

## **Stereotyping of Defects and Grading of Raw Sheep and Goat Skins Collected and Stored by Skin Traders in Bahir-Dar Town, Ethiopia**

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**Abstract:** The current cross-sectional study was conducted from September 2006 to December 2006 to assess the distribution and magnitude of major defects of sheep and goatskins collected and temporarily stored in four purposively selected skin and hide stores of Bahir Dar town, northwest Ethiopia. Thirty percent of raw sheep and goatskins collected by the traders was selected using simple random sampling method for examination of various kinds of skin defects, masses and sizes. Skins were graded according to the standard set by the Ethiopian Quality and Standard Authority. Defects caused by dirt and knife are found to be the most important defects of sheep and goatskins. The proportion of grade 1 skins in case of salted sheepskins was 29.68% while that of fresh sheepskins was 21.60% of the total samples. The proportion of grade 1 in case of fresh and salted goatskins was 23.2 and 29.63%, respectively, among the total goatskin examined. Recommendations were given so that slaughtering of sheep and goats should be done by professionals in order to reduce the defects created during flaying which are found to be among the major defects observed during examination of sheep and goatskins in the current study. In addition appropriate transportation, storage and marketing system should be in place so that the maximum benefit could be achieved from sheep and goat skins.

**Keywords:** Goats, grading, sheep, skin defects, stereotyping

### **INTRODUCTION**

Sheep and goats represent the most important segments of the Ethiopian livestock system. The country has varied climatic conditions which are suitable for the production of different breeds of sheep and goats with various qualities of raw skins. The national sheep and goat population is estimated at 25.5 and 23.4 million, respectively (CSA, 2003). According to Getnet (2006), the number of sheep and goats in Amhara region is estimated at 6.8 million and 4.2 million, respectively, which represents about 35% and 27.7% of the national sheep and goat population, respectively (CSA, 2003). Skins represent a major source of foreign exchange earnings with a share of 14-16% of Ethiopia's total export revenue. The major suppliers of sheepskins for the Ethiopian central market are Amhara, Oromiya and Southern Nations, Nationalities and People Regional states accounting for 34.5, 32.9 and 16.6%, according to their order. On the other hand, 45.4, 26.4, 11.7 and 11.6% of the total goatskins supplied to tanneries are collected from Amhara, Oromiya, Southern Nations, Nationalities and People Regional State and Tigray, respectively

(Adamu, 1997). Ethiopian highland sheepskins in particular, remain highly competitive in international markets for some natural characteristics of clarity, thickness, flexibility, strength and compact texture which make them especially suitable for making of high quality gloves, sport equipments and garments. Goatskins, originating from Wollo in Ethiopia and classified as *Bati-genuine* and *Bati-type* are characterised by thick, highly flexible and clean inner surfaces and are in high demand for the production of fashion leathers (Raga, 2003). Annually, 16.6 million pieces of skins are produced in the country, based on the off take rates of 33% and 32.5% for sheep and goats (Tadesse, 2005). Although large number of sheep and goats are slaughtered per annum, the production of high quality skins in the tannery remains very low (Zewdu, 1995; Ayele *et al.*, 2003; Kassa, 2005). In Ethiopian tanneries, 35% of sheep and 56% of goat skins have been downgraded and rejected due to pre and post slaughter defects. Generally, the major pre and post-slaughter causes of defects are skin diseases and poor preservation methods (Ahmed, 2000). A recent study conducted by Muleken (2001), showed that the proportion of high grades raw sheepskin and goatskin

have shifted towards the lower grades and reject grades in 2001 as compared to 1989, indicating quality deterioration of raw skin over the last 10 years. The most prevalent skin disease called "Ekek", Amharic word for "itch" that is mainly caused by external parasites (lice, keds and mange) is responsible for rejections of skins (Tefera, 2005; Serste and Wossene, 2007; Chanie *et al.*, 2010; Ababayehu and Kibrom, 2010; Berhanu *et al.*, 2011). In general raw skins are downgraded and rejected as a result of various ante-mortem and post-mortem defects contributed by poor animal husbandry and nutrition, skin diseases and parasites, improper slaughter and flaying operations and improper practices of curing, collection, transportation and storage. Estimates from tanneries have put the percentage of reject to be as high as 50 to 60% (Abdi, 2000). In Ethiopia, over 90-95% of skins are collected from animals slaughtered at household level (Ahmed, 2001) and thus postmortem defects are expected. In Ethiopia, raw skin grading can be done by considering the appearance, mass and size of the raw skins according to the Ethiopian Quality Standards Authority (ESQA, 2001a). Therefore, the study was undertaken with the objectives of determining the types and magnitude of skin defects and to grade raw skins based on established standards.

## MATERIALS AND METHODS

**Study area:** The study was conducted from September 2006 to December 2006 at Bahir Dar town, northwest Ethiopia. Bahir Dar is located at 11° 29' latitude North and 37° 29' longitude East at an altitude of 1730 meter above sea level. The area has a mid-altitude agro-climatic zone with an annual rainfall of 800 to 1250 mm. The mean annual minimum and maximum temperature of the area was 10 and 32°C, respectively, with a relative humidity of about 59.18%.

### Study design:

**Stereotyping of skin defects and grade assessment:** Four (each with a capacity of holding 10, 000 skins per annum) private skin shades/stores were purposively selected. Thirty percent of raw sheep and goatskins (fresh and wet-salted sheep and goat skins, wet salted dried and air-dried goat skins) were selected using simple random sampling method and assessed for defects, sizes and masses. Various forms of skin defects were recorded and the numbers of defective units were calculated and thus skins were graded accordingly. The mass of fresh skins was determined by weighing each piece on a digital balance before salting or air-drying. The air-dried skins were weighed to the nearest 10 g of weight 5 days later after sufficient dehydration. Similarly, salted skins were weighed 3 days later after sufficient salting and removal of excess salt by shaking and brushing. Thus, depending on the mass, each skin was categorized into 5 categories (extra light, light and

medium, heavy and extra heavy). In addition, the size of the skin was considered and hence graded into extra small, small, medium, large and extra large. The squared method was used to measure the size (surface area) of each skin. The skins were sampled and graded by their appearance, size and mass based on the standard set by the Ethiopian Quality Standard Authority (ESQA, 2001a). Various forms of skin defects appearing beyond 5 cm from the edges towards the center of the skin like holes, poor pattern (loose fiber), dirt, gouge-marks (thinning of the skin caused by knife), corduroying (a series of shallow and parallel streaks appearing on the skin due to poor flaying), salt spots (small cavities of white or light brown color heavily encrusted with salt due to improper salting) and heating (putrefaction of skin revealed by a premature loss of the hair) were collected on raw sheep and goatskins.

## DATA ANALYSIS

The data obtained from the study was recorded for each treatment and quantification of skin defects was done as proportion of skins with defects to the total number of skins subjected to inspection.

## RESULTS

**Mass, size and defects of sheep and goat skins:** The large proportion of fresh sheep and goatskins were categorized under the medium and heavy category. Only a small percentage of sheep and goat skins fall in the extra heavy category. There was significant difference ( $p \leq 0.05$ ) in the mean weight of fresh skins from sheep and goats as summarized in Table 1.

The category of masses of air-dried goatskins is tabulated in Table 2. Most of the air-dried goatskins supplied to the skin traders belong to the medium category. In the study period none of the air-dried goatskins were falling into the extra heavy ( $\geq 810$  g) category.

Similarly, most of dry-salted sheep and goat skins were in the medium category, but large proportions were also heavy in weight (Table 3). There was significant difference ( $p \leq 0.05$ ) in the mean weight of dry-salted skins from sheep and goats.

The study depicted that most of the skins collected from sheep and goats were medium, also some skins were small and others were large in size. However, skins in both extremities (extra small and extra large) were not encountered during this study (Table 4).

As shown in Table 5 and 6, various forms of skin defects have been detected in raw sheep and goat skins. The most frequently observed defects in raw sheep skins (fresh and salted) in order of importance include dirt, poor pattern and corduroying (Table 5).

Table 1: Mass of fresh sheep and goat skins assessed in selected skin stores at Bahir Dar

Origin	Total No.	Category of masses (grams)					Mean	S.D.
		≤ 1500	1510-1800	1810 - 2100	2110 - 2400	≥ 2410		
Sheep	3538	276 (7.80)	608 (17.18)	1178 (33.30)	1132 (32)	344 (9.72)	707.6	427.14
Goat	1276	119 (9.33)	215 (16.85)	479 (37.54)	447 (35.03)	16 (1.25)	255.2	202.64

Table 2: Masses of air-dried goatskins assessed in selected skin stores in Bahir Dar

Origin	Total No.	Category of masses (grams)					Mean	S.D.
		≤500	510-600	610-700	710-800	≥810		
Goat	1482	46 (3.11)	434 (29.28)	612 (41.29)	390 (26.32)	0 (0)	296	263.56

Table 3: Masses of sheep and goat salted skins assessed in selected skin stores at Bahir Dar

Origin	Total No.	Category of masses (grams)					Mean	S.D.
		≤750 g	760-900	910-1050	1060-1200	≥1210		
Sheep	2394	164 (6.88)	770 (32.16)	886 (37.01)	480 (20.04)	94 (3.91)	478.8	352.77
Goat	1718	151(8.79)	199 (11.58)	826 (48.07)	443 (25.79)	99 (5.77)	343.6	300.18

Table 4: Sizes of raw sheep and goat skins examined in selected skin stores at Bahir Dar

Skin size (dm <sup>2</sup> )	Sheep skin		Goat skin		Air-dried (Total = 1482)
	Fresh (Total = 3538)	Salted (Total = 2394)	Fresh (Total = 1276)	Salted (Total = 1718)	
<20	0(0)	0(0)	0(0)	0(0)	0(0)
20-40	797 (22.53)	596 (24.90)	367 (28.77)	434 (25.26)	419(28.28)
40-65	2129 (60.17)	1407 (58.77)	647 (50.70)	970 (56.46)	825 (55.68)
65-90	612 (17.3)	391 (16.33)	262 (20.53)	314 (18.28)	238 (16.04)
>90	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mean	707.6	478.8	255.2	343.6	296.4
S.D.	871.62	579.12	272.17	399.23	344.35

Table 5: Major defects observed on raw sheep skins in selected skin stores in Bahir Dar

Type of defects	Sheep skin		Goat skin	
	Fresh ( Total examined = 3538)		Salted (Total examined = 2394)	
	Number with defect	Percentage (%)	Number with defect	Percentage (%)
Hole	222	6.27	92	3.84
Gouge mark	149	4.20	186	7.77
Poor pattern	953	26.93	833	34.80
Corduroying	601	17.00	480	20.05
Dirt	1415	40.00	657	27.44
Heating	0	0	74	3.09
Sun heating	0	0	0	0
Flesh	198	5.60	72	3.01
Smoke	0	0	0	0
Mean	393.11		266	
S.D.	498.94		310.82	

Table 6: Major defects observed on raw goatskins in selected skin stores in Bahir Dar

Types of defects	Goat		
	Fresh (Total examined =1276)	Salted (Total examined = 1718)	Air-dried (1482)
	Number with defect (%)	Number with defect (%)	Number with defect (%)
Hole	73 (5.72)	91 (5.3)	63 (4.25)
Gouge mark	86 (6.74)	118 (6.87)	90 (6.07)
Poor pattern	358 (28.05)	501 (29.16)	381(25.71)
Corduroying	180 (14.11)	378 (22.00)	276 (18.62)
Dirt	480 (37.62)	462 (26.89)	517 (34.89)
Heating	(0)	110 (6.4)	0
Sun heating	(0)	(0)	107 (7.22)
Flesh	99(7.76)	58 (3.38)	0
Smoke	(0)	(0)	48 (3.24)
Mean	141.78	190.89	164.67
SD	170.47	199.08	183.85

Table 7: Grades of raw sheep and goat skins examined in selected skin stores in Bahir Dar

Category	Sheep		Goat		
	Fresh (Examined = 3538)	Salted (Examined = 2394)	Fresh (Examined = 1276)	Salted (Examined = 1718)	Air-dried (Examined = 1482)
Grade 1	764 (21.6)	710 (29.68)	296 (23.2)	509 (29.63)	566 (38.21)
Grade 2	1136 (32.13)	870 (36.33)	374 (29.33)	590 (34.34)	475 (32.07)
Grade 3	1006 (28.41)	674 (28.14)	452 (35.42)	474 (27.59)	363 (24.47)
Grade 4	520 (14.65)	80 (3.34)	123 (9.65)	85 (4.95)	64 (4.33)
Reject	112 (3.21)	60 (2.51)	31 (2.4)	60 (3.49)	14 (0.92)
Mean	707.6	478.8	255.2	343.6	296.4
SD	407.95	380.47	174.82	251.19	246.36

The most frequently observed defects in raw goatskins (fresh, salted and air-dried) in order of importance include dirt, poor pattern and corduroying (Table 6). All the skins examined from sheep and goats had defects, but it does not mean that some of the skins with defects cannot be processed in the tannery, but they may be responsible for reducing the quality and hence the grade of the skin.

**Grades of sheep and goat skins:** The large proportions of fresh and salted sheepskins fall in grade 2. Comparable numbers of fresh and salted sheepskins were also categorized in grade 1 and 3. In addition, substantial percentages of fresh sheepskins were in grade 4. Although the proportion of reject grades was smaller, considerable attention should be give to reduce the number of skins to be rejected. Similarly, in goats the largest proportions of air-dried skin fall in grade 1 than the fresh and salted skins. Large numbers of salted fresh goat skins lie in grade 2 than the fresh and air-dried ones. However; most of fresh goatskins were in grade 3, most likely due to the presence of large amount of dirt in this type of skins. Still large number of goatskins fall in grade 4 and also in the reject grade. (Table 7)

## DISCUSSION

The current study discloses the most important aspects of raw skin production from sheep and goats from Ethiopia. As described in this study, various sizes, weight and defects of raw sheep and goat skins have been observed. The supply of sheep skins was higher than that of goat skins and this might be attributed to the highest price of sheep skins. This may contribute to the lower grade of goat skins as most farmers keep goat skins carelessly. In addition, in rural areas large goat skins are reserved for household as cultural article than for sale. This particular selection for extra large and large sized goat skins reduces the variability of size among goat skins as compared to sheep skins in which case most of them are supplied to the market. These extra large goat skins are also used as mattress by the rural people, which also reduce the supply of such items to the market.

Extra small and extra large sized skins are not available in the market probably due to the slaughter of medium sized sheep and goats in the study area. In

addition, tanneries may not select extra small and extra large skins and thus skin traders may disgust farmers not to bring such skins to the market. Although large number of sheep and goats are slaughtered per annum in the country, the production of high quality skins in the tannery remains very low (Zewdu, 1995; Ayele *et al.*, 2003; Kassa, 2005).

In Ethiopian tanneries, 35% of sheep and 56% of goat skins have been downgraded and rejected due to pre and post-slaughter defects (Berhanu *et al.*, 2011). In the country, over 90-95% of skins are collected from sheep and goats slaughtered at household level (Ahmed, 2001) and thus post-mortem defects are very prevalent and hence reduce the skin quality (Chanie *et al.*, 2010). In this study, the most common post-mortem defects recorded include dirt (having the largest share), poor pattern and corduroying. In general, raw skins are downgraded and rejected as a result of various ante-mortem and post-mortem defects contributed by poor animal husbandry and nutrition, skin diseases and parasites, improper slaughter and flaying operations and improper practices of curing, collection, transportation and storage (Ahmed, 2000; Ababayehu and Kibrom, 2010). Moreover, most of the skins (fresh, salted and dried) fall in grade 1, 2 and 3. Still large proportions were in grade 4 and reject grades.

Estimates from tanneries have put the percentage of reject to be as high as 50 to 60% (Abdi, 2000; Ababayehu and Kibrom, 2010; Berhanu *et al.*, 2011). A study conducted by Muleken (2001), showed that the proportion of high grades raw sheepskin and goatskin have shifted towards the lower grades and reject grades in 2001 as compared to 1989, indicating quality deterioration of raw skin over the last 10 years. According to tanners reports for the period from 1970 - 1980, the share of grade I-III pickled sheep and wet blue goatskins from Ethiopia was between 60-70% of total skins supplied to the world market. From 1989/88-1991/92, the share of grade I-III skins dropped to 40 to 50% of total skins supplied. In 1996/97 the share further dropped to 20-30% and in 1997/1998, only 10-20% of skins were grades I to III. The above data showed that poor quality raw material has adverse effects on both processing and commodity value in the world market (Abdi, 2000). Some of the skin defects can seriously affect the quality of processed skins and hence cause rejection, other defects like dirt and flesh may impose high cost of processing skin at tanneries.

The current study revealed that a considerable percentage of sheep and goatskins are found in grade 4 and reject grades. Due to this the country has lost a large amount of money as a result of direct rejection or costs incurred for defective skins processing as indicated by Sertse and Wossene (2007).

In conclusion, slaughtering of sheep and goats should be done by professionals in order to reduce the defects created during flaying which are found to be among the major defects observed during examination of sheep and goatskins in the present investigation. In addition appropriate transportation, storage and marketing system should be in place so that the maximum benefit could be achieved from sheep and goat skins.

#### ACKNOWLEDGMENT

The authors would like to Acknowledge Amhara Regional State Agriculture Bureau and Department of Animal Science of Harromaya University for their all rounded support for the smooth accomplishment of the study.

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