

Full Length Research Paper

Apparent defects and grading of hides and skins in East Gojjam Zone, Amhara Region, Ethiopia

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This study was conducted to assess the apparent defects and grading of hides and skins in Eastern Gojjam zone at three woredas (Dejen, Sinan and Awable). Three warehouses from each woreda were purposively selected and used to generate the data from cow hide, sheep and goat skins. 10% of the total stocks were taken randomly from each warehouse and a total of 180 hides, 2250 sheep skin and 765 goat skins were examined by using close observation. Hides and skins were graded according to the standard set by the Ethiopian Quality and Standard Authority. From these amounts, 74 (41.1%) hides, 750 (33.3%) sheep skins, 151 (31.4%) wet salted and 88 (30.9%) air dried goat skins were grade I; 90 (50%) hides, 1380 (61.3%) sheep, 261 (54.4%) wet salted and 168 (58.9%) air dried goat skins were grade II; 16 (8.9%) hides, 120 (5.3%) sheep skins, 67 (14%) wet salted and 29 (10.2%) air dried goat skin were grade III; and 1 (0.2%) wet salted goat skin was grade IV. The leading observed defects that downgrade the hides were filthiness with a value of 142 (17.9%), gouge mark with a value of 140 (17.7%) and poor pattern with a value of 107 (13.5%). Poor pattern and salt pitting on the hide showed a significant difference at $P < 0.05$ significant level. However there is no significant difference on other defects. The observed primary defects on the sheep skin were filthiness with a value of 494 (22%), poor pattern with a value of 319 (14.2%) and gouge mark with a value of 221 (9.8%). Fly cut, poor pattern, salt crystallization and hard spot showed a marked statistical difference at $p < 0.05$ significant level. The most important defects observed on the wet salted goat skin were filthiness with a value of 136 (28.3%), poor pattern with a value of 88 (18.3%) and fly cut with a value of 75 (15.6%). In this case, poor pattern, filthiness, scores, salt crystallization and salt pitting have shown a significant difference between woredas at $P < 0.05$ significant level. Filthiness with a value of 88 (28.8%), poor pattern with a value of 40 (14%) and fly cut with a value of 32 (11.2%) were the forefront defects of air dried goat skin. Fly cut, poor pattern, corduroying, filthiness and weak spot have shown a statistical significant difference at $P < 0.05$ significant level. This indicates that most defects on hides and skins occurred during slaughtering operations. Therefore, more attention should be taken during slaughtering of animals to get quality hides and skins for national as well as international market, and maximize the country's foreign currency exchange.

Key words: Hides, skins, defects, grading.

INTRODUCTION

Ethiopia holds one of the world's largest livestock populations: eighth for cattle, twelfth for sheep and lambs, and eighth for goats (FAO, 2001). Its share of livestock holdings is 2.4%, 3.1%, 11.15%, 23% and 35.5% when compared with the total livestock population of the world, developing countries, Africa, COMESA member countries and East Africa, respectively (FAO,

2001).

According to CSA (2008), the livestock population of the country is estimated to be 47.6 million cattle, 26.1 million sheep, 21.7 million goats, 1.7 million horses, 0.56 million donkey, 0.38 million mules, 1.01 million camels, 39.6 million poultry and 4.69 million bee colony (hives). The livestock sector in Ethiopia contributes 12 and 40%

of the total and Agricultural Gross Domestic Product (GDP), respectively, and provides livelihood for 65% of the population (Beyene, 1997). From the total household cash income, livestock account for 37-87% in different parts of the country (FAO, 1999), and the sector accounts for 12-15% of total export earnings. It is an integral part of the national agricultural wealth and serves as sources of power, meat, milk, egg, hides and skins, manure, and other products.

In Ethiopia, hides and skins is an important economic component which contributes significant amount to the national economy. In 2002, hides and skins represent major source of foreign exchange earnings for the country accounting for 14-16% of the total export revenue. The major export contributor of the manufacturing sector in the country is leather and footwear industries, which is obtained from hides and skins that contributed 70% of the export earnings for the year 2005-2007 (MoTI, 2008).

In the country, the estimated off-take rate is 6.6%, 31.7% and 32% for cattle, sheep and goat, respectively (MOTI, 2005). From this off-take rate, the estimated number of production is 3.1 million hide, 9.9 million sheep skin and 8.6 million goat skins (CSA, 2004). From these, the actual number of hides and skins collected in the country is 26% hide, 80% sheep skin and 65% goat skin which reach to the tanneries. The rest 74%, 19.4% and 35% of hides, sheep and goat skin, respectively are consumed locally. According to the Ethiopian Tanners Association (ETA, 2004), there are more than 22 tanneries in the country. The current daily capacity of the tanneries is almost 123,300 skins and 5500 hides. However they are being utilized, only 52% skins and 66% hides. This low rate of capacity utilization is surprising considering the enormous livestock population in the country. The supply of hides and skins in the formal market is low in number and poor in quality.

The problem is that large amounts of hides and skins are wasted in the countryside and many hides and skins do not reach to tanneries in the required quality (Loop, 2003). As a result, the income obtained from selling of hides and skins is declining from time to time due to its defectiveness (Acklog, 1993). Defects in leather implicate higher cost in production and a greatly reduced selling value for the leather. In Ethiopia, the economic loss due to hide and skin defects is very high (PIC, 2001). These defects are encountered from the time the animal is born until the leather processing is completed due to carelessness in breeding, feeding in living conditions, disease, parasites, handling, slaughtering, preservation, storing and transporting (PIC, 2001). In Ethiopian tanneries, 35% of sheep and 56% of goat skins have been downgraded and rejected due to defects by external parasites (Kassa et al., 1998). Over 30% of the hides and skins collected and brought to tanneries were "rejected" due to defects or low quality (UNCTAD, 2002). Even in Eastern Gojam zone about 29511 hides, 528907 sheep

skins and 152571 goat skins were collected and reached to the central market in 2011; the quality of these products could not satisfy the tanners demand yet (EGZARDD, 2011).

To achieve rewardable economic benefits and to maximize the Ethiopian national economy, proper utilization of the resources in all areas of the country is very crucial. Accordingly, to back up this national concern and to exploit this resource as a desired level, defect assessment will be done to improve the quality and quantity of raw materials supplied for tanneries. In Eastern Gojam, there is no any documented evidence about the quality of the resources and type of defects which deteriorate the selling price of the raw materials. Due to this reason, satisfactory quality improvement measures have not been taken yet. Thus, this study was conducted to assess the apparent defects and grading of hides and skin in Eastern Gojjam to improve its quality as a desired level.

MATERIALS AND METHODS

The study area

This study was conducted in Eastern Gojjam zone at three representative woredas such as Dejen, Sinan and Awable. The area coverage of the zone is 1,400,975 ha and situated in the range of 500-4154 m above sea level. The landscape of the area is 67.5% plateau, 7.8% mountainous and 24.9% valley. It has different agro ecological zones, which accounts for 2.1% frost land, 11.9% high land, 80.55% mid land and 5.45% low land. The annual rainfall ranges from 900-1800 mm and a minimum and maximum temperature of the area is 7.5 and 25°C, respectively.

The livestock population in the area is 1.5 million cattle, 1.5 million sheep, 0.39 million goats, 0.05 million horses, 0.25 million donkey, 0.009 mule, 0.78 million poultry and 0.12 million hives (CSA, 2008). Annual hide and skin production in the zone was 29511 hides, 528907 sheep skins and 152571 goat skins in 2011 (EGZARDD, 2011). 107 legal traders in the area are involved in collection of raw hide and skin, and storing them in 103 warehouses until they are taken in to the central market.

Methods of data collection

Three representative woredas were purposively selected accordingly (Dejen from the low lands, Awabel from mid lands and Sinan from highlands) in the zone. The data were collected from three representative warehouses in each woreda (nine warehouses in total). Defect assessment was done from 10% randomly selected hide and skins by using close observation both in hair and flesh sides. During this time, all manmade defects or damages were examined like putrefaction, bruises, folding defects, ball drying, red heat, branding, lashes,

Table 1. Criteria for assessment of defects on the hide.

S/N	Defects	Defect units allocated on		
		Bellies	Shoulder	Butt
1	Hand hole or holes caused by beetles each	1	1	2
2	Weak spot, gouge or gash or channels caused by beetles each	1	1	1
3	Badly shaped head	0	1	0
4	Poor pattern	2	2	0
5	Siding or corduroying per side	1	0	0
6	Hole each	0	0	1
7	Hole per scar	0	0	0.5
8	Heating or grain damage per average area of 10x30 cm	1	1.5	2
9	Dung or traces of urine per average area of 15x30 cm	1	0	2
10	Scars per average length of 15 cm	1	1	2
11	Salt spots, red or purple spots per average area of 30x30 cm	1	1.5	2
	Total	9	9	12.5

Table 2. Grade description based on defect units on hide.

Origin of hide or skin	Grade by appearance	Characteristics
Large cattle	Grade 1	No defects visible in the butt; defects in the shoulder or bully assessed at not more than 5 defect units in total
	Grade 2	Defects in butt, shoulder and belly assessed at not more than 12 defect units in total of which not more than 8 in the butt
	Grade 3	Defects assessed between 12 and 24 defect units at the most
	Grade 4	Defect assessed at more than 24 defect units, the unusable area of the hide being at the most equal to 50% of the total area
	Reject	Hides of which more than 50% of the surface is unusable

Table 3. Criteria for assessment of defects on the skin.

S/N	Defect	Defect unit allocated
1	Hand hole, hole or holes caused by beetles each	2
2	Weak spot, gouge or gash or channels caused by beetles each	1
3	Poor pattern	2
4	Siding or corduroying per side	1
5	Edge soiled with urine or dung	2
6	Heating or grain damage per average area of 10x15 cm	2
7	Salt spots red or purple spots per average area of 30x30 cm	2
	Total	12

scratches, smoke drying, flay cut, poor pattern, filthiness/dirt/, disease, insect damage and others. Grading based on defect units was done by using “the standard set by the Ethiopian Quality and Standard Authority” (MOA, 1986; Dervacy and Getachew, 1988).

Defects and grading of hides and skin

Hides: A defect of the hide was examined according to its location and importance. Based on the number of

defect units, the grade of the hide was determined as shown in Table 1. Based on the above defect units, the hide was graded by considering Table 2.

Sheep and goat skin: A defect of a skin was done by examining defects on it and given based on the defect units allocated. Based on the number of defect units, the grade of the skin was determined as shown in Table 3. Based on the above defect units, the hide was graded and described by considering Table 4.

Table 4. Grade description based on defect units of the skin.

Origin of skin	Grade by appearance	Characteristics
Sheep and goat skin	Grade 1	No visible defects which are likely to depreciate the skin appearing beyond 5 cm from the edge
	Grade 2	Defects assessed to a total of 1-3 defect units
	Grade 3	Defects assessed to a total of 4-8 defect units
	Grade 4	Defects assessed at a total of more than 8 defect units, the unusable area being at the most equal to 50% of the total area
	Reject	Skins of which more than 50% of the area is unusable.

Table 5. Number of hides with defect.

Defect	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
Ticks	1	2	2	5	1.8	1	1	2	4	1.5	2	2	2	6	2.3	15	1.9
Scars	1	7	8	16	5.8	7	6	8	21	8.0	7	2	7	16	6.3	53	6.7
Bruise	8	11	20	29	10.6	6	11	10	27	10.3	9	9	7	25	9.8	81	10.2
Fly cut (Hole)	11	12	11	34	12.4	9	11	10	30	11.4	11	11	11	33	12.9	97	12.2
Poor pattern	12	13	13	38	13.9	12	12	12	36	13.7	11	11	11	33	12.9	107	13.5
Gouge mark	17	17	15	49	17.9	15	17	16	48	18.3	15	14	14	43	16.8	140	17.7
Scores	3	5	3	11	4.0	3	4	3	10	3.8	3	3	3	9	3.5	30	3.8
Corduoying	7	9	7	23	8.4	6	8	7	21	8.0	7	6	6	19	7.4	63	7.9
Filthiness	17	17	16	50	18.2	17	15	15	47	17.9	15	15	15	45	17.6	142	17.9
Putrefaction	3	5	6	14	5.1	3	5	6	14	5.3	6	6	6	18	7.0	46	5.8
Salt pitting	1	2	2	5	1.8	1	2	2	5	1.9	3	3	3	9	3.5	19	2.4

Statistical model and data analysis

The analysis of quantitative data was carried out by using SPSS (version, 20) statistical software to compare the observed defects of hides and skin in the study area. The ANOVA was conducted to test each defect in selected woredas. A significant mean difference was declared by using Tukey-Kramer HSD procedure. The statistical models used for the study was:

$$A) Y_{ij} = \mu + \alpha_i + e_{ij}$$

where: Y_{ij} = type of defect per hide or skin, μ = overall mean, α_i = the effect of i th woredas ($i=1-3$), and e_{ij} = random error.

RESULTS AND DISCUSSION

Hide

Defects of the hide

The apparent defects of the hide are presented in Table 5. The result showed that the most important defects of the hide in the study area were filthiness (17.9%), gouge mark (17.7%) and poor pattern (13.5%). This result

disagrees with that of CSA (2004), which reported that knife cut (79.62%), knife damage (54.66%) and siding/corduoying/ (37.18%) were the leading defects of the hide. Also Berihe (2009) reported that disease and flycut were the main defects of the hide. This variation has come from the awareness of people towards the hide during slaughtering time. Nowadays, farmers take great attention for knife cut rather than filthiness, because knife cut does not fetch a good price by legal traders.

As shown in Table 6, Dejen and Sinan woreda have shown a significant difference ($P < 0.05$) compared to Awabel woreda on poor pattern and Awabel has a significant difference among those woredas on salt pitting defects. This is due to the improper ripping of the hide (carelessness, hastiness, improper knife) due to slaughtering and the use of non conventional salt size (> 3 mm). On the other hand, there is no statistically marked difference among woredas on defects like, tickes, scars, fly cut, gouge mark scores, corduoying filthiness and putrefaction. This indicates that the overall attention of the farmers and their understanding towards the defect of the hide in all woredas seem nearly similar.

Grading of the hide

According to the overall grading percentage of the hide

Table 6. Mean defects of hides.

Defects	Woreda			SEM	P- value
	Sinan	Dejen	Awabel		
Ticks	1.67 ^a	1.33 ^a	2 ^a	0.16667	0.296296
Scars	5.33 ^a	7.00 ^a	5.33 ^a	0.85707	0.716816
Bruise	9.67 ^a	9.00 ^a	8.33 ^a	0.57735	0.702332
Fly cut (Hole)	11.33 ^a	10.00 ^a	11 ^a	0.27778	0.110592
Poor pattern	12.67 ^a	12.00 ^a	11.00 ^b	0.26058	0.002536
Gouge mark	16.33 ^a	16 ^a	14.33 ^a	0.41201	0.083089
Scores	3.66 ^z	3.33 ^a	3.00 ^a	0.23570	0.578704
Corduroying	7.66 ^a	7.00 ^a	6.33 ^a	0.33333	0.296296
Filthiness	16.66 ^a	15.66 ^a	15.00 ^a	0.32394	0.085869
Putrefaction	4.66 ^a	4.66 ^a	6.00 ^a	0.42310	0.37972
Salt pitting	1.66 ^a	1.66 ^a	3.00 ^b	0.26058	0.020285

Means with a different superscript in a row are significantly different ($P < 0.05$).

Table 7. Grading of the hide.

Grade	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
I	9	7	9	25	41.7	11	7	9	27	45	8	7	7	22	36.7	74	41.1
II	10	11	9	30	50	8	11	9	28	46.7	10	11	11	32	53.3	90	50
III	1	2	2	5	8.3	1	2	2	5	8.3	2	2	2	6	10	16	8.9
IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reject	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	20	20	20	60	100	20	20	20	60	100	20	20	20	60	100	180	100
Mean				12					12					12		36	
SD				14.4					14.3					14.4		12.9	

as shown in the Table 7, Grade II (50%) is the first rank, Grade I (41.1%) is the second rank, and Grade III (8.9%) is the third rank. In all woredas there is no any grade variation during the study period. This result is similar with that of CSA (2004) in Grade II (36.2%) because it was the first rank but differs in Grade I (22.8) which was the third rank and Grade III (29%) which was the second rank. The present result also disagrees with that of UNIDO (2002) who reported that Grade I was the first rank (50%), Grade II (40%) was the second rank and Grade III (20%) was the third rank. Also Berehe (2009) reported that most of the hides in Atsibii Wonberta Woreda in Tgray regin were Grades I - III. Due to lack of price by grading, the producers have not given more attention about defects that have downgrade the hide.

Sheep skin

Defects of sheep skin

The number of defect in the study area is presented in Table 8. The leading overall defect of sheep skin was

filthiness (22%), poor pattern (14.2%) and gouge mark (9.8%). The result disagrees with the report of CSA (2004), which stated that poor pattern (34.79%), dirt (30.78%) and knife cut (20.04) were the main defects of sheep skin. Also the result is not in line with the report of Zembaba et al. (2013), who reported that poor pattern (34.8%), dirt (27.4%) and corduroying (20.7%) were the chief defects of sheep skin. This is due to the awareness of the producers about the defects which lessens the selling price of skin for legal traders. The result of this study has revealed that the knife cut of the skin is highly minimized during slaughtering operations and the merchants has a strong conviction to refuse for buying of knife cut skins.

As shown in Table 9, in all woredas fly cut has shown a marked significant difference ($p < 0.05$). Among them the mean defect of Dejen is higher than that of Awabel and Sinan. This shows that the producers of sheep skin in Dejen and Awabel woreda have not a good understanding about the skin defects compared with Sinan. Dejen has a significant difference ($p < 0.05$) between Awabel and Sinan on poor patter defect.

Table 8. Number of sheep skin with defects.

Defect	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
Bruise	13	4	15	32	4.3	10	3	3	16	2.1	4	18	17	39	5.2	87	3.9
Fly cut (Hole)	4	7	4	15	2.0	34	17	27	78	10.4	11	16	14	41	5.5	134	6.0
Poor pattern	18	31	33	82	10.9	37	59	53	149	19.9	28	37	23	88	11.7	319	14.2
Gush	14	27	12	53	7.1	2	0	17	19	2.5	19	18	16	53	7.1	125	5.6
Gouge mark	31	18	16	65	8.7	46	8	32	86	11.5	33	17	20	70	9.3	221	9.8
Scores	18	0	6	24	3.2	4	3	3	10	1.3	0	0	0	0	0.0	34	1.5
Corduroying	0	0	0	0	0.0	0	0	0	0	0.0	1	0	7	8	1.1	8	0.4
Filthiness	46	62	80	188	25.1	46	48	47	141	18.8	44	61	60	165	22.0	494	22.0
Putrefaction	1	0	0	1	0.1	15	7	7	29	3.9	5	0	3	8	1.1	38	1.7
Salt pitting	7	0	0	7	0.9	0	0	0	0	0.0	12	6	0	18	2.4	25	1.1
Salt crystaliz	0	18	0	18	2.4	0	0	0	0	0.0	5	5	8	18	2.4	36	1.6
Hard spot	0	0	0	0	0.0	0	0	0	0	0.0	2	2	0	4	0.5	4	0.2

Table 9. Mean defects of sheep skin.

Defects	Woreda			SEM	P-value
	Sinan	Dejen	Awabel		
Bruise	10.66 ^a	5.33 ^a	13.00 ^a	2.09497	0.353
Fly cut (Hole)	5.00 ^a	26.00 ^b	13.66 ^c	3.40116	0.008
Poor pattern	27.33 ^b	49.66 ^a	29.33 ^b	4.42252	0.043
Gush	17.66 ^a	6.33 ^a	17.66 ^a	2.80597	0.164
Gouge mark	21.66 ^a	28.66 ^a	23.33 ^a	3.90196	0.796
Scores	8.00 ^a	3.33 ^a	0.00 ^a	1.92049	0.256
Filthiness	62.66 ^a	47 ^a	55 ^a	3.96318	0.307
Putrefaction	1.00 ^a	9.66 ^a	4.00 ^a	1.97765	0.235
Salt crystalization	18 ^a	0.00 ^b	6.00 ^b	3.08221	0.027
Salt pitting	7.00 ^a	0.00 ^a	9.00 ^a	1.85592	0.766
Hard spot	0.00 ^b	0.00 ^b	2.00 ^a	.00000	0.000

Means with a different superscript in a row are significantly different ($P < 0.05$).

However, Sinan has a significant difference ($P < 0.05$) between Dejen and Awabel on salt crystallization. This shows that Sinan traders use dry salt after milling of a normal salt for human consumption and for preservation purpose. Awabel has a significant difference with others on the defect of hard spot. This is due to the construction of the warehouse in which the wind enters into it through the stock.

Grading of sheep skin

The grading of the sheep skin is presented in Table 10. In this study, the overall grading of the skin according to their rank was Grade II (61.33%) the first rank, Grade I (33.33%) the second and Grade III (5.33%) the third rank. This sequence of grading is similar in all woredas. This result is different from CSA (2004), which is reported that

Grade I is the first rank (38.27%), Grade III is the second (29.38%) and Grade II is the third rank (29.24%). The result is nearly similar with the report of Zembaba et al. (2013), who reported that Grade II was the first rank (36.33%), Grade I (29.68%) the second rank and Grade III (28.14%) the third rank. The present result also disagrees with the report of UNIDO (2002) who reported that Grade I and II was the first rank (40%), Grade III (20%) the second rank. In the previous studies, there were a number of skins categorized in Grade IV and reject.

But in this study there is no anyone defect grouped under Grade IV and reject. This shows that the number of defects per skin is gradually decreased time to time due to the fact that the awareness of the producer is increasing about the defects that come during slaughtering operations.

Table 10. Grading of sheep skin.

Grade	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
I	101	87	94	282	37.6	60	111	70	241	32.1	75	69	83	227	30.3	750	33.33
II	137	151	138	426	56.8	165	125	161	451	60.1	170	172	161	503	67.1	1380	61.33
III	12	12	18	42	5.6	25	14	19	58	7.7	5	9	6	20	2.6	120	5.33
IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reject	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	250	250	250	750	100	250	250	0	750	100	250	250	250	750	100	2250	100
Mean				150					150					150		450	
SD				193.8					195.2					219.3		605.9	

Table 11. Number of wet salted goat skin.

Defect	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
Bruise	0	1	0	1	3.3	5	4	3	12	4.0	3	4	3	10	6.7	23	4.8
Fly cut (Hole)	4	0	1	5	16.7	20	13	14	47	15.7	7	2	14	23	15.3	75	15.6
Poor pattern	0	2	1	3	10.0	19	19	14	52	17.3	11	8	14	33	22.0	88	18.3
Gush	0	0	0	0	0.0	10	8	5	23	7.7	1	3	5	9	6.0	32	6.7
Gouge mark	0	0	1	1	3.3	6	7	8	21	7.0	1	1	8	10	6.7	32	6.7
Scores	0	0	0	0	0.0	0	0	0	0	0.0	3	4	0	7	4.7	7	1.5
Filthiness	3	5	4	12	40.0	25	25	27	77	25.7	7	13	27	47	31.3	136	28.3
Putrefaction	0	0	0	0	0.0	0	0	1	1	0.3	2	1	1	2	1.3	3	0.6
Salt crystaliz	0	0	0	0	0.0	0	0	0	0	0.0	1	1	0	2	1.3	2	0.4
Salt pitting	0	0	0	0	0.0	0	0	0	0	0.0	1	1	0	2	1.3	2	0.4
Hard spot	0	0	0	0	0.0	2	1	1	4	1.3	2	0	1	3	2.0	7	1.5
Defect free				8	26.7				63	21.0				2	1.3	73	15.2
Total				30	100.0				300	100.0				150	100.0	480	100.0

Wet salted goat skin

Defects of wet salted goat skin

The number of defect in the study area is presented in Table 11. The leading overall defect of wet goat skin was filthiness (28.3%), poor pattern (18.3%) and fly cut (15.6%). The result disagrees with the report of CSA (2004), who reported that poor pattern (33.18%), dirt (26.93%) and knife cut (24.09) were the main defects of wet goat skin. Also the result is not in line with the report of Zembaba et al. (2013), who reported that poor pattern (29.16%), dirt (26.89%) and corduroying (22.0%) were the chief defects of wet goat skin. This is due to the awareness of the producers about the defects which lessens the selling price of skin for legal traders.

As Shown in Table 12, Dejen and Awabel woredas have shown a significant difference ($P < 0.05$) compared with Sinan Woreda on poor pattern, filthiness, and putrefaction. The reason for this difference might be

carelessness during ripping process, improper use of knife, non experienced ripper, washing of skin soon after production is unusual and the temperature and the number of skins stored in the warehouse favors for this difference. On the other hand, Awabel has shown a marked statistical difference ($P < 0.05$) among others on scores, salt crystallization and salt pitting defects. This is due to hastiness during flaying, unexperienced flayer, improper knife, using of improper salt size.

Grading of wet salted goat skin

The grading of the wet goat skin is presented in Table 13. In this study, the overall grading of the skin according to their rank was Grade II (54.4%) as the first rank, Grade I (31.4%) as the second, and Grade III (14%) as the third rank. This sequence of grading is similar in all woredas. This result is different from that of CSA (2004), who reported that Grade I is the first rank (37%), Grade II is the second (30%) and Grade III is the third rank (25%).

Table 12. Mean defects of wet salted goat skin.

Defects	Woreda			SEM	P-value
	Sinan	Dejen	Awabel		
Bruise	1.00 ^a	4.00 ^a	3.33 ^a	0.47380	0.080
Fly cut (Hole)	2.500 ^a	15.66 ^a	7.66 ^a	2.41969	0.059
Poor pattern	1.500 ^b	17.33 ^a	11.00 ^a	2.44949	0.004
Gush	0.00 ^a	7.66 ^a	3.00 ^a	1.33333	0.066
Gouge mark	1.00 ^a	7.00 ^a	3.33 ^a	1.28836	0.247
Scores	0.00 ^a	0.00 ^b	3.50 ^a	0.50000	0.000
Filthiness	4.00 ^b	25.00 ^a	15.66 ^a	3.57633	0.013
Putrefaction	0.00 ^b	1.00 ^a	1.00 ^a	0.00000	0.000
Salt crystalization	0.00 ^b	0.00 ^b	1.00 ^a	0.00000	0.000
Salt pitting	0.00 ^b	0.00 ^b	1.00 ^a	0.00000	0.000
Hard spot	0.00 ^a	1.33 ^a	1.50 ^a	0.24495	0.789

Means with a different superscript in a row are significantly different ($P < 0.05$).

Table 13. Grading of wet salted goat skin.

Grade	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
I	3	3	4	10	33.3	28	35	34	97	32.3	16	15	13	44	29.3	151	31.4
II	5	5	5	15	50	51	47	51	149	49.7	32	33	32	97	64.7	261	54.4
III	2	2	1	5	16.7	21	18	14	53	17.7	2	2	5	9	6	67	14
IV	0	0	0	0	0	0	0	1	1	0.3	0	0	0	0	0	1	0.2
Reject	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	10	10	30	100	100	100	100	300	100	50	50	50	150	100	480	100
Mean				6					60					30		96	
SD				6.5					64.1					41.61		111.1	

The result is nearly similar with the report of Zembaba et al. (2013), who reported that Grade II was the first rank (34.34%), Grade I (29.63%) was the second rank and Grade III (25.59%) was the third rank. The present result also disagrees with that of UNIDO (2002) who reported that Grade I was the first rank (40%), Grade II (35%) was the second rank and Grade III (25%) was the third rank. In the previous studies, there were a number of skins categorized in Grade IV and reject. But in this study, there was almost no dried goat skin grouped under Grade IV and reject. This shows that the number of defects per skin is gradually decreased time to time due to the awareness of the producers about slaughtering defects during slaughtering operation.

Air dried goat skin

Defects of air dried goat skin

The number of defect in the study area is presented in Table 14. The leading overall defect of dried goat skin was filthiness (28.8%), poor pattern (14.0%) and fly cut (11.2%). The result disagrees with the report of CSA

(2004), which showed that poor pattern (37.73%), dirt (24.89%) and knife cut (23.86) were the main defects of dried goat skin. Also the result is not in line with the report of Zembaba et al. (2013), who reported that dirt (34.89%), poor pattern (25.71%) and corduroying (18.62%) were the chief defects of dried goat skin. This is due to the awareness of the producers about the defects which lessen the selling price of skin for legal traders.

As indicated in Table 15, Dejen has shown a significant difference ($P < 0.05$) compared with Sinan and Awabel on poor pattern, fly cut, corduroying and weak spot. The reason for this variation might be carelessness during ripping and flying process, improper use of knife, non experienced ripper and flayer of the skin. On the other hand, each woreda has also shown a marked statistical difference ($P < 0.05$) on filthiness. In this case, Sinan has taken a good precaution during slaughtering and after slaughtering operations compared with Dejen and Awabel.

Grading of air dried goat skin

The grading of the wet goat skin is presented in Table 16.

Table 14. Number of air dried goat skin with defects.

Defect	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
Bruise	0	0	1	1	3.3	2	2	2	6	4.0	2	2	1	5	4.8	12	4.2
Fly cut (Hole)	0	1	1	2	6.7	9	6	8	23	15.3	2	2	3	7	6.7	32	11.2
Poor pattern	1	1	2	4	13.3	7	9	9	25	16.7	3	3	5	11	10.5	40	14.0
Gush	0	1	0	1	3.3	4	2	1	7	4.7	2	2	1	5	4.8	13	4.6
Gouge mark	1	1	0	2	6.7	3	4	4	11	7.3	3	3	2	8	7.6	21	7.4
Courdroying	1	0	0	1	3.3	5	0	0	5	3.3	0	0	1	1	1.0	7	2.5
Filthiness	4	2	3	9	30.0	13	13	14	40	26.7	11	12	10	33	31.4	82	28.8
Putrefaction	0	1	1	2	6.7	0	3	2	5	3.3	2	2	1	5	4.8	12	4.2
Insect damage	1	0	0	1	3.3	6	3	3	12	8.0	0	0	3	3	2.9	16	5.6
Weak spot	0	0	0	0	0.0	1	0	0	1	0.7	0	0	0	0	0.0	1	0.4
Defect free				7	23.3				15	10.0				27	25.7	49	17.2
Total				30	100.0				150	100.0				105	100.0	285	100.0

Table 15. Mean defects of air dried goat skin.

Defects	Woreda			SEM	P-value
	Sinan	Dejen	Awabel		
Bruise	1.00 ^a	2.00 ^a	1.66 ^a	0.18443	0.218
Fly cut (Hole)	1.00 ^b	7.66 ^a	2.33 ^b	1.13389	0.001
Poor pattern	1.33 ^b	8.33 ^a	3.66 ^b	1.06863	0.000
Gush	1.00 ^a	2.33 ^a	1.66 ^a	0.40406	0.605
Gouge mark	1.00 ^b	3.66 ^a	2.66 ^a	0.41993	0.007
Courdroying	1.00 ^b	5.00 ^a	1.00 ^b	1.33333	0.000
Filthiness	3.00 ^c	13.33 ^a	11.00 ^b	1.58504	0.000
Putrefaction	1.00 ^a	2.500 ^a	1.66 ^a	0.28571	0.116
Weak spot	0.00 ^b	1.00 ^a	0.00 ^b	0.00000	0.00
Insect damage	1.00 ^a	4.00 ^a	3.00 ^a	0.80000	0.469

Means with a different superscript in a row are significantly different ($P < 0.05$).

Table 16. Grading of air dried goat skin.

Grade	Sinan					Dejen					Awabel					Grand Total	%
	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%	WH-1	WH-2	WH-3	Total	%		
I	4	3	3	10	33.3	17	13	14	44	29.3	11	10	13	34	32.4	88	30.9
II	5	6	6	17	56.7	23	33	31	87	58	22	23	19	64	61	168	58.9
III	1	1	1	3	10	10	4	5	19	12.7	2	2	3	7	6.6	29	10.2
IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reject	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	10	10	30	100	50	50	50	150	100	35	35	35	105	100	285	100
Mean				6					30					21		57	
SD				7.4					36.6					27.8		71.7	

In this study, the overall grading of the skin according to their rank was Grade II (58.9%) as the first rank, Grade I (30.9%) as the second rank, and Grade III (10.2%) as the third rank. This sequence of grading is similar in all woredas. This result disagrees with that of CSA (2004),

who reported that Grade III was the first rank (33.52%), Grade I was the second rank (31.81%) and Grade II was the third rank (26.17%). The result is nearly similar with the report of Zembaba et al. (2013), who reported that Grade I was the first rank (38.21%), Grade II (32.07%)

was the second rank and Grade III (24.47%) was the third rank. The present result also disagrees with that of UNIDO (2002) who reported that Grade I was the first rank (40%), Grade II (35%) was the second rank and Grade III (25%) was the third rank. In the previous studies, there were a number of skins categorized in Grade IV and reject; but in this study, there is no defect grouped under Grade IV and reject. This shows that the number of defects per skin is gradually decreased time to time due to the fact that the producer has an increasing awareness about the defects that come during slaughtering operation.

Conclusion

The result of this study revealed that a considerable percentage of cow hide defects were filthiness, gouge mark and poor pattern. The leading defects of sheep skin were filthiness, poor pattern and gouge mark. In the case of wet salted and air dried goatskins, the major defects were filthiness, poor pattern and fly cut. Some defects showed a significant difference ($P < 0.05$), whereas the highest proportion of hide and skin defects has no significant difference among the woredas. Therefore the result of these defects was responsible for downgrade of hides and skins. The highest percentage of the hides and skins grade is Grade II followed by Grade I and Grade III. Very few skins were grouped in Grade IV and there were no reject hides and skins during this study.

RECOMMENDATIONS

Based on the obtained result, the following recommendations are made:

- Slaughtering of cattle, sheep and goats should be done by professionals in order to reduce the defects created during slaughtering which is found as the major defects observed among others.
- Appropriate ripping and flying knife should be prepared to reduce the defects of hides and skins.
- Recommended salt size should be applied during preservation of hides and skins by wet salting method.
- Control of ectoparasites should be practiced to minimize the effect of parasites that downgrade the quality of hides and skin.
- Regular warehouse sanitation should be practiced to minimize the defect.
- Proper training should be given for producers, development agents and merchants about the effect of the defects on the revenue.
- Further investigation should be undertaken to sort out microscopic defects during pre tanning operations in the tannery.

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REFERENCES

- Akloge N (2001). Raw Hide & Skin Preservation Manual. Federal ATVET. Addis Ababa, Ethiopia. p. 20.
- Bayou K, Mengiste B, Sirak A, Tefera A (1998). Control Of "Ekek", Skin Defect In Sheep By Insecticides And Shearing. In: Proceedings of 12th Annual Conference of Ethiopian Veterinary Association. Addis Ababa, Ethiopia, pp. 104-109.
- Berhe AN (2009). Assessment of hides and skins marketing in Tigray region: the case of atsbi wemberta wereda, Eastern Tigray.
- Beyene K (1997). Key notes address. Looking ahead for sustainable live stock developments in Fifth national conference, Ethiopian Society of Animal Production 17 may, 1997, Addis Ababa, Ethiopia. pp. 9-11.
- CSA (Central Statistics Authority) (2004). Report on livestock and livestock characteristics (private peasant holdings), statistical bulletin, 331, volume II, Addis Ababa, Ethiopia. p. 142.
- CSA (Central Statistics Authority) (2008). Report on Livestock and Livestock Characteristics: Agricultural Sample Survey 2007/08. Statistical Bulletin 417, Volume II, March 2008. Addis Ababa.
- Dervacy TS, Getachew A (1988). Hide and skin improvement manual, Addis Ababa, Ethiopia. pp. 250.
- EGZARDD (Eastern Gojam Zone Agriculture and Rural Development Department) (2011). Annual Report, unpublished data, Debre markos, Eastern Gojam.
- ETA (Ethiopian tread Authority) (2004). Broucher and personal communication.
- FAO (Food and Agricultural Organisation) (1999). Marketing Of Leather Products. Committee on commodity problems, Sub group on hide and skins, Six session November 1998. Development of the hides, skins and leather sector in Africa, Cape Town, South Africa. Pp. 9-11. Footwear for the years 1982-2000. Rome, Italy.
- FAO (Food and Agricultural Organisation) (1999). On FAOSTAT 1999 <http://apps.fao.org/cgi-bin/nph.db.pl>.
- FAO (Food and Agricultural Organisation) (2001). World Statistical Compendium for Raw Hides and Skins Leather and Leather.
- Kassa B, Mengiste B, Sirak A, Tefera A (1998). Control of "Ekek", skin defect in sheep by insecticides and shearing. In: Proceedings of 12th Annual Conference of Ethiopian Veterinary Association. June 1998, Addis Ababa, Ethiopia, pp. 104-109.
- Loop T, Tseguereda A (2003). Contributions to Local Economic Development (LED) by Enterprise and Business Development; Footwear Clusters in Addis Ababa. Paper presented at the 2nd RLDS International

- Policy Research Workshop: "LED and Globalization", held on 28/29 April 2003 in Addis Ababa. Addis Ababa University: RLDS.
- MOA (Ministry of Agriculture) (1986). Hides and Skins Quality Control Manual. Addis Ababa, Ethiopia.
- MOTI (Ministry of trade and Industry) (2005). A Strategic Action Plan for the Development of the Ethiopian Leather and Leather Products Industry', Volume I, March 2005.
- MOTI (Ministry of trade and Industry) (2008). Export of agricultural products of Ethiopia: Documentation center.
- PIC (Productivity improvement centre) (1981). Hides and Skins quality improvement manual. Addis Ababa, Ethiopia.
- Population and Housing Census of Ethiopia (2004). Results for Amhara Region, Vol. 1, part 1, Tables 2.1, 2.11, 2.14, 2.17 (accessed 6 April 2009).
- SPSS (2012). Statistical Package for Social Science, SPSS 20 for Windows. SPSS Inc. Chicago Illinois.
- United Nations/United Nations Conference on Trade and Development UNCTAD (2002). Investment and Innovation Policy Review- Ethiopia, Division on Investment, Technology and Enterprise Development Geneva, Switzerland.
- Zembaba T, Mengesha D, Negash T, Melaku S, Garedew L (2013). Stereotyping of Defects and Grading of Raw Sheep and Goat Skins Collected And Stored by Skin Traders In Bahir-Dar Town, Ethiopia. *Int. J. Anim. Vet. Adv.*, 5(1): 15-20