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# Production practices and quality defects of hides and skins in Northern Ethiopia

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## ABSTRACT

This research was undertaken to assess hide and skin production practices and identify quality defects of skins. The study was undertaken in Hyquey region of Ethiopia. Data collected from skins were analyzed by R software. For ranking constraints, priority index was employed. Major constraints were feed shortage, low price and poor husbandry with indexes of 0.15, 0.14 and 0.13, respectively. Common causes of skin rejections were: smoke, fly cut, parasite, scratch, wart, pox, putrefaction, vein, thorn, cockle, careless handling, rats and small size. Bati had highest rate of rejection (46.7%). Major causes of skin defect were fly cut (Hara); vein and smoke (Bati); fly cut, putrefaction and smoke (Kelala). There was a significant difference ($P<0.001$) among rejection causes. Kelala had highest quality (4.8%) and Bati lowest (0.1%). To reduce the defects use of appropriate knives, proper preservation, proper feeding and health care are important. Rigorous awareness should also be given to value chain actors on proper handling, transportation and preservation of hides and skins.

Key words: Ethiopia; hides and skin defects; Hyquey

## RÈSUMÈ

Cette recherche a été entreprise pour évaluer les pratiques de production des cuirs et des peaux et identifier les défauts de qualité des peaux. L'étude a été entreprise dans la région de Hyquey en Éthiopie. Les données collectées sur les peaux ont été analysées par le logiciel R. Pour les contraintes de classement, un indice de priorité a été utilisé. Les principales contraintes étaient la pénurie d'aliments, les bas prix et les mauvaises pratiques d'élevage avec des indices de 0,15, 0,14 et 0,13, respectivement. Les causes courantes de rejets cutanés étaient: la fumée, la coupure de mouche, le parasite, l'égratignure, la verrue, la variole, la putréfaction, la veine, l'épine, la coque, la manipulation imprudente, les rats et la petite taille. Bati avait le taux de rejet le plus élevé (46,7%). Les principales causes de défauts cutanés étaient les coupures de mouches (Hara); la veine et la fumée (Bati); la coupure de mouche, la putréfaction et la fumée (Kelala). Il y avait une différence significative ($P <0,001$) entre les causes de rejet. Kelala avait la qualité la plus élevée (4,8%) tandis que Bati avait la plus faible (0,1%). Pour réduire les défauts cutanés, l'utilisation de couteaux appropriés, une bonne conservation, une alimentation appropriée et des soins de santé sont importants. Il convient également de sensibiliser rigoureusement les acteurs de la chaîne de valeur à la manipulation, au transport et à la conservation appropriés des cuirs et des peaux.

Mots clés: Éthiopie; défauts des cuirs et des peaux; Hyquey

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## INTRODUCTION

Ethiopia possesses one of the world largest livestock populations: eighth for cattle, twelfth for sheep and lambs, and eighth for goats (FAO, 2001). Hides and skins are important livestock products providing income for the poor people living in the rural areas of the country. Since these products have significant economic importance, much effort is needed to improve the quality and increase the quantity so that there will be effective and efficient utilization.

The raw material of the leather industry is mainly derived from local areas of the country where basic amenities for slaughtering and subsequent marketing are either not in existence or lacking. Additional sources of hides and skins include slaughter slabs, municipal slaughter houses, the limited number of export abattoirs and meat and meat product processing plants. In the last few years, the government of Ethiopia has launched different development programs aimed to increase the supply and improve the quality of the raw material. Despite these development interventions, hides, skins and the leather industry are still constrained by the poor quality of raw materials, lack of an efficient market structure, a weak extension service, competition from local/rural tanning industries and a lack of price incentive for production of good quality raw material (Mahmud, 2001). The quality of finished leather is related to a number of surface and structural defects that hides and skins acquire during the life of the animal, slaughtering, storage and transportation stages.

As many as 1/4 to 1/3 of all skins processed at tanneries have various defects and are unsuitable for export purposes (Kassa, 1998). Up to 65% of these defects occur in the pre-slaughter stage of production while the animals are alive. The estimates from Ethiopian tanneries have put the numbers of reject skins, at certain times of the year at as high as 50-60% (Stosic, 1997). The environment and husbandry practices contribute to the reduction in the quality of raw materials. Apart from damage due to ecto-parasites and diseases, it is estimated that more than 300 different kinds or more of physical or mechanical damages can be identified on skin and hides. According to Zenaw and Mekonnen (2012), these include those caused during ante-mortem and post-slaughter.

By identifying the major problems of quality and quantity of hides and skins in eastern Amhara, this study will help to inform policy makers to implement specific and efficient institutional and other relevant options to develop efficient production and extension program that would benefit the smallholders and the country. Hence, the research findings will inform policy makers and practitioners to rethink and pinpoint about the constraints and solutions of the current problems of hides and skins and indicate intervention options.

The quality and quantity of the raw materials do not satisfy the existing leather plants of the country. For instance, Kombolcha tanning industry is operating at much below full capacity inevitably face a relatively high unit cost of production and there by adversely affecting its competitiveness in the market. As a result, the country has put a temporary plan to import raw hides and skins. This calls for to carry out depth research on hides and skins so that to improve the quality and increase the quantity which goes to the leather plants.

Eastern Amhara is assumed one of the major potential sources of these materials especially for skins of sheep and goat. However, to date, there is no compiled and published information on production systems of hides and skins and the associated constraints and opportunities of hides and skins produced in the study area. In addition, the general quality of hides and skins produced in the study area has not been

assessed so far. In order to increase income and marketability of hides and skins produced in the study area, it is important to assess the nature of defects of hides and skins vis-à-vis the standards set for hides and skins. Studying the production system is also important to identify problems associated with hides and skins production and to formulate appropriate development strategies pertinent to hides and skins production in the study area. Hence, this research work was aimed to assess hide and skin production practices and identify quality defects of skins in eastern Amhara.

## MATERIAL AND METHODS

**Description of the study area.** According to the livelihood zone categorization of the country, the study area is generally food insecure, with a long history of food aid distributions as the forest and cultivated lands are degraded. Livestock income of the area is more important sources of income than crops. Small ruminants (sheep and goats) are generally the most important livestock species adapted to the area. As a result, eastern Amhara is expected to be the major source of skins to Kombolcha tanning industry and to the country in general.

**Sampling sites and types of data collected.** A cross sectional study was conducted and samples were taken from three different sites of eastern Amhara Region, i.e., Kelala, Bati and Hara. Skin samples from the three sites were purposely selected in the tanning industry. Samples were taken from two stages of the tanning industry, i.e., from raw skin reception area and wet blue processing stage. A total 5,996 skins were taken from the industry. In the examination room skins were categorized according to the Ethiopian standard authority for quality and size of skins. The same sites (where skin samples taken for the quality defect analysis in the tanning industry) were used for survey to understand about hide and skin production and preservation practices. During the survey, concerned offices, focal persons for focus group discussion and key informants (farmers and/or pastoralists, hide and skin collectors, merchants and butchers) were involved.

**Data collection and analysis.** Participatory Rural Appraisal techniques were used for data collection from the focus group discussion. There were ten participants in each of the focus group discussants. More specific methods included Focus Group Discussions, key informant interviews, desk review and observation/visual appraisal. The main data collection tools were checklists which were drawn up for the focus group discussants and counting the number and type of defects in the tanning industry. Various data collecting techniques were applied; it included focused group discussion with the help of checklists, direct observation and key informants. The aim of direct observation and key informants was to solicit additional information not captured during the administration of focused group discussion methods.

Data collected from the survey were analyzed by using SPSS version 20 (SPSS, 2012) and the results were reported using descriptive statistics. The quantitative data was analyzed using mean and percentages, and qualitative data was narrated. For ranking major constraints of hide and skin production and utilization, priority index was employed using the following formula: Priority Index (PI) = [(F1 × 3) + (F2 x 2) + (F3 × 1)] divided by the sum (F total). That is, index was calculated as index = sum of [(3 × number of beans to ranked first) + (2 × number of beans to ranked second) + (1 × number of beans to ranked third)] given for an individual constraint divided by the sum of [(3 × number of beans to ranked first) + (2 × number of household ranked second) + (1 × number of household ranked third)] for overall constraints. Data collected from the tannery for the skin quality defects were analyzed by using R software version 3.3.1

(R, 2016). Chi-square was used to compare the degree of quality defects experienced among the samples obtained from the three localities.

## RESULTS

Hide and skin production practices. The major slaughtering practices in the study area are reported in Table 1, while the major preservation methods are indicated in Table 2. The main constraints adversely affecting the production and quality of hides and skins as reported by the focus group discussants are shown in Table 3.

**Table 1. The major slaughtering practices in the study area**

| No | Slaughtering practice | Responses (%) | | | Total |
|---|---|---|---|---|---|
| | | Kelala | Bati | Hara | |
| 1 | Homestead slaughtering | 90 | 89 | 92 | 90.3 |
| 2 | Rural slaughter slabs | 10 | 11 | 8 | 9.7 |
| 3 | Use of improper knife | 72 | 70 | 76 | 72.7 |
| 4 | Use of appropriate knife | 28 | 30 | 24 | 27.3 |

**Table 2. The major preservation methods in the study area**

| No | Preservation methods | Responses (%) | | | Total |
|---|---|---|---|---|---|
| | | Kelala | Bati | Hara | |
| 1 | Fresh | 80 | 65 | 70 | 71.7 |
| 2 | Sun (rope) drying | 10 | 24 | 19 | 17.7 |
| 3 | Ground drying | 0 | 3 | 3 | 2.0 |
| 4 | Smoking | 10 | 8 | 8 | 8.7 |

**Table 3. Constraints to hide and skin quality production in the study area**

| Constraints | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | F-sum | PI | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Insufficient facilities | 29 | 9 | 11 | 8 | 12 | 0 | 9 | 6 | 473 | 0.13 | 4 |
| Poor husbandry | 28 | 18 | 7 | 7 | 9 | 6 | 0 | 0 | 481 | 0.13 | 3 |
| Lack of awareness | 24 | 12 | 14 | 10 | 8 | 4 | 3 | 0 | 460 | 0.13 | 5 |
| Inadequate VS | 25 | 18 | 8 | 4 | 3 | 7 | 5 | 5 | 442 | 0.12 | 6 |
| Distance from market | 8 | 14 | 8 | 5 | 10 | 10 | 8 | 12 | 333 | 0.09 | 8 |
| Low price | 38 | 22 | 3 | 6 | 6 | 0 | 0 | 0 | 530 | 0.14 | 2 |
| Poor slaughtering | 10 | 15 | 15 | 10 | 10 | 7 | 8 | 0 | 402 | 0.1 | 7 |
| Shortage of feed | 50 | 12 | 8 | 5 | 0 | 0 | 0 | 0 | 557 | 0.2 | 1 |
| Total | | | | | | | | | 3678 | 1 | |

PI = Priority Index; VS = veterinary service

**Quality defects of skins.** Hyque tannery has two sections for identification of quality defects of incoming skins from the localities, i.e., at raw skin reception area and wet blue processing stage. Sorting and grading of skins was done at these stages. The number of sheep skins coming from the market was small as a result the tannery focuses on goat skin for export market. The type of defects and their causes were identified and those skins having series problems were rejected at the tannery.

The number of skins rejected at Hyque raw skin reception area is shown in Table 4 and the numbers and the causes of rejected skins at the raw skin reception area are indicated in Table 5. At wet blue processing stage, the amount of skins rejected is shown Table 4 and the numbers and the causes of skin rejection at wet blue stage of Hyque tannery are shown in Table 6.

The grades of skins at wet blue stage in Hyque tannery are shown in Table 7 whereas the size of skins at wet blue stage is indicated in Table 8.

Table 4. The proportion of skins rejected at raw skin and wet blue stages of Hyque tannery

| Source of skins | Raw skin stage | | Wet blue stage | | Total (%) | |
|---|---|---|---|---|---|---|
| | Received N) | Rejected (%) | Received (N) | Rejected (%) | Received (N) | Rejected (%) |
| Hara | 1534 | 5.3 | 1453 | 36.4 | 1534 | 39.8 |
| Bati | 1897 | 1.3 | 1873 | 46.0 | 1897 | 46.7 |
| Kelala | 2565 | 11 | 2282 | 25.5 | 2565 | 33.7 |
| Total | 5996 | 6.5 | 5608 | 35.1 | 5996 | 39.3 |

N: number

**Table 5. The cause of skin rejection at the raw skin reception area of Hyque tannery**

| Causes of rejection | | Source | | | Total | X-square | Significant level |
|---|---|---|---|---|---|---|---|
| Common name | Local name | Hara | Bati | Kelala | | | |
| Smoke | *Chis* | 2 | 0 | 53 | 55 | 98.4 | *** |
| Fly cut | *Bilawa* | 11 | 4 | 50 | 65 | 56.7 | *** |
| Parasite | *Bil* | 20 | 0 | 30 | 50 | 28 | *** |
| Cockle | *Ekek* | 6 | 0 | 0 | 6 | 12 | ** |
| Rat | *Ayt* | 5 | 0 | 40 | 45 | 63.3 | *** |
| Careless handling | *Englit* | 0 | 0 | 30 | 30 | 60 | *** |
| Crack | *Senetik* | 1 | 0 | 0 | 1 | 2 | ns |
| Putrefaction | *Mebesibes* | 14 | 10 | 80 | 104 | 89.2 | *** |
| Wound | *Qusil* | 0 | 0 | 80 | 80 | 160 | *** |
| Poor substance | *Mesasat* | 0 | 10 | 0 | 10 | 20 | *** |
| Scar | *Tebasa* | 1 | 0 | 0 | 1 | 2 | ns |
| Pox | *Fentata* | 18 | 0 | 0 | 18 | 36 | *** |
| Small size | *Tinish* | 2 | 0 | 0 | 2 | 4 | ns |
| Fly after died | *Bekit* | 1 | 0 | 0 | 1 | 2 | ns |
| Total | | 81 | 24 | 283 | 388 | | |
| X-square | | 111.4 | 102 | 466.6 | | | |
| Significance level | | *** | *** | *** | | | |

Significant level: *** (P<0.001); ** (P<0.01); * (P<0.05); ns: not significant; Pox: both burst and not burst

**Table 6. The causes of skin rejection at wet blue stage in Hyque tannery**

| Causes of rejection | | Source | | | Total | X-square | Significant level |
|---|---|---|---|---|---|---|---|
| Common name | Local name | Hara | Bati | Kelala | | | |
| Smoke | *Chis* | 70 | 146 | 67 | 283 | 42.49 | *** |
| Fly cut | *Bilewa* | 110 | 0 | 129 | 239 | 109.68 | *** |
| Parasite | *Bil* | 26 | 0 | 54 | 80 | 42.66 | *** |
| Scratch | *Sintik* | 0 | 0 | 74 | 74 | 113.36 | *** |
| Wart | *Kintarot* | 0 | 90 | 0 | 90 | 144.5 | *** |
| Putrefaction | *Mebesibes* | 82 | 0 | 69 | 151 | 65.35 | *** |
| Miscellaneous | *Qilikil* | 62 | 132 | 77 | 271 | 30.07 | *** |
| Vein | *Chiret* | 0 | 170 | 0 | 170 | 302.5 | *** |
| Pox | *Fentata* | 0 | 108 | 54 | 162 | 95.37 | *** |
| *Qeto* | *Qeto* | *102* | *125* | *57* | *284* | *25.28* | *** |
| Thorn | *Eishoh* | 77 | 90 | 0 | 167 | 73.13 | *** |
| Total | | 529 | 861 | 581 | 1971 | | |
| X-square | | 346.2 | 507.8 | 261.3 | | | |
| Significance level | | *** | *** | *** | | | |

Significance level: *** (P<0.001); ** (P<0.01); * (P<0.05); ns: not significant; miscellaneous is a combination of defects, i.e., mainly wound, scar and itch/cockle; *Qeto* is unburst pox and is bigger and filled with dirty matter.

**Table 7. The grade of skins at wet blue stage in Hyque tannery**

| Source | Grade | Number | Percentage |
|---|---|---|---|
| Hara | I-III | 27 | 1.9 |
| | IV | 120 | 8.3 |
| | V | 322 | 22.2 |
| | VI | 455 | 31.3 |
| | Rejected | 529 | 36.4 |
| Bati | I-III | 2 | 0.1 |
| | IV | 20 | 1.1 |
| | V | 192 | 10.3 |
| | VI | 798 | 42.6 |
| | Rejected | 861 | 46.0 |
| Kelala | I-III | 109 | 4.8 |
| | IV | 271 | 11.9 |
| | V | 541 | 23.7 |
| | VI | 780 | 34.2 |
| | Rejected | 581 | 25.5 |

**Table 8. The proportion of the size of skins at wet blue stage in Hyque tannery**

| Source | Proportion by size (%) | | | |
|---|---|---|---|---|
| | Small | Medium | Large | Extra large |
| Hara | 4.9 | 20.8 | 41 | 33.3 |
| Bati | 4.1 | 24.5 | 55.4 | 16 |
| Kelala | 3.8 | 34.3 | 45.8 | 16.2 |
| Total | 4.2 | 26.4 | 48.7 | 20.7 |

## DISCUSSION

**Hide and skin production practices**. *Slaughtering Practice*. The focus group discussants indicated that majority of the animals (90.3%) were slaughtered in homesteads during different social ceremonies and religious holidays. The rest have an experience of slaughtering animals in rural slaughter slabs. Upon slaughtering, the use of appropriate knife for different slaughtering purposes was not common. According to focus group discussants, majority of the farmers/pastoralists (72.7%) used improper knives for ripping and flaying which clearly indicates that there was a probability of flay cuts as defects during slaughtering. The result is consistent with the report of Koloka (2010) who indicated that lack of knowledge and experience of people who perform skinning, the type of flaying equipment used for flaying and lack of slaughter facilities in almost all slaughtering slabs were the main sources of flay cuts and gouges of hides and skins in Ethiopia. The major slaughtering practices of the study area are reported in Table 1.

Preservation of hides and skins. According to focus group discussants, majority of the farmers/ pastoralists (71.7%) sold hide and skin to market after backyard slaughter in fresh (unpreserved state) whereas the rest practice different types of hide and skin preservation techniques from which ground drying (2%) and smoking (8.7%) were common. On the other hand, 17.7% of the farmers prefer rope drying. The result is different from the report of Juhar (2015) that 85% of hide and skin producers sell unpreserved hide and skin. The major preservation methods in the study area are indicated in Table 2.

The focus group discussants indicated that most of the farmers/pastoralists who sell hides and skins in a fresh state in 12 hour without preservation are those who reside near to district towns. On the other hand, the farmers living far away from district towns (more than 3 walking hours) prefer using different preservation methods. Farmers did not have the practice of using salt for preservation, only the local hide and skin collectors and/or traders in each site of the study area use salts for preservation of these products. This result is different from the report of Foxwell (1999) observed that pastoralist use sun drying methods of curing hides and skins leading to poor quality products. Delaying selling without the necessary precaution results in the spoilage of products and degrades their quality.

The focus group discussants and the key informants explained that nowadays there is relatively an improvement of attitude in the handling and preservation status of hides and skins in the study area. They indicated the change of attitude was due to the existing trainings and extension systems.

**Constraints to quality defect.** The main constraints adversely affecting the production and quality of hides and skins as reported by the focus group discussants were insufficient slaughtering houses and facilities, poor slaughtering system, poor animal husbandry practices, shortage of feed, lack of awareness on quality defects; inadequate veterinary service; distance from market and low price of hides and skins (Table 3). These constraints in turn have resulted in: small sized; poor substance, purification; smoked; and fly cuts of hide and skins. The index values of for the major three constraints were: 0.15, 0.14 and 0.13 for shortage of feed, low price and poor animal husbandry practices, respectively (Table 3). This indicates that shortage of feed is the major constraint for the production practice of hides and skins in the study area. The result is consistent with the report of Ahmed (2000) that the main constraints in the production and marketing of hides and skins included an inadequate network of primary buyers, lack of facilities for slaughtering, preservation, storage and transportation, 'lack of incentives for improvement' and limited effectiveness of

government extension service and other man-made and natural damage inflicted on the raw hides and skins downgrades quality. The result is also supported by the report of Jabar et al. (2002), poor animal husbandry (inadequate and poor quality feeds, inadequate parasite and disease management) and inappropriate slaughtering, flaying, collection and initial processing methods used were the main problems that affect hide and skin quality. It is also similar with the report of Assefa and Amistu (2016).

According to the focus group discussants, poor substance (thinness) of hides and skins was caused by drought (shortage of feed) and old age of the animals. When there is prevalence of drought (shortage of feed) and as the animals become aged, the flayed hides and skins would have poor substance or become thin. At pickling (sheep) and wet blue (goat) stages of tanning processes, skins having poor substance will be visible as veins or shrinkages and will have light weight. According to the focus group discussants, majority of preservation of hides and skins using smoke comes from the farmers/pastoralists residing in the lowland parts of the study area. Thinness of hides and skins is also high those coming from the lowland parts of the study. The focus group discussants indicated that putrefaction of hides and skins were caused by being delayed of the products to the market. Putrefaction of hides and skins causes removal of hairs of the products and bad smell.

**Quality defects of skins.** Hyque tannery has two sections for identification of quality defects of incoming skins from the localities, i.e., at raw skin reception area and wet blue processing stage. Sorting and grading of skins was done at these stages. The number of sheep skins coming from the market was small as a result the tannery focuses on goat skin for export market. The type of defects and their causes were identified and those skins having series problems were rejected at the tannery.

*Defects identified at raw skin reception area*. Every skin brought by the skin traders should initially pass through this stage. At this stage the skins were classified into two categories (to be purchased and to be rejected). The good quality skins would be purchased whereas those skins having series damages would be rejected. At the skin reception area, the number of skins rejected was highest in those skins coming from Kelala (11%) than Hara (5.3%) and Bati (1.3%) (Table 4). From the total skins (5,996) coming to the tannery 388 skins were rejected (6.5%). The number and the causes of rejected skins at Hyque raw skin reception area is indicated in table 5. The major causes of skin rejection identified at the skin reception area of the tannery were: smoke, fly cut, parasite, cockle, rat, careless handling, crack, putrefaction, wound, poor substance, scar, pox, small size and flying after the animal is died. There were a significant difference ($P<0.001$) in most of the causes of skin defect among the three localities where skins were collected. Putrefaction and wound were the major causes of skin rejections in Kelala than Bati and Hara. Pox was the major causes of skin rejections in Hara than Kelala and Bati. On the other hand, poor substance was the major causes of skin rejections in Bati than Hara and Kelala. Crack, scar, small size and skins flayed after the animal is died were not significant ($P>0.05$) among the three localities.

In each site (locality) there was a significance difference ($P<0.001$) among the listed major causes of skin rejections. In Hara, parasite and pox were the major causes of skin defects. In Bati, poor substance and putrefaction were the major causes of skin defects. The poor substance condition observed was atrophy of skin (thin skin), which seems to be associated with malnutrition. Where as in Kelala the major causes of skin defects were putrefaction, wound and smoke. The result is different from

Hagos (2013) who reported scratch along with cockle, scars and technical defects were the major causes of skin downgrading and rejection in Wukro Sheba tannery.

*Defects identified at Wet Blue Processing stage***.** The skins identified to be relatively better quality were taken for processing up to wet blue stage to Kombolcha tannery. At wet blue stage the skins were graded as grade 1 to 3, grade 4, grade 5, grade 6 and reject in Hyque tannery. After grading in such categories, the skins were then taken from Hyque tannery to Kombolcha tannery for further processing. At Kombolcha tannery, good quality skins were taken to the capital city of the country (Addis Ababa) to be exported whereas those skins having series damages were taken to local market (Merkato). In addition, at this stage skins were sorted into different categories by size (very small, small, medium, large and extra-large).

At wet blue processing stage, the amount of skins rejected was highest those coming from Bati area (46%) and followed by Hara (36.4%) and Kelala (25.5%), respectively (Table 4). In general (in both stages) 39.34% of the skins coming to Hyque tannery was rejected (Table 4). The highest number of skins was rejected of the skins from Bati area (46.7%) than Hara (39.8%) and Kelala (33.7%). The result is in line with the report of Stosic (1997) who indicated the estimates from Ethiopian tanneries have put the numbers of reject skins, at certain times of the year at as high as 50-60%.

This study showed that the quality of skin in the study area declined due to various defects produced by different causative agents mainly in the wet blue processing stage of the tannery. The common causes of skin rejection which were visible at wet blue processing stage of the tannery were: smoke, fly cut, parasite, scratch, wart, pox, putrefaction, vein, Qeto, thorn and miscellaneous (combination of two or more causes). From these the major causes were Qeto (14.4%), smoke (14.35%, miscellaneous (13.8%) and fly cut (12.1%). The result is different from Worku et al. (2011) of Mojo tannery and Zenaw and Mekonnen (2012) of Bahirdar tannery who indicated the major cause of skin rejection at wet blue stage were ekek and scratch. On the other hand the result is in line with the report of Zenaw and Mekonnen (2012) who reported majority of the skins were found to be affected with one or more defects. There were a significant difference ($P<0.001$) in all of the causes of skin defect among the three localities where skins were collected. The number and the causes of rejected skins at wet blue stage are indicated in Table 6. In each site (locality) there was a significance difference ($P<0.00$) among the listed major causes of skin rejections. In Hara, fly cut and Qeto were the major causes of skin defects. In Bati, Vein and smoke were the major causes of skin defects. Where as in Kelala the major causes of skin defects were fly cut, putrefaction, smoke and a combination (synergetic) effect of different causes.

The grading system in the tannery at wet blue stage was made into five (grade I to III, grade IV, grade V, grade VI and reject). The proportion of grade 1-3 (2.5%) skins was very small. This is similar with the report of Kassa (1998) who indicated the defects from the diseases and other causes have reached very significant level especially in goats' skin dropping aniline leather (Grade I-III) and increasing rejections. Comparatively, the maximum proportion of good quality skin (grade I-III) was obtained from Kelala (4.8%) and the lowest proportion of high quality skin was from Bati area (0.1%). From the total wet blue skins observed, high rejection was recorded in skins of Bati area (46%), followed by Hara (36.4%) and Kelala (25.5%) as shown in Table 7.

Sorting of skins by size was made at the wet blue stage of the tannery. The proportion of the skins sorted by size is indicated in Table 8. According to the classification system of the tannery, majority (48.7%) of the skins of the study area

were grouped as large in size. Majority of the size of skins came from the different localities of Hara, Bati and Kelala were large at a proportion of 41%, 55.4% and 45.8%, respectively. This result agrees with the reports of Zenaw and Mekonnen (2012) in Bahirdar tannery.

## CONCLUSION

The common causes of skin rejection which were visible at both defect identification stages were: smoke, fly cut, parasite, scratch, wart, pox, putrefaction, vein, Qeto, thorn, cockle, careless handling, rat, small size, scar, fly after died, wound, crack and miscellaneous. Majority of quality defects was observed in wet blue processing stage. In each locality there was a significance difference among the major causes of skin rejections. So as to improve the quality defects of hide and skin in the study area producers need to use appropriate knife and place for slaughtering, use proper method of preservation and attention should be given to animal nutrition. An integrated effort towards good animal husbandry and animal health care are very important. Furthermore, rigorous awareness and training should be given to value chain actors on proper handling, transportation and conservation.

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## STATEMENT OF NO-CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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