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RESEARCH ARTICLE

Evaluation of Artisanal Pelt Curing Practices in Indigenous Tanneries in Ghana: A Case Study of Asawasi Tannery

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Abstract
Pelt awaiting tanning requires proper curing to ensure preservation of the inherent leather properties. In the global leather industry, the direct impact of the quality of pelt received in the tannery cannot be overemphasized. In the Ghanaian indigenous leather production sector, the

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standards for preserving good quality pelt for leather making seems compromised. It has been observed that many defects are usually found with pelts after storage, and when used for leather production, the defects reflect in the leathers and render them poor in quality. With the aim of evaluating the pelt preservation situation in the Ghanaian indigenous tanneries, this case study took interest to assess the artisanal pelt curing practices at the Asawasi tannery which operates on indigenous methods but produces vegetable tanned leathers to serve the needs of several craftsmen and Educational Institutions in the southern parts of Ghana. The study adopted the qualitative approach of research, utilizing interview and observational surveys to assess the strength and weaknesses of pelt preservation activities of six (6) artisanal curers and four (4) tanners based on acceptable standards. Additionally, focus group discussion was used to obtain data. The study found that curers and tanners have conventional understanding about pelt preservation methods but lack the canons for effective and standardized application of the techniques. They also overlook the necessary quality control measures of pelt curing, which result in numerous defects of skins obtained from the local tannery. These situations consequently reflect in the low quality of leathers produced by the tanners. To ensure improvement, this study has recommended various strategies to address quality control, appropriate salting and drying application mechanisms and reduction in pelt preservation defects.

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Introduction

In Ghana, indigenous tanneries are spread across different regions nationwide; Upper East, Upper West, Northern Region, Ashanti Region and Greater Accra Region. These tanneries are mainly into the production of vegetable tanned leathers for local craftsmen who are into the production of conventional leather artefacts such as footrest, bags, native sandals locally known as "Ahenema", to mention a few. It is a practice that has been handed over from generations to generations (Gebremichael, 2016; Wemegah, 2014). According to Boahin (2015) these tannery activities in some years back, were lucrative; their economic values could not be overemphasized. However, he observed a downward turn in both leather production and utility. In his study, he associated the economic value decline to the inability of the artisanal pelt curers and tanners to evolve their processes towards yielding leathers with enhanced qualities to compete with the changing trends in demand by end users. Besides, Asubonteng (2010) has indicated that the experience of contemporary advancement in technology and globalization of trade have resulted in huge influx of alternative materials such as foreign leathers, synthetic leathers, fabric, etc. are used in the production of divers products, theses alternative materials have almost remarkably overshadowed the indigenous vegetable tanned leather products possibly due to its poor treatment.

The problem is that in the local tanneries, pelts received from the meat industry are usually not tanned instantly or same day, they are therefore stored for future processing into leather. The normal practice is that during the storage period, proper curing methods are employed to ensure effective preservation of the leather properties inherent the pelt through drying, salting, freezing, refrigeration or other available methods.

The researchers have observed that when the pelts are eventually released after days or weeks of storage, they usually develop defects, such as red-heat, hardness, grain and hair looseness and loss of fibre, which consequently reflect in the quality of the resulting leathers after tanning. Boahin (2015) and many other writers and researchers such as Covington and Wise (2019), Bekele et al. (2025) and Gudroe et al. (2014) have concluded that skin defects impair the ability of leather makers to attain the requisite qualities for customer satisfaction on the market. In this regard, the objective of this research was to evaluate the curing practices in the artisanal tanneries in Ghana, to ascertain the state of curing activities, impact on pelt storage and leather quality, and further find means of improving the practices found.

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2. Review of Related Literature

Literature related to the study area has been reviewed based on the theoretical and empirical information available. Available literature reveals that pelt curing and preservation in indigenous tanneries represent a crucial step in the global leather supply chain, balancing centuries-old cultural craft with modern environmental and structural challenges (Appiah-Brempong et al., 2020). They have emphasized that raw pelts possess high moisture (~65%) and protein content (~30%), rendering them highly susceptible to rapid bacterial degradation and putrefaction within 5 to 6 hours after flaying. Meanwhile, the processing of raw mammalian pelts into leather depends heavily on preventing swift bacterial putrefaction, especially when they are not tanned the same day, hence requiring immediate treatment to stop bacterial action. This is the stage where the employment of appropriate curing methods and techniques become crucial.

Decay and Decomposition Theory

The theories on decay and decomposition mostly surround key words such as deterioration, disintegration, putrefaction, rotting, breakdown, lose quality, go bad, go off, atrophy, degeneration, waste away, crumble, fading, to mention a few. According to Sarkar (2004), influence from any of such actions is tantamount to causing defects, hence, reducing the relevance of the skin for leather making. Decomposition begins at the moment of death, caused by two factors: autolysis, which is the breaking down of tissues by the body's own internal chemicals and enzymes, and putrefaction, the breakdown of tissues by bacteria. These processes release gases that are the chief source of the unmistakably putrid odour of decaying animal tissue.

Bienkiewicz (1983) and Sarkar (2004) have explained that most decomposers of pelt are bacteria or fungi, although scavengers play an important role in decomposition. They further indicate that if a dead body is accessible to insects and other animals, they are typically the next agents of decomposition. Decomposition which in this study is best represented by 'putrefaction,' is the process by which tissues of a dead organism break down into simpler forms of matter. The progression of decomposition of the flesh of dead organisms and carcasses has been viewed as four phases as found in Asubonteng (2010):

1. Autolysis (fresh)
2. Putrfaction (bloat)
3. Decay (putrefaction and carnivores)
4. Diagenesis (dry)

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Autolysis (fresh): The fresh stage of decomposition of biological bodies occurs during the first few days following the death. There are no physical signs of decomposition during this time. However, homeostasis of the body would have ceased, allowing cellular and soft tissue changes to occur as a result of the process of autolysis; the destruction of cells and organs due to an aseptic chemical process. At this point, the body enters algor mortis, the cooling of the body's temperature to that of its surroundings. When the body's cells reach the final stage of autolysis, an anaerobic environment is created, that is, an environment wherein oxygen is not present. This allows the body's normal bacteria to break down the remaining carbohydrates, proteins, and lipids. The products from the breakdown create acids, gases, and other products which cause volatile organic compounds (VOCs), and putrefactive effects. VOCs are produced during the early stages of human decomposition.

Putrifaction (bloat): Odour, colour changes, and bloating of the animal's body during decomposition are the results of putrefaction. The lower part of the abdomen turns green due to bacteria activity in the cecum. Bacteria break down haemoglobin into sulfhemoglobin, which causes the green colour. A formation of gases enters the abdomen which forces liquids and feaces out of the body. The gases also enter the neck and face, causing swelling of the mouth, lips, and tongue. Due to this swelling and misconfiguration of the face, identification of the body can be difficult. Bacteria also enter the venous system causing blood to hemolyse. This leads to the formation of red streaks along the veins. This colour soon changes to green, through a process known as marbleisation. It can be seen on the shoulders, chest and shoulder area, and thighs. The skin can develop blisters containing serous fluid. The skin also becomes fragile, leading to skin slippage, making it difficult to move a body. Body hair comes off easily. The colour changes from green to brown and this marks the transition of the early stage of putrefaction to the advanced decomposition stages.

Black putrefaction: After the body goes through the bloating stage it begins the black putrefaction stage. At this point the body cavity ruptures, the abdominal gases escape, and the body darkens from its greenish colour. These activities allow for a greater invasion of scavengers, and insect activity increases greatly. This stage ends as the bones become apparent, which can take anywhere from 10 to 20 days after death depending on region and temperature. This period is also dependent on the degree to which the body is exposed. During the black putrefaction stage of decomposition, insects can be found living in the body. The types of insects will differ based on where the body is, although Diptera larvae can be found feeding on the body in almost all cases.

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Butyric fermentation: After the early putrefaction and black putrefaction phases have taken place, the body begins mummification, in which the body begins to dry out. The human carcass is first mummified and then goes through adipocere formation. Adipocere (grave wax) formation refers to the loss of body odour and the formation of a cheesy appearance on the cadaver. Mummification is considered a post-active stage because there is less definite distinction between changes and they are indicated by reduced skin, cartilage, and bone. Mummification is also indicated when all of the internal organs are lost due to insect activity.

Dry decay: When the last of the soft tissue has been removed from the body, the final stage of decomposition, skeletonization, occurs. This stage encompasses the deterioration of skeletal remains and is the longest of the decomposition processes.

2.1 Rationale of Curing and Pelt Preservation for Leather Production

The rationale of curing and preservation of animal skins for the purpose of making leather is hinged on the principles of autolysis, putrefaction and deterioration of organic fibres Theoretically, the principles regarding the breakdown of biological or organic bodies have attracted several authors and researchers as a result of the enormity of relevance of the subject to various fields of life. According to Asgedom (2025), to ensure continuity of life, bodies of living organisms have been programmed by nature to begin decomposing shortly after death, starting with autolysis, and further through a cascade of processes that go through distinct phases.

The process is essential for new growth and development of living organisms because it recycles the finite matter that occupies physical space in the biome. He therefore advices that for tanners to secure raw skins and hides for making quality and useful leathers, it is required that when skins are flayed from the animal's carcass, they go through series of activities to preserve them for future processing into leather. Sharphouse (1995) has also emphasized that skins and hides become viable for leather making when all of their leathery properties are intact through proper curing, thus, application of methods which aim at conditioning skins and hides against microbial attacks in order to preserve their leather properties for tanning. Sharphouse (1995) has also made it clear that the principle of pelt storage requires the protection against autolysis caused by bacteria immediately the animal is slaughtered and skin or hide removed as raw material for leather processing. Failure to perform this duty effectively, the skins or hides (pelts) needed as raw material for leather making will become chaotic and lose their desirable properties for valuable leather production and marketability.

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In leather technology, due to the undesirable impact of autolysis on skins and hides meant for leather production, much attention has been given to the area by many researchers. Consequently, accounts of research findings on decomposition have led to the discovery of curing methods and techniques relevant for sustainable fresh skin and hides requisite for the production of quality leather (Asgedom, 2025; Sharphouse, 1995; Bienkiewicz, 1983).

Globally, the curing methods mainly employed to preservation raw skins and hide are technically categorized under dehydration, thus, drying; sun drying, shade drying, shed drying; or Salting: wet salted, dry salted, raceway brining, drum, brining; or Refrigeration/Cooling: Chilling. Toxicity: Antiseptic, Radiation and Partial Processing: Pickling, Wet blue, "Wet white" are other modern acceptable approaches to pelt preservation. Oteng-Amoako (2006) has written that pelt preservation process, according to is accomplished by process of removing moisture or by replacing moisture; however, water is dehydrated in each case. Salting or drying or both are employed to dehydrate water from the skin, and once water is dehydrated and temperature made unfavorable, microbial activities are reduced drastically. However, bacterial growth rate and microbial activities on organic materials such as skins and hides require the support of two major agents, thus, ambient temperature and the presence of water or moisture (Sharphouse, 1995; Oteng-Amoako, 2006 and Sarkar 2004).

1. ***Ambient temperature*:** Ultimately, the rate of bacterial decomposition acting on the tissue will depend upon the temperature of the surroundings. Colder temperatures decrease the rate of decomposition while warmer temperatures increase it. *Warmth* determines the speed of organic material decay, with the rate of decay increasing as heat increases, e.g. fresh skin in a warm environment will decay over a shorter period.

2. ***Water or moisture*** is another factor that promotes bacterial growth and activities.

2.2 Target Conditions of Pelt Preservation for Leather Making

With the understanding of the facilitating role of ambient temperature and water/moisture in pelt putrefaction process, Sharphouse (1995) has explained that curers and tanners employ preservation methods employed mostly targets the restrain of the presence of temperature and water or moisture in the fresh skin or hide to protect the collagen fibres and all other leather properties needed to influence the achievement of quality leather capable of meeting customer satisfaction or end-user standards.

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Therefore, curing methods such as refrigeration target restraining ambient temperature, freezing aims at constraining ambient temperature and moisture, while drying and salting target moisture reduction through dehydration. Since the storage period depends highly on the readiness of the tanner to process the pelt into leather, Boahin (2008) has advised that when choosing curing methods for pelt preservation, curers and tanners should envisage or have projection on the possible time the pelt will reach the destination for tanning. This is on the basis that some curing methods can preserve pelts for short periods, while others for long periods.

2.3 Impact of Quality Preservation on Skins and Leather

According to Khambhaty and Samidurai (2024), effective preservation acts as a critical bridge between raw animal skin and high-quality leather. Because skin is primarily composed of protein and moisture, it is highly susceptible to microbial putrefaction immediately after slaughter. Good preservation–primarily through dehydration or chemical curing–stops this biological decay, ensuring the final leather retains its strength, aesthetic appeal, and structural integrity. Covington and Wise (2019) have emphasized that since raw stock of hides and skins serve as the primary material for the survival of a tanning business, good preservation maintains the raw materials' fundamental properties by controlling bacterial and enzymatic activity against any potential damage. In their view, drying appears simple enough, but actually requires specific conditions of heat and shade to avoid incurring damage. Salting is still the commonest form of preserving raw stock and is well known as a feature of preserving foodstuffs. The salting technique of curing hides and skins also requires specific conditions of sufficient salt, of the right kind, applied uniformly, followed by appropriate storage. Bekele et al. (2025) and Gudroe et al. (2014) have advised that quality pelt preservation of pelt is deemed relevant for sustainable leather production due to the following reasons:

1. **Microbiological Control**: Techniques like wet salting or air drying reduce moisture to levels where bacteria cannot function. Without this, bacteria can double every 4 hours, leading to putrefaction.
2. **Structural Integrity**: Proper preservation protects collagen fibres, the skin's main protein. Inadequate methods lead to "staling," where enzymes cause autolysis (self-digestion) of these fibres.
3. **Yield Preservation**: Controlled drying prevents excessive shrinkage. In contrast, poor air-drying can cause hides to lose up to 15% of their surface area permanently.
4. **Grain Surface Perfection**: If bacteria reach the grain-corium junction before curing, permanent grain damage (pitting or scarring) is inevitable, making the leather unsuitable for high-end fashion or upholstery.

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5. **Strength and Flexibility**: Effective curing prevents "horrification," a condition where fibres stick together irreversibly, resulting in brittle and stiff leather.

3. Methodology

By using the Asawasi artisanal tannery as a case study, the qualitative research method was employed, under which the non-randomized probability sampling (purposive) was adopted to select correspondents in the indigenous leather industry for the data collected through interview and observation. Six (6) artisanal curers and four (4) tanners were sampled from the Asawasi tannery in Kumasi. Precisely, the study used descriptive case study, observational and experimental study to evaluate the standardization process of curing pelts. The research instruments used in the study were the observation and Interviews through focus-group discussions.

During the data collection, the curers and tanners were interviewed separately. The interview of the curers practically focused on their description of the nature the pelt collection and preservation business, sources of pelt received from butchers and flayers at the slaughterhouses, the curing methods and techniques they adopt and hides and the quality control measures employed to preserve the integrity of the leather properties inherent the raw skins.

The tanners on the other hand were interviewed with focus on pelts received from the curers, their conditions, storage activities and impact on tanning processes and leathers produced. To ascertain and validate the data gathered through the interviews, the activities of both the curers and tanners were critically observed for 21 days as each person went about their daily processes of pelt preservation methods principally used at the tannery, pelt distribution to tanners, further storage by the tanners and soaking of the preserved pelt at the pre-tanning stage.

3.1 Ethical Considerations

To address ethical issues, the researcher took into consideration ways to ensure or protect privacy as well as the security of the respondents. This was necessary to prevent possible problems. Some of the issues that were considered included consent, confidentiality and data protection. This was done to ensure trust between the researchers and the respondents.

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4. Results and Discussion

4.1 Curers and Tanners Understanding of Autolysis and Decomposition of Skins

In curing principles and theories, it has been established that the animal's carcass as a biological or organic material is susceptible to decomposition as a result of autolysis and microbial activities; and the skin being a system of organic tissues of proteins, lipides, some carbohydrates, inorganic salts and water is not exempted (Mader, 1994; Fritz et al., 1999; Hougham, 2006).

This is the reason curing strategically precedes tanning to ensure that pelt awaiting tanning can be preserved successfully to prevent microbial attacks. According to the observation of the activities happening at the tannery, the artisanal curers were found engaging in methods and processes used to preserve pelt towards avoidance of microbial attack; and it proved that they understand the principle of autolysis and decomposition as damage causing conditions of pelt meant for leather making. They only lacked the appropriate techniques of conditioning and quality control measures to guarantee the attainment of defect-free pelt for quality leather production.

4.2 Sources of pelt supply and Conditions of Pelt Received

The study noted that pelt supplied to the tannery from pelt collectors, distributors and flayers from almost all over the regions in the country, with the Ashanti, Greater Accra, Northern regions being the places where most of the pelt were obtained in Ghana. The curers and tanners also emphasized that during lean seasons, they go to the extent of getting supplies from neighboring countries such as Burkina Faso, Ivory Coast, Mali and Niger. Few of the skins and hides occasionally come from Eastern, Central and Western Regions. According to the tanners and curers, pelts are brought to the tannery on basis of agreement between a tanner and the supplier (pelt collector, curer or flayer), where the pelts are received and paid for according to the prevailing conditions, and the tanner will have to do his own further storage for pelts not tanned instantly. The curer or supplier has no cost to bear if damage occurs. This is the reason the tanners found engaging in curing for pelt awaiting tanning.

Per the data collected, it was noted that about 75% of the tanners prefer fresh pelt whiles 25% prefer a semi-preserved pelt. Meanwhile, the curers received pelt in wet state from the abattoir, slaughterhouses and slaughter slabs, and decided on which method of curing to use, depending on anticipated duration of storage before distribution to the tanners. Because the tanners depend on the pelt curers and distributors for supply, they usually find it difficult to receive fresh pelt as preferred.

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4.3 Method of Curing Employed for Pelt Preservation

Regarding preservation of pelts received by the curers and tanners, it was observed that two main curing methods are employed; sun drying and salting. Statistically, about 70% of the tanners and curers preferred drying of pelt for preservation, using either direct sun drying or shade drying. Meanwhile 30% stood for salting the skins raw with salt.

The strength of the methods was that the sun as source of energy for drying is free, but its control dehydration of the pelt has always been very difficult, hence experiencing over drying. On the other hand, the potency of the salting method lies in its curing efficiency and control of dehydration, but the weakness was found in the inability of the curers and tanners to purchase the required quantities for preservation purposes.

This confirms the assertion of Sivakumar et al. (2019) that when salt-cured hides are exposed to moisture during storage, halophilic bacteria can multiply and cause permanent grain defects like red heat which result in hair loss, grain damage and fibre weakness.

From observations it was apparent that, the means of spreading skins to get them cured at the tannery were different from the method of drying with global standards of drying pelt. The procedures and methods of pelt spreading used by the curers and tanners showed that the pelts are salted or dried on the ground, roof tops, poles and wire lines. This very methods corresponded with previous literature as opined by Wemegah (2014). For instance, salting, drying, smoking, and the application of animal brains and fats were the earliest strategies adopted by several cultures to process animal skins. The conventional salt cured skins revealed about 30 percent reduction in the moisture content after 21 days of preservation (Vinodhkumar et al., 2016). Tanners in this present study explained that salted pelts are more quality than dried pelts. Similarly, salt based preservation is efficient because of the dual role as dehydrant and bacteriostatic effect (Appiah-Brempong et al., 2020; Vinodhkumar et al., 2016). There was no growth of colonies by the 21st day because of the synergistic reaction of the antibacterial activity of *Cassia fistula, Psidium guajava* and bacteriostatic activity of salt.

4.3.1 Sun Drying of Pelt by Rooftop Spreading

At the tannery it was observed that using this means of drying involves spreading the skins on corrugated sheets to get them dried for subsequent processing. However, from the interview, the curers and tanners explained that this means of spreading is basically practiced to avoid so much dust from settling on the pelt, and they further added that it was time consuming in the sense that the pelts had to be turned over and over until equilibrium is reached depending on the direction of the sun. Again, they stressed that temperature needed to get the pelt dried was a problem. Bactericides were not identified at any point as anti-bacteria agent for reducing the rate of bacteria growth in the pelt preservation processes.

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Figure 1: Sun drying; roof spreading
(Source: Field Work, 2025)

4.3.2 Impact of Rooftop Spreading on Pelt Quality

The rooftop curing approach practiced by the indigenous curers and tanners shown to have a major direct impact on skin and leather quality presented as follows:

i. Softness and Pliability

Sharphouse (1995), and Boahin (2005) have established that the viability of pelt as natural material for leather making is seen in its ability to be manipulated in diverse ways due to its diverse properties. The study has revealed that skins cured at the local tannery using this means of drying accelerate rapid evaporation of water content present in the pelt which consequently causes the skin to lose its softness and flexing nature and result in bony flint pelts. The nature of leathers produced out of this means of spreading makes it difficult to be used in articles such as clothing and upholstery due to the fact that pelt produced out of this means of spreading lack the property of been moldable as compared to skins cured using vacuum dryers (International Standards Organisation, 1974).

ii. Colour Intensity

It was also noted that, in instances where the roofing sheets corrodes or rust, skins were stained which also reduces the value of the leather made out of them.

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iii. Surface Quality and Flatness

Sharphouse (1995), Twumasi (2000) and Boahin (2005) have stated clearly that the value of leather quality is dependent upon on the estimation of number of subjective characteristics such as smoothness of grain surface, surface free spots and maximum flatness of the leather which can be referred to as 'leathery feel'. The purpose of this assessment was to determine the extent of surface quality and maximum surface flatness of leathers produced using this means of spreading. Observations made on this means of spreading as far as surface quality and flatness is concerned revealed that under unfavorable weather conditions, the pelt shrinks more than expected and develops wrinkles on the resultant leather due to inappropriate or otherwise improper execution of this mode of spreading.

4.3.3 Sun Drying of Pelt by Ground Spreading

Based on the interview conducted, one of the master tanners held the opinion that ground spreading is where skins are spread on the bare ground and allowed to dry either in an open shed or under direct sunshine. It was further added that the rate at which skins dry on the ground is slow during the early hours of the day that is between seven (7am) and eleven (11 am) after which they are assured of a faster drying rate. It was also observed that ground spreading gives off maximum surface for evaporation to take place and in effect accelerates drying of the leathers.

Figure 2: Ground spreading via sun drying of fresh skins
(Source: Field Work, 2025)

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4.3.4 Impact of ground spreading on Pelt Quality

i. Softness and Pliability

Per the observation, it was realized that ground spreading usually dries skins fully and hides partially, leading to degrading and invasion of pelt quality. The impurities such as dung, blood stains, and sand particles usually result in pollution of pelts, reduction of chemical concentration and potency, promotion of microbial activities, hindrance to aqueous penetration due to precipitation. This mode of spreading also delays the soaking process of pelt making it to prolonged rehydration process. Based on the criteria for discussion, the aim of this assessment was to establish the overall physical softness and pliability of skins preserved out of this mode of spreading against the standards of pelts made internationally. From observations, it was apparent that leathers produced at the tannery by this means of spreading have crusty feel and do not drape.

ii. Surface Quality and Flatness

Dust cannot be overlooked when the skins are dried on the ground where dirt is inevitable, even though the ground gives the material a large surface area to dry and ensure a degree of flatness. There could also be contaminants on the ground that can infect the pelt and increase the rate of bacteria attack.

4.3.5 *Sun Drying of Pelt by Wire and Pole Spreading*

Data recorded for this mode of spreading clearly outlines that when skins are freshly brought from the abattoir, slaughterhouse or slaughter centers, they are hung on a wire or ropes (dry line) erected above the ground and left to dry as a means of preserving them Bawa (Personal Communication). This is since tanners have too little pelt to tan or more than they can work on, hence the selection of this means of preservation. Upon considerable observation and critical analysis, the principal factor underlining this means of spreading is to give room for the fat imbedded in the pelt to melt with the heat of the sun rays and drain downwards without sipping into the corium, additionally it avoids decomposition of the pelts. In this process, it was cognizance that; the sun's rays reduce the humidity in the atmosphere which in turn quickens the rate of evaporation. Bawa (Personal Communication) opines that the method was weather dependent. Considerable observation made on this mode of spreading reveals that, under an average condition, it took approximately 72 hours for freshly flayed skins to dry using this method.

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Figure 3: Pelt spread on wire
(Source: Field Work,2025)

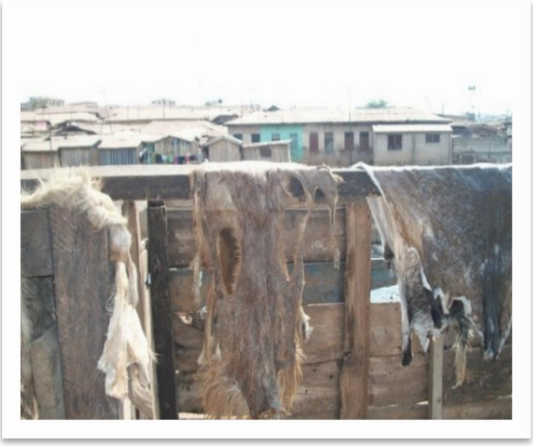

Figure 4: Pelt spread on pole
(Source: Field Work,2025)

4.3.6 Impact of Sun Drying by Wire and Pole Spreading

The study finds pelts dried on lines are far better than those dried-on floors. Pelts dried on lines are normally exposed to air or wind before and preparatory activity is done. Tanned leathers are first dried on a drying line and allowed to dry partially before embarking on softening process (Gebremichael, 2016).

i. Softness and pliability

When wire, pole hanging or frame stretching is employed for sun drying, pelts usually become excessively dried and hard. Excessive pressure is then required in folding which also leads to cracks along the folding lines. The consequent pressure employed in folding produces rupture in the grain with an immediate reduction of marketability of pelt. The situation becomes serious when the folded pelt goes through loading, offloading and transportation due to pressure from pilling and rubbing. Bad folding techniques are disincentive to leather making. Based on the criteria for evaluation it was unearthed that this means of spreading eventually result in a bony flint pelt if not turned within a considerable interval. The study observes that out of every ten (10) skins dried using this means of spreading, about 8 to 9, representing 80% to 90% are deficit in considerable softness and pliability as against pelt produced using well defined means of drying (vacuum drying).

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ii. Surface Quality and Flatness

Practical observations made into this mode of spreading show that the position the pelt assumes whiles hanged, causes the fiber to break (Grain Break) even though this approach was the most predominantly used at the tannery. In cases where the lines are made with ferrous metals the skin gets stained.

4.4 Impact Evaluation of Salting Methods Identified at the Tannery

At the tannery it was observed that few tanners adopt this method of preservation. This is where granulated salt (Sodium Chloride) is spread on the flesh side of skins and packed for storage. It was recorded that, when skins arrive at the tannery in a green state, washing was done to get rid of blood and other stains from them. Skins are spread-out on bare floor for sprinkling of granulated salt to be spread on it. Also cost of common salt needed for proper salting was a problem for the tanners. Based on interviews, it was evident that salts used for curing were waste sodium chloride coupled with sand obtained from salt crushers from Aboabo Station in Kumasi central business district. Again, salt rubbed on the skins were not measurement. Tanners resorted to idealized means of salting.

4.5 Enlightenment to the Proposed Derived Standards

Theoretically, Asubonteng (2010) has emphasized that in any creative endeavor, the essential element is the joy of seeing an idea take shape under one's own hands and the pleasure of that work being appreciated by others. However, since appreciation comes out of satisfaction and quality is the cornerstone of satisfaction, seeking satisfaction implies seeking quality. This practically creates every basis for strategic optimization of the satisfaction rendered by the product in question through every possible available avenue. The progressivity attained so far in the study has established to a large extent the theoretical and empirical rationalization which justify the capacity of leather to express competency to meet its demands are inherent in three major conditions;

(1) the kind and source of skin or hide,
(2) the mode of preservation of skins awaiting tanning and
(3) the manufacturing processes employed in transforming pelt into leather.

The derivation of proposed standards in the local tanneries is basically to serve as interventional approaches towards the acquisition of quality pelt for making quality leathers to support economically viable Leatherwork in Ghana. The following are simple procedures of pelt curing enhancement processes which the artisanal curers and tanners in the Asawasi tannery were taken thought.

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1. Awareness to Guard Against Putrefaction and "Hair Slip":

The curers and tanners were thought to be aware that putrefaction and "hair slip occur due to poor cold-chain logistics between local slaughterhouses and decentralized tanneries, raw pelts often experience significant delays before curing. Therefore, to avoid Halotolerant bacteria multiply rapidly, breaking down collagen and causing "hair slip," which ruins the leather grain surface, the curers should wash the pelt as soon as they arrive, and cure them immediately to seize bacterial operations.

2. Reduction of Fat and Excess Flesh before Curing

Before beginning the curing process, there is the need to use a sharp knife or curved knife to scrap off excess flesh and fat to minimize the rate of bacteria attack and increase curing rate.

3. Reduction of Offensive Odours and Putrid Fermentation

Local tanneries are noted for offensive odours emission due to high rate of bacterial growth. To reduce the odour associated with raw skins and hides, the curers and tanners were advised to avoid frequent reuse of water for washing, and also reuse of old curing mixtures and practice adequate rinsing of pelt with clean water before beginning the curing process. This reduces the tendencies of fostering anaerobic bacterial pockets, producing volatile sulfur compounds and an offensive stench.

4. Avoidance of Irreversible Hornification During drying

In arid zones like the middle and Northern Ghana direct exposure of pelt to harsh sun rays dries the outer layers of the pelt too rapidly. This triggers hornification, leading to a structural collapse whereby collagen fibers fuse irreversibly, preventing proper rehydration during the soaking phase at the beamhouse. To avoid irreversible hornification during drying, the artisanal curers and tanners were educated to adopt shade drying and air drying instead of direct sun drying. This prevents direct contact of pelts from the sun and ensures slow dehydration processes to condition the moisture content accordingly for storage. They were advised to follow the following steps;

a. Some skins are placed in a shaded area away from direct sunlight.
b. The skins are then laid on a wooden pallet with the flesh side up.
c. The pallet is diagonally tilted slightly to allow fluid to drain off.
d. Again, the skins are prevented from touching dust, any metal, pallet nails, including pallet nails etc., as metal rust residue makes permanent black stains on the skin when tanned.
e.

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Figure 5

Figure 6

Figures 5 and 6 are skins streched on clean board to avoid contact with metalic objects, dirts, etc. (Source: Field Work, 2025)

5. Salt Application Process

The artisanal pelt curers and tanners were educated on the procedures to follow when applying dry salt for curing.

a. While wearing gloves, salt was rubbed onto the entire surface of the skin. Working methodically and paying special attention to the edges of the skin as these will tend to fold and curl back on themselves.
b. Additionally, stretching of the skin is done edge out with one hand while administering salt with the other. Salt was poured on the flesh side of the pelt but rubbed in it thoroughly. A generous amount of salt was used; ideally about 5 pounds of salt to 3sft. of skin was observed.
c. With close monitoring and timely turning, salted pelt is left under a shed to cure for a period of 14 days at normal atmospheric temperature, as chilling or freezing will slow the curing process. After which pelt is rolled and stored for future processing. A well cured salted skin feels firm and completely flexible whiles overly dried skins become stiff and brittle though they can be kept for months.
d. When pelts are cured, they are folded from the outside edges to the middle particularly rolling them from the head downwards to the tail side. Skins are then stored out of sunlight in a spot with good air circulation. Skins are then monitored closely for signs of rodent or bug activity to prevent damage.

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4.5 Leathers Produced from properaly Cured pelts

Having passed the cured pelt through the propossed procedures, the artisenal tanners subjected the pelt through indigenous method of tanning to ascertain the possitive impact of how well-preserved skins result in defect free leather production. The leathers attained exhibitted softeness, pliability and without any visible surface defects.

Figure 7: Final leather from salt cured skin

Figure 6: Final leather from dry cured skin

(Source: Field Work, 2025)

5. Conclusions

1. Pelt preservation is a common practice in the Asawasi tannery, and the concept of skin preservation to guarantee the avoidance of microbial attack is well-known and understood by the Asawasi artisanal curers and tanners. From experience, they find it necessary to maintain the integrity and leather properties of pelt received from the slaughterhouses awaiting tanning, however, they fall short on the best canons for curing pelts to fully prevent microbial attacks. Drying and salting were found as the main methods they employ for curing, and in some cases, they apply wood ash and drying. The drying results in pelt hardening and brittleness, and the poor salting also leads to halophilic defects resulting from exposure of the pelts to moisture, halophilic (salt-loving) and halotolerant bacteria multiplication which leads to irreversible leather defects, such as "red heat" stains and grain damage, which degrade the quality of the final leather product.
2. The curing standards employed by the curers mostly ignored quality control and quality assurance measures, and this impedes the quality of skins preserved for leather processing, hence encountering numerous defects such as red head.

3. Based on the pelt preservation challenges identified at the tannery, the strategies proposed have been demonstrated to the curers and tanners operating at the Asawasi local tannery to enhance their practice towards protect their raw materials from bacterial attacks and maintenance of pelt quality.

Recommendations

1. Considering the level of understanding of the curers and tanners in the relevance of pelt preservation in the sustenance of leather production in the local tanneries, this study recommends that the artisanal curers and tanners adopt and practice the improvement strategies proposed to guarantee quality skins stored for leather making. This will help them improve on their methods and techniques in drying and salting approaches.
2. Researchers in the field of leather technology, leather art and material science are also encouraged to develop interest in conducting further research into the indigenous methods and techniques being employed by the artisanal tanners and contribute to finding improved approaches for enhanced quality of skins and leathers to support their livelihoods.
3. Workshops on the necessity to employ quality control measures in pelt preservation is recommended to the Standard Authorities, to reduce the numerous defects of skins obtained from the local tanneries.

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