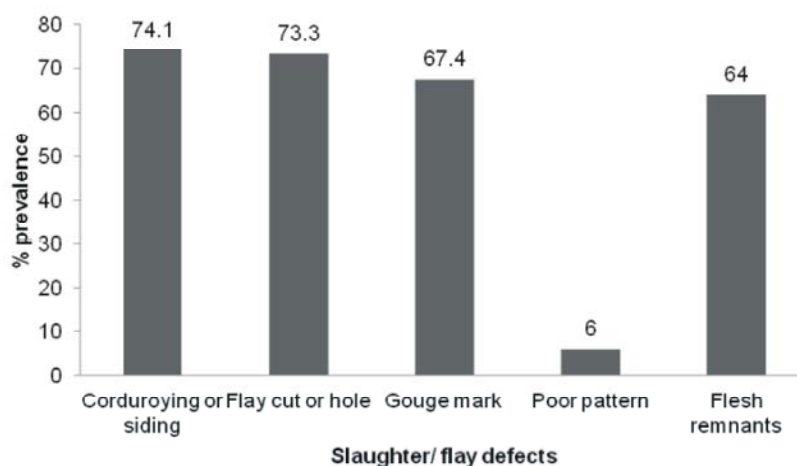


Fig. 3: Slaughter defects registered from cattle hide at collection centers in the study Districts

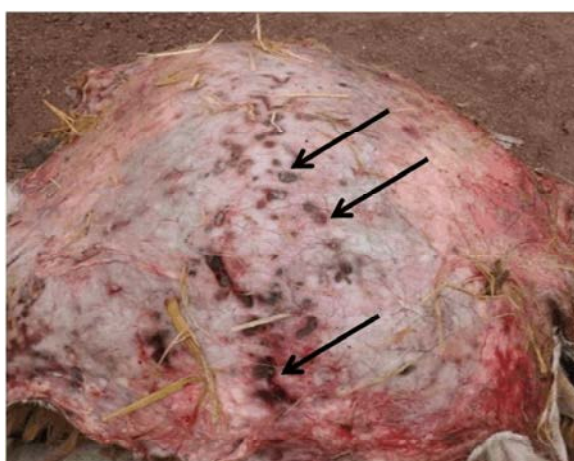


Fig. 4: Necrotic pox-like lesion (Arrows) on raw sheep skin (Eteya collection center, Hitosa District)

Table 2: Pre-slaughter defects detected on raw sheep and goat skins at the study districts

| Pre-slaughter defects | Number (%) prevalence of defects | | P-Value |
|--|----------------------------------|---------------------|---------|
| | Sheep raw skin N=388 | Goat raw skin N=384 | |
| Lesions from ecto-parasitism & sheep pox | 37(9.5)* | 17(4.4) | 0.022* |
| Bruising | 38(9.8) | 6 (1.6) | 0.000* |
| scar/wound | 6(1.5) | 4(1.0) | 0.538 |
| Small size | 34(8.8) | 35(9.1) | 0.855 |
| Poor substance | 0(0.0) | 5(1.3) | 0.024* |
| Overall | 28.4 | 17.4 | |

* Difference between sheep and goat skin is statistically significant

Table 3: Slaughter defects detected on raw sheep and goat skins at the study districts

| Slaughter defects | Number of defects (%) | | P-Value |
|---------------------|-----------------------|---------------------|---------|
| | Sheep raw skin N=388 | Goat raw skin N=384 | |
| Flay cut/hole | 122(31.4) | 63(16.4) | 0.0001 |
| Corduroying /siding | 65(16.8) | 54(13.8) | 0.261 |
| Gouge mark | 44(11.3) | 39(9.9) | 0.523 |
| Flesh remnant | 68(17.5) | 41(10.7) | 0.007 |
| poor pattern | 27(7.0) | 10(2.6) | 0.005 |
| Overall | 84 | 54 | |

Assessment of Hide and Skin Defects at Collection Centers

Defects on Raw Cattle Hides: The present study showed that, one or more defects were observed in all (n=384) examined raw hides. On visual examination of cattle hide at collection centers, horn gouge and bruising were the predominant pre-slaughter defects (Figure 2), whereas slaughtering problems such as corduroying, flay cut, hole, gouge mark and flesh remnants prevail at much higher frequency (Figure 3). Contamination with dirt (43.3%) was the only post-slaughter defect noticed on cattle hides at collection centers. Parasites such as lice and ticks as well as lumpy skin disease (LSD) were among the causes of lesions on the hide.

Defects on Raw Sheep and Goat Skins: The study revealed that, all raw skins sampled from 388 sheep and 384 goats were found with at least one defect. The major pre-slaughter defects observed were bruising, lesions from skin disease and small size in sheep whereas lesions from skin disease and small size predominate in goat skin (Table 2, Figure 4). Prevalence of skin lesions and bruising is significantly higher in sheep skin than goat skin whereas poor substance was dominant in goat skin ($P<0.05$). On the other hand, flay cut/hole, gouge mark and flesh remnants were the most prevalent defects originating from faulty slaughtering process in both sheep and goat skins (Table 3). The frequency of defects caused by flesh remnants, poor pattern and flay cut/hole was much higher in sheep skin than in goat skin ($P<0.05$). Defects assumed to appear at post-slaughter stage were also assessed. Accordingly, contamination with dirt was 26.5% for sheep skin and 20.6% for goat skin and the difference between the two was significant ($P<0.05$). Similarly, putrefaction due to delay in selling or preservation was prevalent at 7.2% and 4.7% in sheep and goat skins respectively.

DISCUSSION

Questioner Survey: The present survey revealed that livestock keepers in the study areas manage their livestock in a traditional way. The existence of animal feed shortage in the study areas is very significant because poor nutrition predisposes the skin to low fiber condition where the weight and final quality of leather is affected irrespective of the subsequent efforts of other condition being optimized [14]. The resulting condition is referred to as “papery leather” which is a common problem experienced in areas where inadequacy of quality and

quantity of feed is prevalent. Hence animals in such areas are of dilapidated condition affecting subsequently the final quality of leather.

The enquiry made to know the experiences of housing in both study areas revealed that livestock owners construct shelter for their animals. However, they are not appropriate for good handling of animals and quality of hide and skins. Mwinyihija [14] reported that the issue of housing and fencing were managerial problems that predisposed the hide and skins to damages such as pricking, scratches, drag marks and dunging. Indeed, these damages affected the grain layer (Leather surface of the corium layer) which after tanning, lowers the quality of leather and utility in resultant leather goods processing. This condition might be one of the reasons for the prevalence of scars, bruising and wounds observed in the present study.

Majority of respondent farmers were aware of the impact of good animal management on the quality of the hide and skin. However, significant number of them were also lacking this perception suggesting that continued awareness creation programs through livestock extension services is essential. In this regards, the questionnaire survey respondent's ascertained absence of extension services on hide and skin quality management. Similar analysis was made on the significance of adequate knowledge with regards to hide and skin quality management in Botswana [15].

Backyard slaughtering practiced by all of our respondents has their own limitations. The rough slaughtering ground exposes the skin to bruising and scratches, some of them use inappropriate knives for ripping and flaying altogether contributing to hide and skin damage and poor quality. This has been further reflected by the high prevalence of flay defects in both hides and skins. According to USAID [16] nearly 76% of sheep and 82% of goats were slaughtered in the backyard. There was only one slaughtering facility available in the study areas which agreed with the situation elsewhere in Ethiopia [3, 8] and Botswana [15]. The questionnaire survey findings on livestock skin diseases were in line with the report of USAID [16]. A considerable portion of the pre-slaughter defects that accounts for 65% of hide and skin rejection or downgrading cases are directly related to skin diseases caused by ectoparasites, or to the secondary damage that occurs when the animal scratches itself to relief the itching [17, 18]. Assessment of factors causing skin defects at Bahir Dar Tannery in Ethiopia has also revealed cockle caused by ectoparasitism as major cause of skin quality degradation [6, 8, 19].

Observation of Raw Hide and Skin Defects: The findings of this study clearly showed that no skin or hide was detected free of defects. This is in agreement with the reports of Zemene and Addis [19]. The most important defects of the raw hide in the study areas were horn gouge and bruising, corduroying, flay cut/hole, gouge mark and contamination with dirt. In Bahirdar [19] and Sheba tannery [20] leather industry of Northern Tigray of Ethiopia recorded similar results. The prevalence of corduroying, flay cut hole, gouge mark and dirt in the present study was higher than the result reported by Melkamu [21] who reported corduroying (7.9%), flay cut (12.2%), gouge mark (17.7%), dirt (17.9%), poor pattern (13.5%) and scar (6.7%) in East Gojjam zone of Amhara regional state suggesting differences in perception, practices and access to slaughtering facilities of communities from different areas. Absence of adequate slaughtering slabs and practice of using inappropriate flaying and ripping knives in the study areas might have contributed for the high prevalence of flay defects during the slaughtering process. Manual removal of hides and skins, if not carefully done, can cause extensive damage to the hide /skin via cuts and holes which substantially reduces their value.

The current study also revealed bruising and skin diseases mainly by ectoparasites during pre-slaughter stage, knife cut/hole, gouge mark and flesh remnants during slaughtering process and contamination with dirt and putrefaction at post-slaughter stage were the major defects of sheep and goat skins in the study areas. This result is in line with study reports from different regions of Ethiopia [8, 9, 11, 19, 20, 22]. On the other hand, the prevalence of sheep and goat skin defects observed in this study was higher than the findings of Melkamu [21] in East Gojjam zone of Amhara regional state (Ethiopia). Absence of differential pricing coupled with lack of hide and skin quality management extension services might have contributed to the careless production and handling of the raw materials.

CONCLUSION

In conclusion, assessing perception and practices of communities and identify major hide and skin defects revealed the presence of knowledge gap, faulty hide and skin management practices and prevalence of major pre-, during- and post-slaughter hide and skin defects that can ultimately contribute to downgrading of the products. Therefore, it is recommended to integrate hide and skin quality management in livestock extension packages and

install quality-based differential pricing scheme to encourage hide and skin producers, improve access to slaughtering facilities and boost sustainable community based skin disease control.

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