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An Assessment Study on the Quality Status of Hides and Skins: in the Case of Ethiopian Tanneries

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Abstract

The Ethiopian leather sector enjoys significant national and international advantages such as availability of enormous livestock resource which implies to availability of raw material (hide and skin), highly disciplined, trainable and cheap labour force, availability of big tanneries, support from government and nongovernmental partners, open to EU and US markets that have the potential to make it one of the most competitive industries. However, still the sector is constrained by different factors along the supply. Having the objective of identifying the major defects causing quality deterioration of hide and skin and their grading levels an assessment study was conducted in the purposely selected eight potential tanneries in and around Addis Ababa (N= 648 hides, 648 sheepskins and 324 goatskins). Defect analysis of this study showed different defect types (cockle or ekek, flaying defect, scratch, brand mark, putrefaction, process (machine) defect, smallpox, veinnes, scar, ripping defect, poor substance, tick mark, shrinkage as result of old age) are observed in a hide/skin either in single or in combination and cause quality deterioration of the raw material. The distribution of the defect types are pooled out and categorized in to pre, peri and post slaughter defects. The prevalence of these defect categories showed the values of 81.80%, 59.90%, 27.80% in hide, 87.00%, 36.70%, 32.90% in sheepskins and 70.00%, 75.30%, 27.20% in goatskins as pre, peri and post slaughter defects respectively. Grade values in this study showed that best quality graded (Grade I & II) are absent with a very insignificant ratio of grade three (0.31% in hide, 0.93% in sheepskin and 2.47% in goatskin) and most grades fall in grade V, VI and rejects due to the effect of defects occurred as pre, peri and post slaughter that are taking greater share and responsible for the quality deterioration of the raw materials.

Keywords: Ethiopia; Hide/skin; Defect; Quality

Introduction

The Ethiopian export commodities are agricultural outputs like coffee; hides and skins; and seeds and nuts used for edible oil production. As these are the main sources of foreign earnings, they also automatically define the country's capacity to import other materials used in manufacturing. Haile Kibret [1] also mentioned that macro aggregates, like employment and inflation rates, are also influenced by the sector. The hides and skins of country as an important economic component contributing significant amount to the national economy by providing 14–18% of the foreign exchange earnings [2]. Thus, leather in Ethiopia is one of the forth growing economic sectors [3,4].

The national annual off take/killing rate for Ethiopian cattle, sheep, and goats, are 10 %, 35 %, 38 %, respectively Asfaw and Mohamed [5]. Since the country is gifted to have large livestock population of (55.694, 26.537 and 25.035 million bovines; sheep and goats respectively [6]. based on population size and off take rate, the number of hide and skin that should be produced annually is expected to be 5,569,400 hides; 9,287,950 sheep skin and 9,513,300 goat skin. However, 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 whereas the rest 74%, 19.4% and 35% of hides, sheep and goat skin, respectively are either consumed locally or sold illegally through cross border illicit market [7]. The Ethiopian leather sector enjoys significant international comparative advantages such as availability of huge livestock population which implies to the availability of raw materials, highly disciplined and cheap trainable labor force, availability of big tanneries (soaking capacity), open access to Europe and U.S markets, that has potential to make the industry one of the most competitive industries if the existing local and international market opportunities are exploited and utilized in an efficient and effective manner, however, the reality gives a different picture [8,9]. In majority of developing countries including Ethiopia despite the fact that they have enormous livestock population, their contribution to growing supplies of hide and skin on the world market is very unreasonable [10]. The reason for this low contribution is due to poor husbandry practices, Poor slaughter facilities and practices, Lack of backward and forward linkages in the Ethiopian leather sector, less manpower training and skills, lack of quality grading, and prices not based on quality, Limited supply of skins and hides as a result of low off take and high proportion of informal slaughtering, Research gap for technology generation and Lack of strong technology transfer efforts [11].

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The objective of this study therefore is to evaluate the factors causing quality deterioration of the Ethiopian hides and skins and the status of grading levels of the raw materials at the tanning stage (wet blue) so that it will help us to indicate the way forward on measures to be taken to improve the quality of the raw materials (hide and skin) in Ethiopia.

Methodology and Data Analysis

1620 hides (N=648 hide) and skins (648 sheepskin; N=324 goatskin) are collected from the purposely selected eight potential tanneries in and around Addis Ababa to identify the defects deteriorating hides and skin quality and know the grade level of the raw materials (hides/skins). Data was coded using Microsoft Excel spread sheet and then analyzed using SPSS version 20 software to know the frequency and percentage levels and excel is used to show the figures.

Results and Discussions

Table 1 shows the name of sampled tannerie.108 hides and skins are taken from each of the sampled potential tanneries found in Addis Ababa and around Addis Ababa-Ethiopia. As shown in Table 2, different defects (cockle or ekek, flaying defect, scratch, brand mark, putrefaction, process (machine) defect, smallpox, veinnes, scar, ripping defect, poor substance, tick mark, shrinkage as result of old age) are observed in a hide or skin either in single or in combination (that occur as single defect type, two defect type and three and above defect types) and cause quality deterioration of the raw material. Among the different observed defects in the (N=648) hides, (N=648 sheepskins) and (N=324 goatskins) the prevalence of flaying defect ranked first which is 59.88 %(388), followed by scratch 44.60% (289), cockle (ekek) 41.98% (272), Putrefaction 24.38% (158, scar 17.59% (114) and other defects(brand mark, process defect, smallpox, veinnes, ripping defect, poor substance, tick mark, & shrinkage) in their share ranges of 8.02% (52) - 0.15%(1 hide). In the two + three and above defect type it is impossible to evaluate the impact of single defect type and its contribution on grade. There we tried to take the most prevalent defects as representing in each defect category and evaluated their effect on grades in the following Figures.

Table 1: Tannery name & share of each hide/skin from which sample is taken.

No	Tannery name	Hide		Sheepskin		Goatskin	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
1	Colba tannery	108	16.7	108	16.7	108	33.3
2	ELICO tannery	108	16.7	108	16.7	0	0.00
3	Ethio tannery	108	16.7	108	16.7	0	0.00
4	Mojo tannery	108	16.7	108	16.7	108	33.3
5	AA tannery	108	16.7	108	16.7	0	0.00
6	Abiyssinia tannery	0	0.00	0	0.00	108	33.3
7	Dire tannery	108	16.7	108	16.7	0	0.00
8	Debrebrhan tannery	0	0.00	108	16.7	0	0.00
	Total	648	100.0	648	100.0	324	100.0

As presented in Table 3, majorities of grades in these hides fall in grade six and reject (seven). The reject grade (grade seven according to the tanneries naming) is 31.48% as the result of the defects mentioned in Table 2. From this we see that the grades (quality) of the hides is deteriorated with its insignificant number of grades three 0.31 % (2 hides) only out of 648 and higher proportion of lower grades and reject. In case of sheepskins the same trend is followed i.e. 27.31 % (177) as reject grade, 36.11% (234) grade six,26.54% (172) grade five 9.10% (59) grade four and 0.93% (6) grade three. When we take goatskins 19.75% (64) reject, 35.49% (115) grade six, 34.26% (111) grade five, 8.02% (26) grade four and 2.47% (8) grade three. In all species best quality grade (grade I & II) hides and skins are in existent.

When we compare the present results from the previous reports the quality status is becoming much lower. Results of this study showed much lower values than that of Bisrat [12] since best quality hides and skins (grades I & II is totally inexistent and grade III is only 0.31% in hide. 0.93% in sheepskin and 2.47% in goatskins. Whereas in the previous reports it was about 70% of what the Ethiopia tanneries produce three decades ago and 15% in 2013 [12,13]. The possible reasons for the declining of quality of hides and skin might be due to the fact that the animal management, slaughtering techniques and post slaughter management is not given enough care. Even though the government set the leather sector as priority sector, the attention given to the production of the raw materials is minimal and the declining in price of the raw materials in the international market might also be another reason.

Table 2: Prevalence of defect types in each hide and skin.

No	Defect types	N=648 Hide		N=648 sheepskin		N=324 Goatskin	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
1	Cockle(ekek)	272	41.98	389	60.00	92	28.40
2	Flaying defect	388	59.88	228	35.20	225	69.44
3	Scratch	289	44.60	201	31.00	132	40.74
4	Brand mark	52	8.02	23	3.50	11	3.40
5	Putrefaction	158	24.38	131	20.20	82	25.31
6	Process defect	17	2.62	2	0.31	1	0.31
7	Smallpox	14	2.16	30	4.63	10	3.09
8	Veinnes	6	0.93	92	14.20	87	26.85
9	Scar	114	17.59	63	9.72	32	9.88
10	Ripping defect	6	0.93	21	3.24	5	1.54
11	Poor substance	17	2.62	68	10.49	14	4.32
12	Tick mark	15	2.31	3	0.46	0	0.00
13	Shrinkage	1	0.15	3	0.46	3	0.93

Table 3: Total grades of hides.

No	Grade	Hide		sheepskin		Goatskin	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
1	Grade three	2	0.31	6	0.93	8	2.47
2	Grade four	36	5.56	59	9.10	26	8.02
3	Grade five	148	22.84	172	26.54	111	34.26
4	Grade six	258	39.81	234	36.11	115	35.49
5	Reject	204	31.48	177	27.31	64	19.75
	Total	648	100.0	648	100.0	324	100.0

In each of the different raw materials (hides and skins), the three different defect categories: pre-slaughter, Peri-slaughter and post-slaughter and prevalence of representative defects and their effect on grades is presented separately in the following.

Hide

When we pool the distribution of hide defects into three different categories: pre-slaughter, Peri-slaughter and post-slaughter, and filtered out, then prevalence becomes 81.80%, 59.90%, and 27.80% respectively. As presented in Figure 1, the defect categories were evaluated in their respective percentage of clustered grades per each defect category**.**

From these, hides with single category defect (pre-slaughter only, Peri-slaughter only and post-slaughter only were filtered out and their corresponding grades evaluated as presented in Figure 1.

As seen in Figure 1, best quality grades (grade 1 & II) are absent in either of the defect categories (in pre, peri and post slaughter). Grade three & four is only 7.6% in pre slaughter, 20.7% in slaughtering and none in post slaughter. This implies that comparatively better number of hides (grade 3 & 4) are obtained in the peri slaughter (20.7%) followed by pre slaughter (7.6%) and we don't find hides having better grades (grades 3 & 4) in the post slaughter. When we see the lower graded hides (grade 5 & 6), better proportion is obtained in the pre slaughter (64.9%), followed by peri slaughter (56.9%) and post slaughter (33.3%). In the reject grade the proportion of post slaughter (in which putrefaction is responsible to cause 66.7% rejection of hides followed by pre slaughter (27.6%) and then peri slaughter (22.4%).

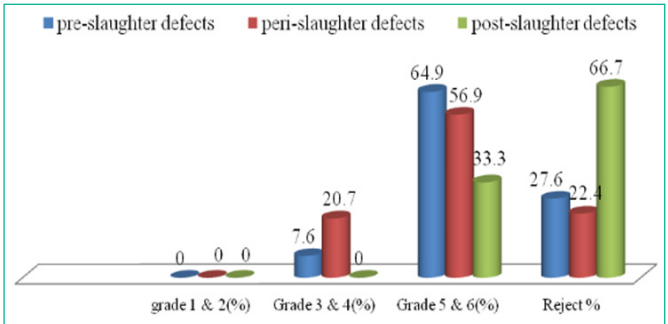

Figure 1: percent share of clustered grades of hides in relation to the categorized defects.

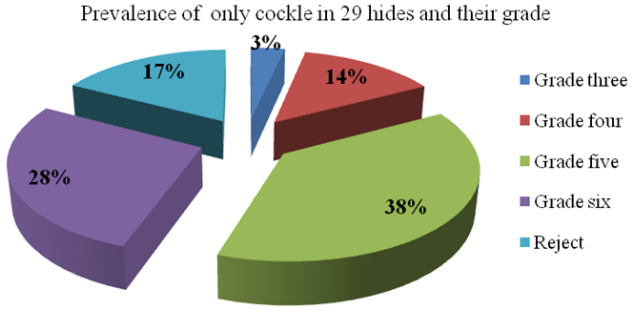

Figure 2: hides affected by only cockle and their grades.

Among the various defects observed during this study, cockle (ekek), scratch and wound (scar) from pre-slaughter defects, flaying defect from peri-slaughter and putrefaction from post-slaughter defect were the highly prevalent problems observed. Accordingly, the impact of these major defects on quality (specifically on grade values of the hides) was evaluated, when they occur singly in each hide as shown in (Figures 2-7).

As presented in Figure 2, 29 hides affected by only cockle and have grade values of 17% (29) as reject and 28% (8) grade six 38% (11) grade five, 14% (4) grade four and only 3% (1) grade three but grade I & II are absent. This indicates that the prevalence of cockle is significant in causing hide rejection of 17% (29 hides) as well as downgrading the quality status (about 66% grade six and five) of the hide.

Figure 3, is presented to show the effect of scratch on the grading values of hide affected as pre slaughter defect. In these 44 hides affected by only scratch rejection rate is comparatively smaller7% (3) whereas grade deterioration is significant amount with their respective values of 64% (28) 18% (8),11% (5) and 7% (3) as grade five, six, four and reject.

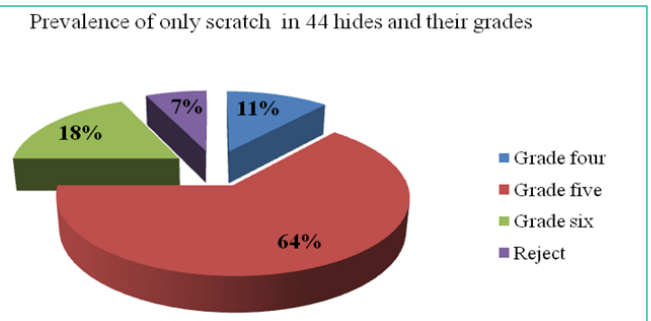

Figure 3: hides affected by only scratch and their grade.

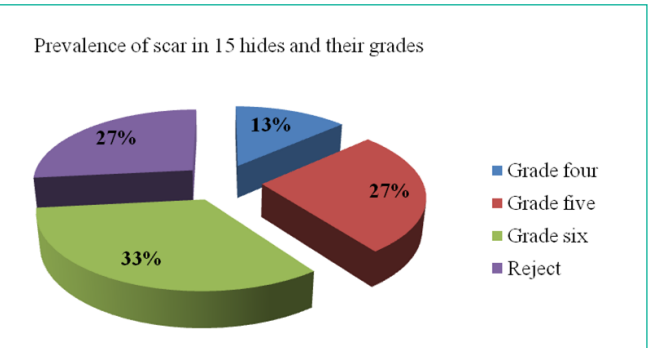

Figure 4: Hides affected by only wounds (scars) and their grades.

Figure 4 is presented to evaluate the impact of only wound in a hide on its grade value as a major pre slaughter defect. in this case 15 hides are affected by only scar and their grade values look like 27% (4) reject, 33% (5) grade six, 27% (4) grade five and 13% (2 hides) grade three, but grade I, II and III are totally in existent. The rejection rate in this case (of scar) is comparably higher (27%) than other representing major pre slaughter defects (Figure 5).

As presented in Figure 6, flaying defect is among the major operational faults during the slaughtering process of the animals. Here 60 hides are affected by only flaying defects (flay cuts, holes, gouges, corduroys) and evaluated to their corresponding respective grades. these hides therefore have shown grade values of 22% (13) as reject and 28 % (17), 28 % (17) and 22 % (13) as grade six, five and four respectively whereas best quality grades (I-III) are absent. This implies that carless or un skillful slaughtering operations can brought about significant rejection and lower graded hides (grade IV-VI). The presentation in Figure 7 showed that putrefaction is the major among post slaughter defects and is the one that brought about very significant challenge in causing rejection. Thus, their grade proportion in these hides is 83% (15) as reject, 6% (2) as grade six and 11% (1) as grade five whereas grade values of (I-IV) are not exiting and this indicates how the post slaughter hide management is affecting the quality and bring huge economic loss in the sector.

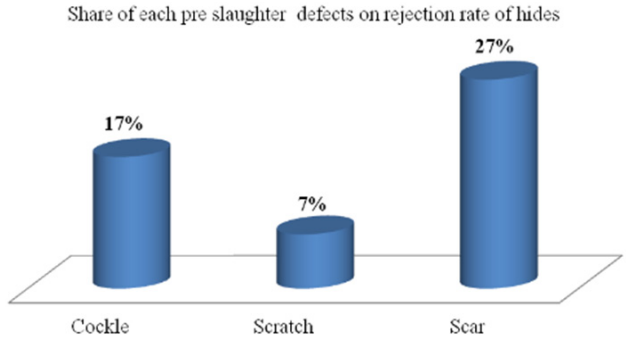

Figure 5: share of each representative pre slaughter defect on rejection rate of the hide.

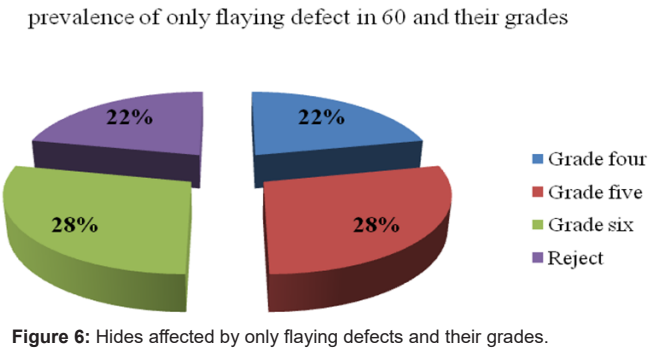

Figure 6: Hides affected by only flaying defects and their grades.

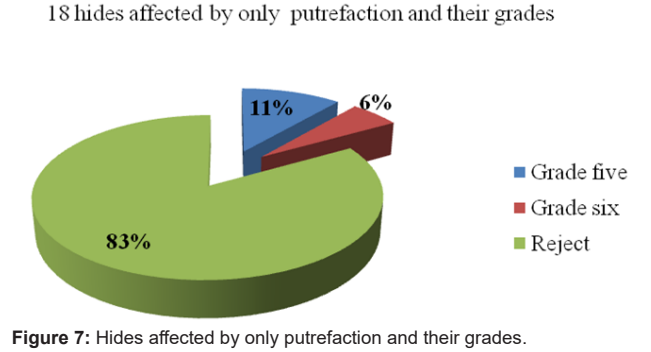

Figure 7: Hides affected by only putrefaction and their grades.

Sheepskins

When we pool the distribution of sheepskins defects into three different categories: pre-slaughter, Peri-slaughter and post-slaughter, the prevalence becomes 87%, 36.7%, and 32.9% respectively. As presented in Figure 8, the defect categories were evaluated in their respective percentage of clustered grades per each defect category.

As shown in Figure 8, best quality grades (grade 1 & II) are absent in either of the defect categories. Grade three & four is only 11.4% in pre slaughter, 20.8% in slaughtering and 15.6% post slaughter this implies that comparatively better number of skins (grade 3 & 4) are obtained in the peri slaughter (20.8%) followed by post slaughter (15.6%) and 11.4% in the pre slaughter. When we see the lower graded skins (grade 5 & 6), better proportion is obtained in the post slaughter (65.6%), followed by pre slaughter (59.8%) and peri slaughter (58.3%). In the reject grade the proportion of pre slaughter (28.8%) is higher followed by post slaughter (21.9%) and then peri slaughter (20.8%).

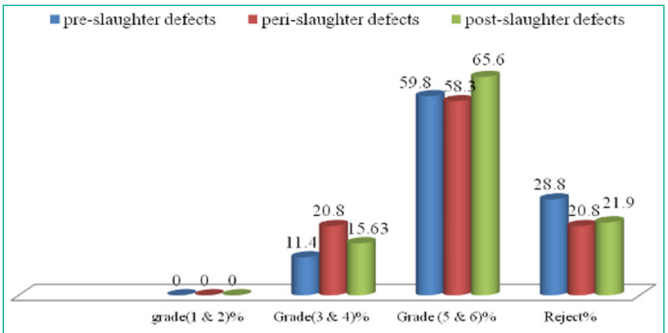

Figure 8: Percent share of clustered sheepskin grades in relation to the categorized defects.

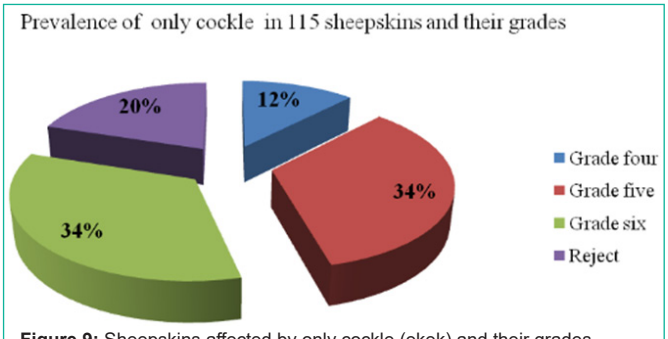

Figure 9: Sheepskins affected by only cockle (ekek) and their grades.

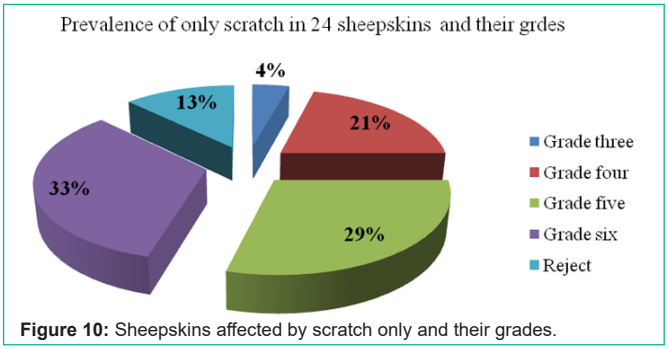

Figure 10: Sheepskins affected by scratch only and their grades.

From these, sheepskins with single category defect (only pre-slaughter, only Peri-slaughter and only post-slaughter were filtered out and their corresponding grades evaluated as presented in Figure 9-14.

As presented in Figure 9, 115 sheepskins affected by only cockle one which is the one among the potential pre slaughter defects. The sheepskins affected by this defect have grade values of 20 % (23) as reject, 34% (39) each grade six and five and 12% (14) grade four. Sheepskins having grade values of grade I, II and III are absent in this case also. Thus, cockle played great role in causing sheepskin rejection as well as downgrading the sheepskins quality.

As shown in Figure 10, scratch is one of the potential pre slaughter defects. Here 24 sheepskins are affected by only scratch and presented with their respective grade values of 13% (3) as reject, 33% (8) grade six, 29% (7) grade five, 21% (5) grade four and 4% (1) grade three wheas grade I & II are absent like it mentioned in the others this pre slaughter defect has brought significant rejection and deterioration(dowgrading) rate in the sheepskin.

16 sheepskins are affected by only scars. Even though this pre slaughter defect looks smaller in its prevalence in comparing with the other pre slaughter defects, its impact on rejection rate is much higher than its comparatives and their grade values are 44% (7) as reject, 50% (8) grade six and 6% (1) grade four with the absence of grade I-III (Figure 11).

Among the three most prevalent pre slaughter defects observed in sheepskins (cockle, scratch and scar), scar took the greatest share in bringing rejection rate as seen in Figure 12.

As presented in Figure 13, flaying defect is one potential factor causing huge operational fault which can be brought due to the skill of the operating personnel or the facilities available during slaughtering process of the animals. In this case 25 sheepskins are affected by only flaying defects, and their respective grade values are 24% (6) as reject, 40% (10) grade six, 16% (4) grade five, 12% (3) grade four and 8% (2) grade three whereas grade I & II are absent.

Figure 14, is presented to show sheepskins affected by only putrefaction. Putrefaction one of the most prevalent & major post slaughter defects. this human created problem can be minimized to minimum occurrence if the post slaughter management is improved, however due lack of careful attention given to to this management approch, the grades of sheepskins look like 19% (6) reject, 36% (11) grade six, 29% (9) grade five and 16% (5) grade four. Best quality sheepskins are absent in these case.

Goatskins

When we pool out the distribution of goatskins defects into three different categories: pre-slaughter, Peri-slaughter and post-slaughter, the prevalence becomes 70%, 75.3%, and 27.2% respectively. As presented in Figure 15, the defect categories were evaluated against their respective percentage of clustered grades per each defect category.

From these, goatskins with single category defect (pre-slaughter only, Peri-slaughter only and post-slaughter only were filtered out and their corresponding grades evaluated as presented in Figure15.

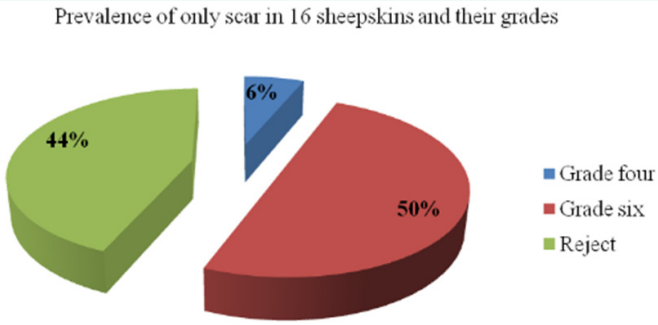

Figure 11: Sheepskins affected by only scars and their grades.

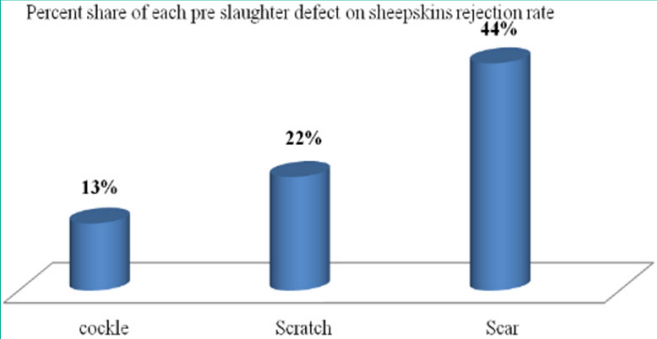

Figure 12: Percent share of each pre slaughter defect on sheepskins rejection rate.

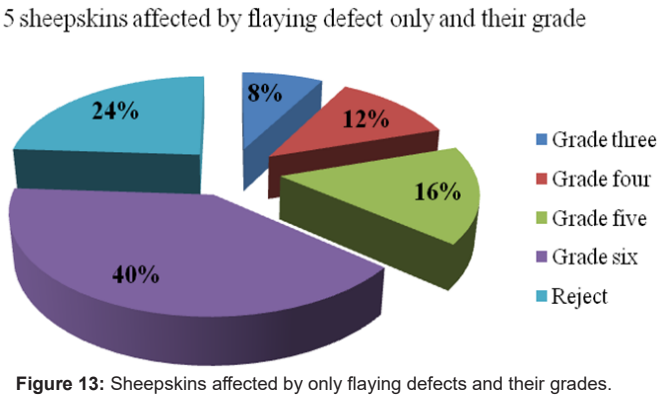

Figure 13: Sheepskins affected by only flaying defects and their grades.

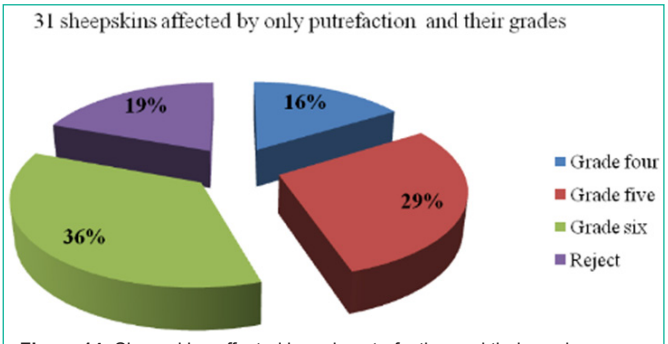

Figure 14: Sheepskins affected by only putrefaction and their grades.

As shown in Figure 15, best quality grades (grade 1 & II) are absent in either of the defect categories. Grade three & four is only 26% in pre slaughter, 13% in slaughtering and none in post slaughter this implies that comparatively better number of skins (grade 3 & 4) are obtained in the pre slaughter (26%) followed by peri slaughter (13%) and we don't find skins having better grades (grades 3 & 4) in

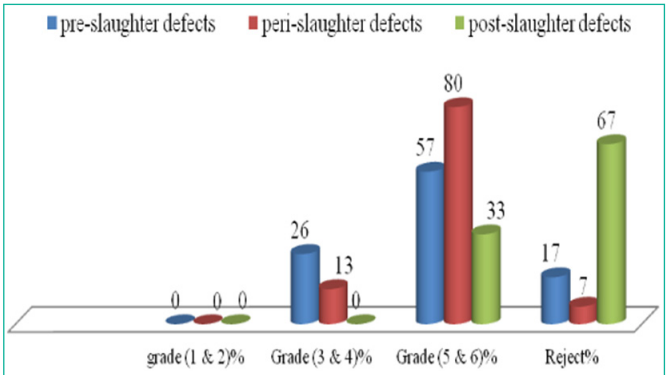

Figure 15: Percent share of clustered goatskin grades in relation to the categorized defects.

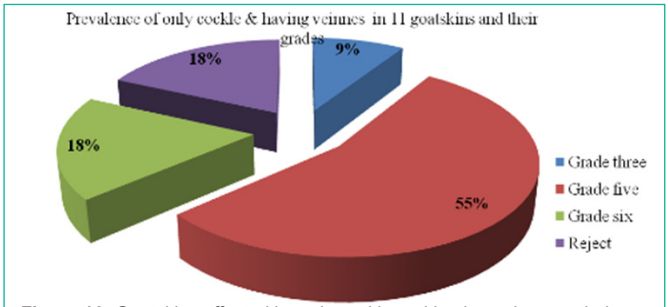

Figure 16: Goatskins affected by only cockle and having veinnes + their grades.

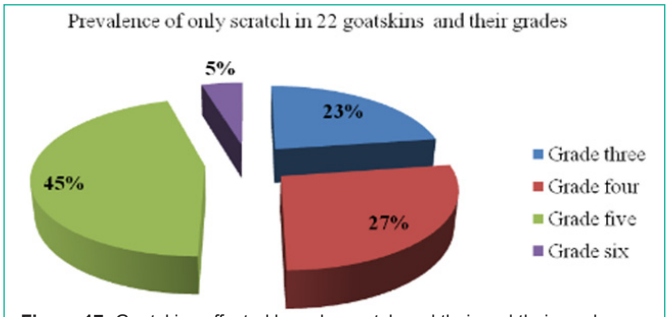

Figure 17: Goatskins affected by only scratch and their and their grades.

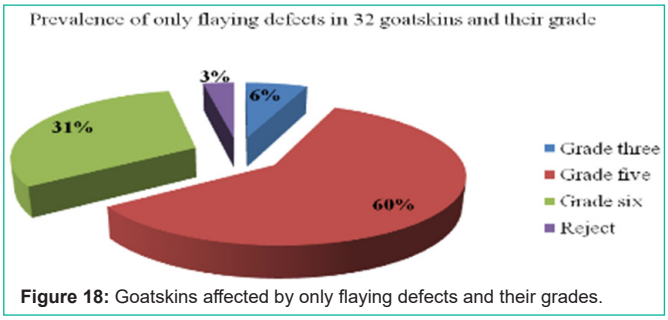

Figure 18: Goatskins affected by only flaying defects and their grades.

the post slaughter. When we see the lower graded hides (grade 5 & 6), better proportion is obtained in the peri slaughter (80%), followed by pre slaughter (57%) and post slaughter (33%). In the reject grade the proportion of post slaughter (putrefaction is responsible to cause (67% rejection of skins) followed by pre slaughter (17%) and then peri slaughter (7%). As presented in Figure 16, 11 goatskins are affected by only cockle and having veinnes. In this case the grade values of the skins are 18% (2) as reject, 18% (2) grade six, 9% (1) grade three 55% (6) grade five. But grades I, II and IV is absent.

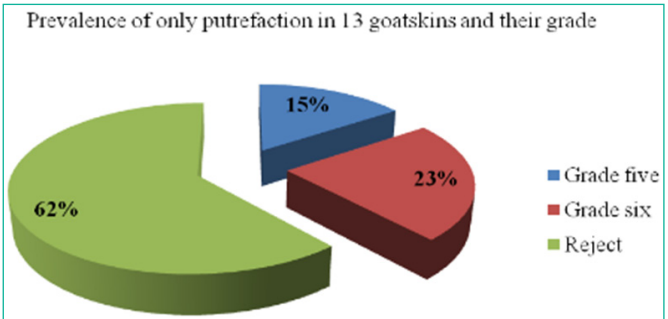

Figure 19: Goatskins affected by only putrefaction and their grades.

As seen in Figure 17, 22 goatskins are affected by only scratch one among the pre slaughter defects and have grade values of 5% (1) grade six, 45% (10) grade five, 27% (6) grade four and 23% (5) grade three. Scratch in goatskins didn't result in rejection but cause higher number of lower grades.

As shown in Figure 18, 32 goatskins are affected by only flaying defects which is a potential slaughtering (operational) defect and these have grade value of 3% (1) reject, 31% (10) grade six, 60% (19) grade five, 6% (2) grade three.

As presented in Figure 19, 13 goatskins are affected by the post slaughter defect putrefaction and their grade values are 62% (8) reject, 23% (3) grade six and 15% (2) grade five. Skins having grade (I-IV) is absent.

Conclusion and Recommendation

The Ethiopian tanning industries are constrained by remarkable quality deterioration of raw materials (hides & skins) supplied with absence of best grade (I & II) hides and skins & very insignificant ratio of grade III. Majorities of grades fall in grade V, VI and reject. This drastic quality deterioration (as the result of pre, peri and post slaughter defects) in hides and skins production process together with other factors hampers the sectors' competitiveness at the international markets. An improvement strategy on the livestock management approaches, slaughtering techniques, post slaughter handling and delivery system to the tanneries, as well as awareness of the society on the national benefit of this product should therefore be designed and intervention being implemented as the nation is losing significant amount of foreign currency from the quality deterioration of the raw material.

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