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SUBSECTOR OUTLOOK RESEARCH IN ETHIOPIA: THE CASE OF HIDES AND SKINS PRODUCTION, AND MARKETING

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ABSTRACT

Ethiopia is the 5th largest livestock producer in the world and ranks first in Africa and the country is home to millions of livestock population that has the potential to produce hides and skins. The study aimed to analyze the status and outlook of hides and skins (HSs) production and marketing in Ethiopia. The study used secondary data and triangulated using KII and FGD, and conducted analysis using different forecasting techniques. Hides production increased by 4.94% annually between 2005/06 and 2021/22. Smallholder HSs sales rate declined while HSs home utilization rate increased between 2008/09 and 2021/22, these might be due to poor HSs quality and marketing problems. These suggest that preparing a livestock management training manual and incorporating it into the existing extension package, and linking actors with markets are crucial. From 2002/03-2021/22, the volume of HSs, and leather and leather product (LLP) exports was volatile but reduced from 10.55 to 2.24 thousand MT, and the income reduced from USD 52.22 to 33.2 million. The volume of exports reduced by 43.47% from 2012/13 to 2021/22; this could be the result of the low quality of HSs, and government policy led to low production of tanners and manufacturers to supply to the export market therefore, maintaining the quality of HSs starting from livestock production, slaughter, and post-slaughter through extension service, and revising policies are important. Despite Ethiopia has opportunity for livestock availability, government support of the leather sector, and high demand for HSs in the international market, the leather sector faces production, marketing, and policy challenges. With these challenges, HSs production will continue and increase, while the sales rate will decrease and the utilization rate will continue but never increase for the next ten years. The HS and LLP export will also continue, but never increase in these years.

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INTRODUCTION

Ethiopia is the 5th largest livestock producer in the world and ranks first in Africa in 2021 (FAOSTAT, 2023). The country is home to millions of 66.26 cattle, 38.01 sheep 45.72 goats, 6.8 camels, poultry 41.35, and other animals in 2021/22 (CSA/ESS, 2022) that have the potential to produce hides from cattle, skins from sheep, and goats, and other livestock product. The Ethiopian government underlined the importance of hides and skins (HSs) and the leather sector as one of the promising and strategic sectors for the development of Ethiopia by providing raw materials to the leather industry and generating income from exports (NBE, 2022; Teame, 2017; NPC, 2016, AGP-LMD, 2013; MoFED, 2010). The global market for HSs, and leather and leather products (LLPs) are huge, yet Ethiopia has a small fraction of the total global market for such products. Despite Ethiopia has potential for price competition and quality supply of HSs, the country does not compete in the international market, because its price of HSs and LLP in the international market remains high compared with Asia due to high processing costs (Coppeaux et al., 2016). Another study (Teame, 2017) also reported that HSs transactions take place without taking grading standards that are just verified by visual inspection leading to failure to meet factory demand quality as well as an inability to compete in the international market.

Backyard slaughters are common in both urban and rural areas; this results in low-quality HSs production. The research (ILRI, 2017) estimated that 80% of cattle and 90% of shoats are slaughtered in the backyard which affects quality, therefore the bulk of HSs in the value chain are collected from the backyard resulting in price difference or rejection for processing. Nearly 80% of raw HSs transacted in the formal market are derived from rural areas, and only 20% are collected from abattoirs and slaughterhouses in large cities and towns (Coppeaux et al., 2016). In Ethiopia, the production potential of cattle Hides, sheepskins, and goatskins is estimated at 64,107, 36,455, and 33,883 tonnes, respectively in 2021(FAOSTAT, 2023). However, the potential contribution of livestock to the leather sector is not maximized. To indicate the untapped investment opportunities in this sector, only 50% of Hides and skins potential are being utilized by industries (MoT, 2016). The study (Dinaol et al., 2018) identified that in Eastern Ethiopia HSs have price differences and fluctuations at a time and in different locations, and the market price of skin ranged from 5-10 ETB/skin in 2017. According to the study (Kedir, 2016) in the Somali Region, the average price of hides was 75 ETB/piece and skin 22 ETB/skin in 2015 and in the same years, Amistu and Feleke (2017) identified that the average price of raw hides in Wolaita 2016 Zone varied from 100-120

ETB/piece, sheep skin 50-60, and goat skin 40-50 ETB/skin. These variations indicate HSs market is inefficient.

One of the top manufacturing sectors in Ethiopia is the leather industry, which offers significant economic advantages such as a source of income, foreign exchange earnings, job creation, and linkages among actors in the leather sector. A variety of participants, such as smallholder farmers, slaughterhouses, collectors of raw or fresh hides and skins, tanneries, and producers of leather goods like shoes, bags, and coats, that could benefit from the LLP value chain. In this respect, the LLP industry is regarded as one of the highest priority sectors in Ethiopia. It is also seen as a strategic sector for the development of industries and foreign earnings; therefore, the leather sector is recognized in Ethiopia's previous growth and transformation plans (GTP I and GTP II) and the present ten-year perspective plan (MoFED, 2010; NPC, 2016; PDC, 2020). However, the worst thing is happening, recently the price of HSs has decreased, and most areas of the country have no buyers for the product, simply producers or meat consumers dump HSs everywhere which causes environmental pollution. Despite ample resources of livestock in Ethiopia; the country can produce quality and adequate HSs supply for industries to produce LLPs for domestic and international markets, however, the country does not benefit from the sector as expected.

Therefore, to endorse hides and skins' importance, this study was conducted to assess the current situation of HSs, and examine opportunities and challenges of HSs production and marketing. The study also intends to analyze trends and future outlooks of HSs production and market.

Key Terms Definitions in The Leather Sector

Raw Skins: Originate from smaller animals and in the case of Ethiopia leathers originating from goats and sheep.

Raw Hides: is the raw skin of mature larger animals, and in the case of Ethiopia refers specifically to leather originating from heifer, bull, ox and cow.

Pickling skins: It is a method for preserving, bleaching, and tanning with synthetic tans or mineral tans skin for a long time by lowering the swelling of the skin that occurs in the bathing stage of the pre-tanning operation.

Pickled hides and skins: hides and skins are prepared for bleaching and tanning.

Wet blue skins: Wet blue refers to moist chrome-tanned leather. In this phase, the leather is tanned, but neither dried, dyed nor finished.

Crust leather: At this stage in the process, the leather has gone through tanning and is dry. Crust leather and raw leather are materials that are tanned but have not yet been colored or finished, and it is the most common type of semi-finished leather.

Semi-finished leather: is a category that describes the stage of leather processing. It's not about the quality or the part of the hide, but rather about how far the leather has been processed, including wet blue and crust leather. **Leather/Finished Leather:** is dyed and treated with coloring, waterproofing, wax dressings, etc., as well as ironing or embossing. Finished leather, refers to the final, processed product ready for use in various products.

Leather products: refers the product of finished leather including, leather garments, footwear, gloves, bags, and other leather articles

METHODOLOGY

The study area and data source

The study focused on HSs production and marketing in Ethiopia. To address the objectives, blends of techniques and approaches are employed; extensive desk reviews were done.

The study used time series data sourced from CSA/ESS (Ethiopian Central Statistics Agency/Ethiopian Statistics Service), ERCA (Ethiopian Revenue and Customs Authority), and the National Bank of Ethiopia (NBE). To validate key issues for the research primary data collected from stakeholders including the Ministry of Agriculture (MoA), Ethiopian Leather Industries Association (ELIA), tanneries, Addis Ababa Abattoirs Enterprise (AAAE), and HSs collectors through focus group discussions (FGDs) and key informant interviews (KII).

Method of Data Analysis

Two methods: descriptive and econometric methods were used to analyze the data. Descriptive statistics which include mean, percentage, and graphical tools used for the analysis. The research used time series econometric models and selected the best model to forecast the future HSs production, household use and marketed surplus, and export. For the coming ten years (between 2022/23 and 2031/32) by assuming that producers will continue producing livestock and HSs using the existing production system, tanners, traders, and exporters continue tanning, marketing, and exporting HSs, and LLP in similar way in Ethiopia. The selection of a method depends on the relevance and availability of historical data, the degree of accuracy desirable and the time available for making the analysis. The study selected the best econometric model based on the information obtained from the available literature that an ARIMA model is one of the best techniques for predicting and it is suitable for at least 50 observations (Mgaya, 2019; Urrutia et al., 2019, Sharmam et al., 2018; Box et al., 2016). For a few observations, various studies (Ruekkasaem and Sasananan, 2018; Castillo et al., 2015; Abid et al., 2014) used different forecasting models listed in Table 1, therefore based on the available data for this study, the listed models used for the analysis.

Forecasts Accuracy Measuring Tools

To select the appropriate model from the above models for specific time series variable in Table 1, the accuracy measures calculated from all the trend models, which included mean forecast error (MSE), mean absolute deviation (MAD), and mean absolute percentage error (MAPE); these tools are used by many researchers (Abid et al., 2018, 2016, 2014; Masood et al., 2018; Ruekkasaem and Sasananan, 2018). The empirical model for accuracy is indicated as follows:

- i. Mean sum of error (MSE) = the average of the squared errors

$$MSE = \frac{\sum_{t=1}^n (E_t)^2}{n} = \frac{\text{Actual-forecast}^2}{n}$$

Where MSE estimates the variance of the forecast error, n is the number of observations

- ii. MAD clarifies the average of the absolute deviation over all periods and is given by:

$$MAD = \frac{\sum_{t=1}^n |E_t|}{n} \text{ or } MAD = \frac{\sum \text{Absolute variance}}{\text{Number of observations}}$$

- iii. MAPE = $\frac{1}{n} \sum_{t=1}^n \frac{|E_t|}{D_t}$

or

$$MAPE = (\text{Absolute Value (Actual-Forecast)/Actual}) \times 100$$

Table 1. Econometric models used in the study.

Model	Mathematical Equation	Explanation
Naive	$F_{t+1} = Y_t$ F is the forecast and Y is the observed value. The subscript t is an index for the time. The current actual observed sales from the last period as the forecast for period is t + 1.	Naïve forecasting is one of the simplest forecasting methods often used by sales and finance departments. It uses the current actual observed sales from the last period as the forecast for the next period, without considering any predictions or factor adjustments.
Linear Trend (LT)	$F = a + b_t$ F is the forecast and b_t is the expected period-to-period change in the trend F	The LT estimation is a statistical method used to analyze data patterns. Linear regression forecasting is used when forecasting a time series F, with the assumption that it has a linear relationship with another time series b
Simple Moving-Average (SMA)	$F_{t+1} = (Y_{t+1} + Y_{t-1} + \dots + Y_{t-n+1})/n$ F_{t+1} = the forecast value for the next period, Y_t = the actual value at period t, n = the number of terms in the moving average	The SMA is a statistical method used for forecasting long-term trends. The technique represents taking an average of a set of numbers in a given range while moving the range
Weighted Moving Average (WMA)	$F_{t+1} = (w_1 \cdot D_t) + (w_2 \cdot D_{t-1}) + \dots + (w_n \cdot D_{t-n})$ F_{t+1} is the forecast for the coming period, t is the current period, n is the total number of periods in series by the forecast, D is the actual occurrence for the period data. The sum of the weighting should add up to 1 which t-i, and w is the weight to be given to the actual ranges from 0 to 1. occurrence for the period t-i.	The WMA is a technical indicator that assigns a greater weighting to the most recent data points, and less weighting to data points in the distant past. WMA forecasts are used to overcome the strong effect of extreme values within a time series by assigning current data more weight than older data. The sum of the weighting should add up to 1 which t-i, and w is the weight to be given to the actual ranges from 0 to 1. occurrence for the period t-i.
Exponential Smoothing (ES)	$F_t = F_{t-1} + \rho(Y_{t-1} - F_{t-1})$ F_t is the forecast for period t, F_{t-1} is the forecast made for the prior period, Y_{t-1} = the actual value at period t, ρ is the desired response rate, or smoothing constant	Exponential Smoothing is a time series forecasting technique that uses weighted averages to predict future values based on past observations. It assigns exponentially decreasing weights to older data points, giving more importance to recent observations. a smoothing coefficient whose value is between 0 and 1

RESULTS AND DISCUSSION

Trends of Smallholder HSs Production

Based on offtake rates of 7% for cattle, 33% for sheep, and 35% for goats (MoA, 2013; Mohammed, 2019), Ethiopian rural smallholders’ average annual piece of hides production was 3.9 million, while the average annual production of sheepskin, and goatskin were 9.8 and 10.7 million pieces, respectively between 2004/2005 and 2021/22. The trend of the production (Figure 1) showed that hides production increased from 2.83

to 4.64 million pieces, with an average annual growth rate of 3.21%. Similarly, the number of sheepskins grew from 5.96 to 12.54 million pieces, while the pieces of goatskins increased from 5.20 to 16.2 million within the same period. The annual growth rates of sheepskin and goatskins account for 4.2% and 7.42%, respectively. However, pieces of hides, sheepskin, and goatskin decreased by 5.73%, 11.42%, and 12.86%, respectively, in 2021/22 because of the recurrent drought in the year.

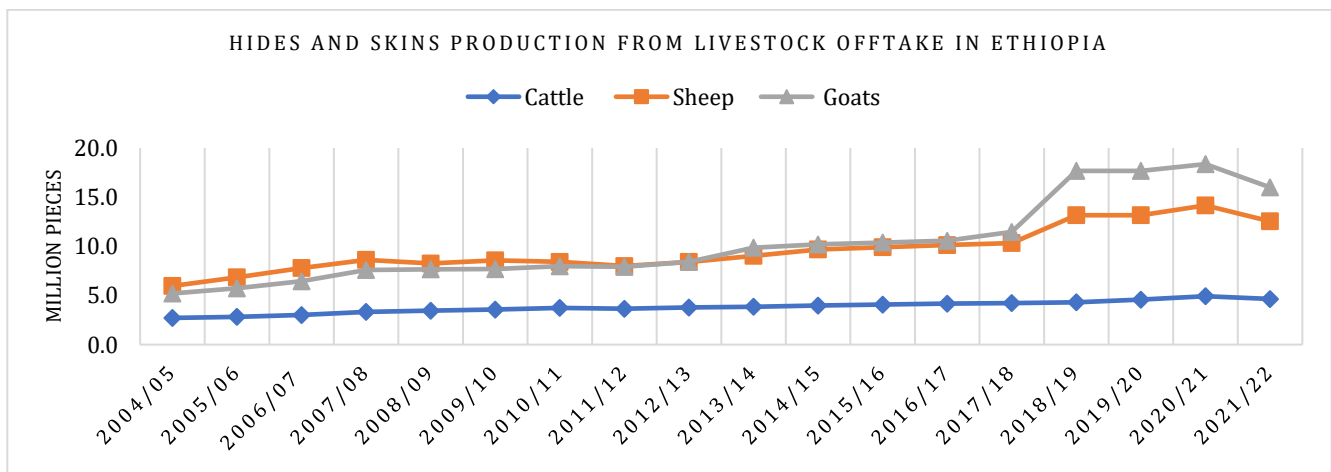


Figure 1. Trends of HSs production from livestock offtake; Source: Computed from CSA/ESS data.

Trends of Smallholders HSs Sales and Household Utilization Rate

The Hides sales and household utilization percentage fluctuated (Figure 2) between 2008/09 and 2021/22 under rural smallholders. The sales percentage decreased from 61.5% to 11.96%, while the utilization percentage climbed from 35.73% to 61.5% of the total amount of hides produced by rural smallholders. As indicated in Figure 2, previously HSs were cash commodities for smallholders, therefore the hides sale percentage was more than the household utilization rate before 2016/17, then after that the sales rate continued to decrease until 2021/22. The trend of percentages of skins sales and household use fluctuated over time (Figure 3), like hides, the use rate of skins increased from 37.3% to 50.95% while skins sales reduced from 59.44% to 15.13% between 2008/09 and 2021/22. The largest hides use rate increment (from 41.42% to 56.35%) and its sales rate reduction (from 50.54% to 41.24%) was recorded in 2016/17. Similarly, the highest rates of skin utilization increment

(46.24% to 66.57%) and skin sales reduction (from 44.45% to 28.46%) were recorded in the same year.

The HSs sales rate reduction under smallholders (Figures 2 and 3) might be due to poor quality attributes caused by pre-slaughter, peri-slaughter, and post-slaughter reasons, which might lead to low demand for the product. The utilization rate of HSs increment might be due to low demand in the market that households were forced to use for making household furniture and utensils including chairs, bedding, sacks, sitting mats, pillows, and other utensils. A similar study (Mesele et al., 2015) found that in Tigray, 55.86% of the sampled families used raw HSs for traditional utensil-making purposes rather than selling them to traders. The expanding gap between total HSs production and sales plus consumption indicated in Figures 2 and 3 could lead to an increase in the rate of HSs discarding that has been observed recently in both urban and rural areas because of the poor quality and absence of a well-organized market for producers, as well as the low capacity of tanneries due to shortage of capital to absorb surplus raw HSs.

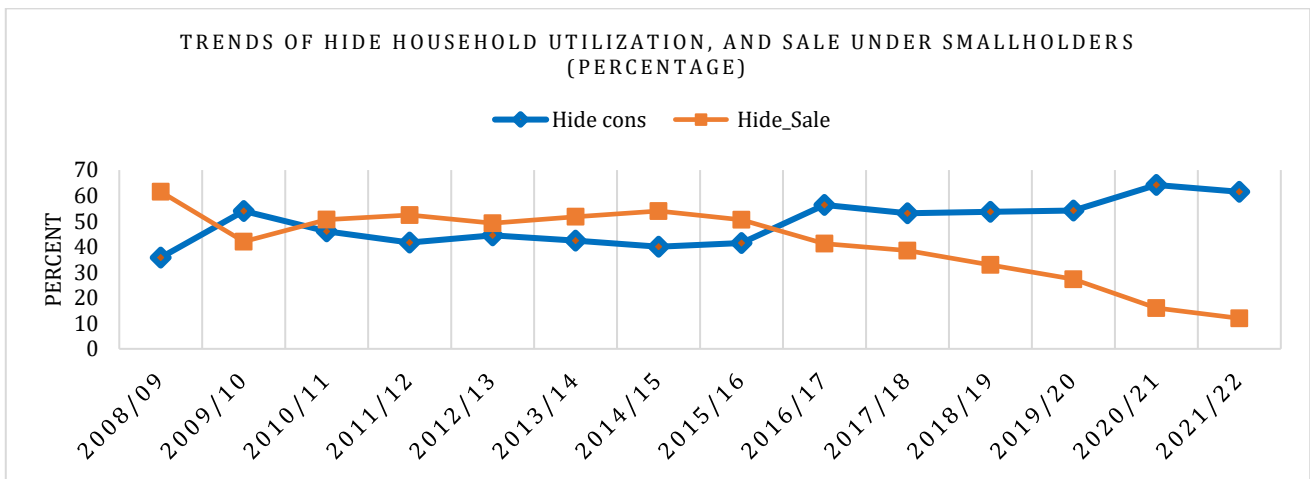


Figure 2. Trends of Hides consumption and sale rate; Sources: CSA/ESS.

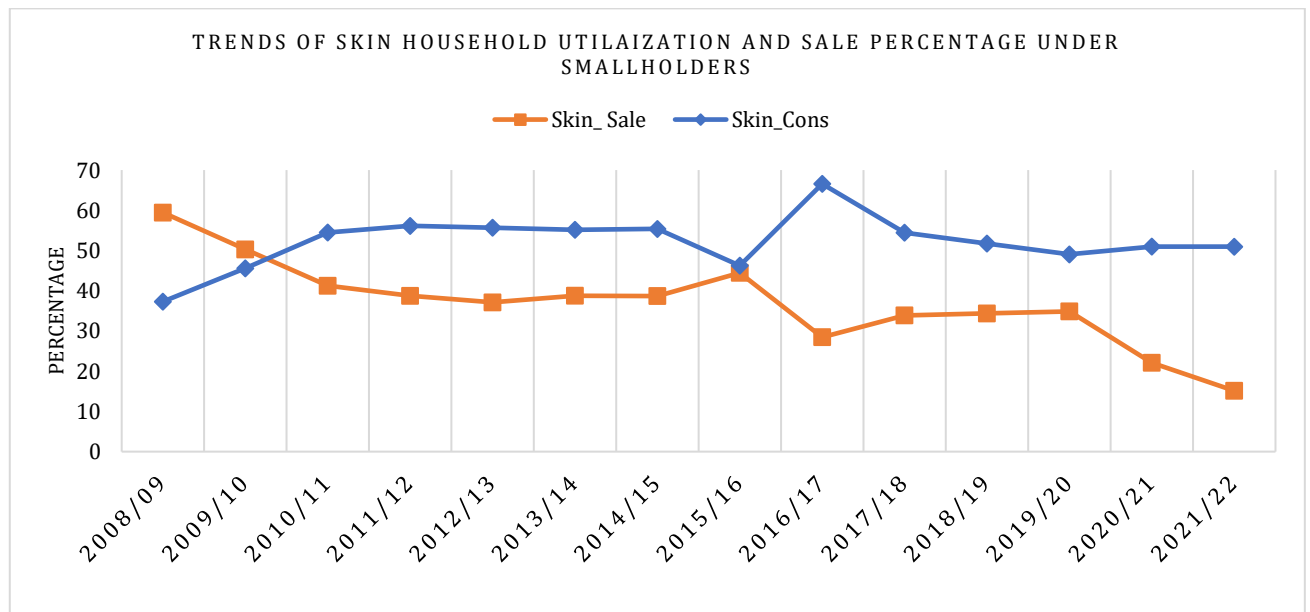


Figure 3. Trends of skins consumption and sale rate; Source: CSA/ESS.

Status of Hides and Skins (HSs), and Leather and Leather Product (LLP) Export

Based on the ERCA 2018 and 2019 data, the top three destinations of Ethiopian HSs and LLP exports were China (including Hong Kong), Italy, and Nigeria accounting for 52%, 29%, and 12%, respectively. The NBE data indicated that the annual average volume and value of HSs, and semi-processed LLP export was 7,358.53 MT and USD 88.80 million, y between 2002/03 and 2021/22.

As indicated in Figure 4, the trend of the exports varied over the years the volume of the exports reduced from 10.55 to 2.24 thousand MT, similarly, the revenue from the exports also decreased from USD 52.22 to 33.2 million between 2002/03 and 2021/22. Initially, the exports increased from 10.55 MT to 15.77 thousand MT between 2002/03 to 2006/07, and the income increased from USD 52.22 million to USD 99.2 million between 2002/03 and 2007/08. The volume of exports showed a continuous reduction between 2006/07 and 2009/10, similarly, the income reduced between 2007/08 and 2009/2010. The reduction might be due to the Great Recession that occurred from late 2007 to 2009 creating weak international demand for the products in importing countries. In addition to this, GoE imposed a tax on semi-processed leather exports in 2008 to boost value-added products in the country; as a result, in 2009/10 the volume and value of exports declined by 60.15% and 25.1%, respectively. In 2010/11, the volume and value of exports showed radical increments (Figure 4) by 77.8% and 84.0%, respectively; this might be a highly imposed tax on semifinished HSs which led to factories producing and exporting finished leather and LLP to the international market. Then after, the tax imposed on crust leather in 2011 however the volume and value of the export varied and continued to increase since 2010/11 (Figure 4). Due to this progress encouraged world-famous footwear companies from China (opened in January 2012, and have committed to jointly and expect to be able to provide around 30,000 jobs in Addis Ababa by 2022), Italy, and the UK were relocated their facilities to Ethiopia (CBIT, 2020), and the export increased to USD 131.6 in 2014/15, this might due to the foreign direct investment attraction in Ethiopia.

Despite having more advantages to semi-processed HSs export, local tanneries lost their export market share since 2012 after the imposed export tax. Similar studies (CBIT, 2020; Wegayehu and Kalaba, 2019) also reported that the Ethiopian government’s

policies targeted at fostering value-added local processing have met with some success at the expense of Ethiopian tanneries, and small local tanneries stopped exporting or significantly reduced their exports due to the new policy. The study (UNCTAD, 2018) acknowledges the advantage of exporting semi-processed HSs export that Ethiopia has a significant relative competitive advantage in the export of semi-processed HSs but not in the export of finished leather products.

After 2014/15, the exports fluctuated and declined, particularly since 2017/18 radical volume and value of the export reductions were recorded (Figure 4). The income decreased from USD 132.40 to 33.20 the volume and value of the export annually decreased by 21.7% and 27.1%, respectively between 2017/18 and 2021/22. This might be due to a shortage of quality raw HSs supply, foreign direct investment (FDI) inflows and shortage of working capital for local tanneries made them work under capacity and unable to compete in the international markets. A similar finding (CBIT, 2020) indicated that the foreign companies’ inflows increased from 10 to 30 in 2018, which could cause them to lose market share of local tanneries.

Conversely, Chinese tanneries have more options to address the declining quality of the HSs and can import enough amount from abroad because they do not have foreign exchange and capital problems. In comparison to domestic tanneries, foreign tanneries also have greater access to the foreign exchange required to buy important inputs, because they have sister companies abroad. This finding is supported by the study (Xiaoyang, 2019) that found some tanneries import HSs from Mali, Saudi Arabia, Sudan, and Yemen.

The price of HSs fluctuated and increased from USD 4.95/kg to 14.81/kg between 2002/2003 and 2021/22; however, a continuous increment was seen until 2011/12 and the price shows a continuous reduction between 2012/13 and 2021/22 (Figure 4), this might be due to the international market condition and poor quality of the HSs and LLP export that led to low demand for the product. Tanneries also verified that the poor quality of HSs was primarily cusse of a drop in foreign demand. Different researchers (Tenaw et al., 2023; Tewelde et al., 2020; Teklay et al., 2019) verified that in large tanneries very few percent of the sampled raw HSs were found in grade III that available for the export market. Most of the samples found in Grade V and Grade VI that used for the local markets. Totally there were no Grade I and II from the sampled raw HSs that were needed for the export market.

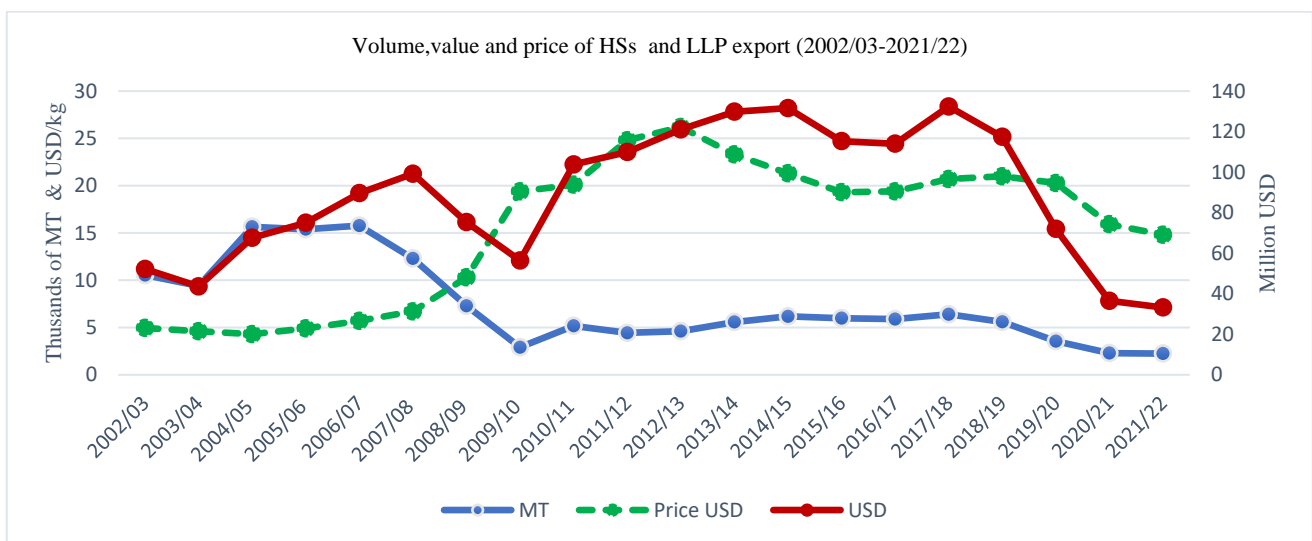


Figure 4. Trends of HSs export; Source: NBE.

Share of HSs and LLP Export

One of Ethiopia's main export goods is semi-processed and processed HSs. The majority of tanneries in Ethiopia were founded as export-based semi-processed raw HSs. The leather sector was the second major source of foreign currency through the export of live animals, meat, hides, and skins in 2002/03 (NBE, 2004); however, Figure 5 depicts a downward trend in the percentage of

HSs and LLP exports relative to Ethiopia's overall export income, which fell from 10.8% to 0.8% of total country's export between 2002/03 and 2021/22. This could be because the exports of other agricultural subsectors surpass those of the leather sector, and the leather industry was more negatively impacted by various Ethiopian policies and strategies than by those of other subsectors.

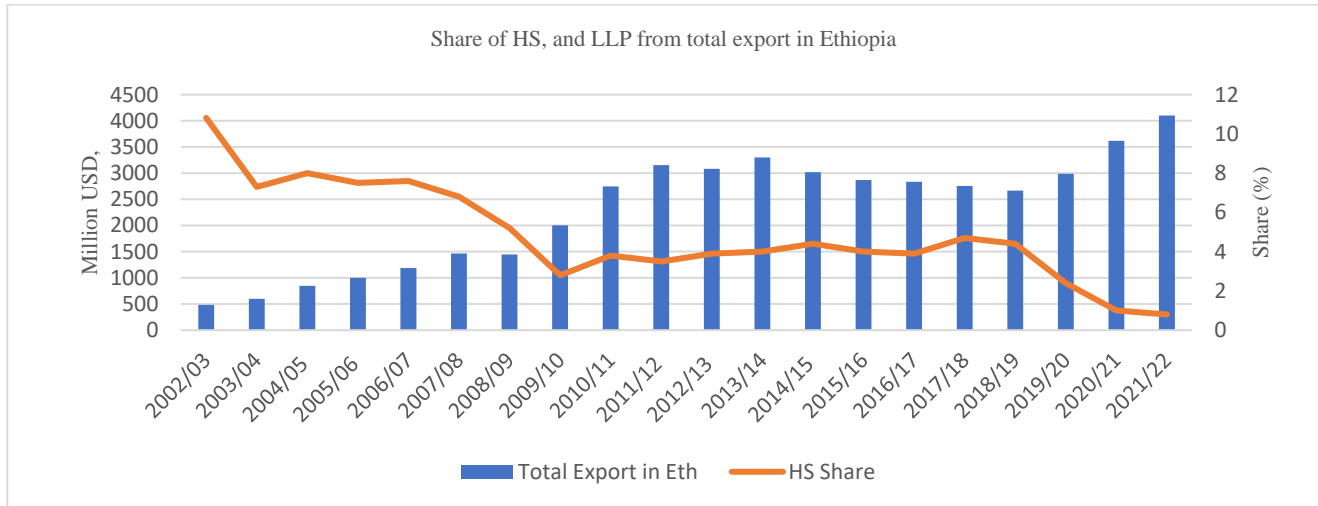


Figure 5. Share of HS, an LLP export from Ethiopian total export; Source: NBE.

Opportunities and Challenges of HSs Production and Marketing in Ethiopia

Opportunities

The livestock population in Ethiopia and the availability of the labor force (able to provide jobs for many women and young people to work in the leather industry for a living) provide ample opportunity for the production of HSs and LLP to be competent in the world market. The Ethiopian government's willingness to support the leather sector that, included in the two GTP plans, is an opportunity to develop the sector. There is a growing domestic and global market for HSs and LLP, which is driving tanneries to demand raw HSs as an input. With the rising demand for LLPs (shoes, bags, clothing, wallets, belts, etc.) throughout the country, HSs could have derived demand from tanneries. The GoE uses agro-industrial parks, as one of the country's development strategies that may enhance the demand for HSs production. Ethiopian HSs are well-known in the world leather market for their special natural qualities of fitness, cleanliness, compactness of texture, thickness, flexibility, and strength. According to Behailu (2017) and Ahmed (2000), some of the HSs have gotten recognition internationally, like the highland sheepskin, that "hair sheep/Selale type" is suitable for the manufacturing of high-quality leather for dresses, gloves, sports gloves, and other items. Lowland goatskins labeled as "bati-type" and highland goatskins "bati-genuine" are identified by their thicker, extremely flexible, and spotless inner surface. The fine grain pattern and fiber structure of Ethiopian cattle hide branded as "Zebu type" originate from the Western and South Eastern regions of the country; it is perfect for producing high-quality upper leather and the manufacture of shoe uppers.

Production challenges

Ethiopian tanners struggle with shortage and poor quality of HSs supply that pre-slaughter, peri-slaughter, and post-slaughter defects impact on HSs production and supply quality. These quality issues are linked to the entire value chain, starting with

poor animal husbandry, weak veterinary care, poor livestock extension services, and traditional methods of slaughtering up to poor HSs collection, handling, preservation, and transport at various levels. Many cattle, sheep, and goat slaughter and flaying operations take place in backyards, often by unskilled workers using traditional methods. Similarly, these challenges frequently mentioned by (Tewelde et al., 2020; Grumille and Raza, 2019; Mohammed, 2019; Teklay et al., 2019; Brautigam et al., 2018, UNCTAD, 2018, Teame, 2017, Girum and Schaefer, 2013) that defects can be one of the causes of the tanneries' poor access to quality supply and lead them working under capacity to produce for export market. Some of the tanneries also closed due to a shortage of working capital, government tax on semi-finished leather, environmental protection issues, etc., therefore currently the functioning tanneries are not more than 10, which leads to a reduction in the derived demand for raw HSs.

Hides and skins marketing challenges

Shortage of raw HSs is not only because of quality problems in Ethiopia; but also, it is because of the existing unorganized markets. Ineffective and uncoordinated supply of raw HSs are the main constraints including an inadequate network of primary buyers, preservation, storage, and transportation, and a lack of incentives for quality improvements are marketing problems. The market chain for raw HSs is long; it passes through four to five steps (village collectors, small collectors in town, big collectors, final collectors) to reach the raw material to the tanneries, most of found 130 km radius around Addis Ababa. Hides and skins collectors have very narrow collection houses, with limited capacity, poor ventilation, and poor preservation methods that can affect the quality.

The absence of a well-organized poor market and poor market linkage lead to high market margins between producers and end buyers/tanners. The study (Tenaw et al., 2023) identified that producers' price was ETB 30 (USD 0.57)/piece of raw HSs; tanneries' purchasing price was ETB 183.5 (USD 3.46)/piece of

raw HSs on average; the marketing margin was ETB 153.5, which was more than 500% of the producers' price, this might be due to lengthy market and many agents engaged in HSs market. In Ethiopia recently, the HSs producer or meat consumers are not concerned about the quality of HSs because of the low price offered. According to the study (Tenaw et al., 2023) the cost of the skin made up 0.38% of the cost of a sheep or goat purchased for meat use. As a result, nowadays the producer disposes of the HSs everywhere, polluting the environment throughout Ethiopia. Sometimes, especially during the holiday times, producers pay flayers to dump the raw HSs.

Institutional problem

The study confirmed that there is minimal support (technical, financial, and training support, facilitating financial resources, identifying potential markets, capacity building, etc.) provided by MoA, MoT, ELIA, ILDI, etc. to collectors, tanneries, and traders, even though the HSs require help from these stakeholders. In addition to a lack of high-quality raw materials, most tanneries are operating below capacity due to a shortage of capital because bank loan policies do not consider the country's current inflation rate or the tanneries' potential for growth, that the loan amount fixed over years.

Poor platforms where tanneries, traders, and other stockholders may exchange information about the price, supply, and demand for the product and may provide financial and technical support. Several proclamations and policies have been implemented in the leather sector, most notably the 150 tax imposed on semi-finished and crust leather export in 2008 and 2011, respectively, which affected the volume and value of the export. The tanners also complained about the export tax and the relaxed FDI regulations affected local tanneries that FDI policies facilitated the new dominance of foreign investors, particularly Chinese-owned tanneries at the cost of locally-owned tanneries (Wegayehu and Kalaba, 2019; Grumiller and Raza, 2019). Until 2019 most tanneries exported semi-finished leather to tanneries located in the European Union and Asia for further processing and only a few

tanneries had finishing capacity. Starting with the de facto ban on crust leather exports, locally-owned tanneries continuously lost market share to foreign-owned tanneries. In 2017/18, foreign-owned tanneries exported 73%, and Chinese-owned tanneries 30%, of total leather exports, indicating the lack of locally-owned tanneries capacity and competitiveness in leather finishing (Grumiller and Raza, 2019). The previous study (Coppeaux et al., 2016) indicated that, after the 2008 export tax policy local tanneries were forced to vertically integrate the entire tanning process, thus causing discrepancies in the processing capacity between raw, wet-blue, and finished leather. As a result, the sector is slowed down and is less competitive than it could be.

Outlook on HSs Production and Export

Making timely forecasts of HSs and LLP enables the policymakers and government to take wiser steps for enhancing the production, quality, and marketing, as a result, increased production, sale, and export of HSs and LLP will certainly contribute to meeting the demands of the commodities at national and international level. Based on past data and the expectation that there won't be any shocks (no change in livestock production practices, factory demand, policies, etc.), analysis was carried out using some forecast techniques for the following ten years. To select the best model, accuracy ratings were computed for all models for each variable. The best of the forecasting methods is selected based on the lowest values of MAD, MSE, and MAPE; the lowest MAD is a criterion used to determine a choice of the model.

Projection of HSs production trends

The analysis compared the error of the five different methods indicated in Table 2 and compared the efficiency of prediction methods for forecasting hides and skins separately (cattle, sheep, and goats' offtake). Based on the results, the Linear Trend (LT) with a MAD value of 0.09 outperformed the other methods for ides production forecasting. The Naïve method was a suitable model among others to forecast sheepskins and goatskins production with MAD values of 0.68 and 0.94, respectively.

Table 2. Accuracy measures for best model for cattle, sheep, and goat offtakes in Ethiopia.

Item	Forecasting models	Criteria		
		MAD/ MAE	MSE	MAPE
Cattle_offtake	Naïve	0.16	0.03	4%
	Linear Trend	**0.09	0.01	2%
	Simple Moving Average (2YMA)	0.19	0.05	5%
	Weighted Moving Average (2YWMA)	0.18	0.04	5%
	Exponential Smoothing (Da=0.01, α=0.09)	0.17	0.04	4%
Sheep_offtake	Naïve	**0.68	0.92	6%
	Linear Trend	6.08	39.35	60%
	Simple Moving Average (2 YMA)	0.74	1.13	7%
	Weighted Moving Average (2YWMA)	0.70	1.02	7%
	Exponential Smoothing (Da=0.01, α=0.09)	0.82	1.15	8%
Goats_offtake	Naïve	**0.94	3.12	8%
	Linear Trend	1.45	2.82	14%
	Simple Moving Average (2YMA)	1.33	4.45	10%
	Weighted Moving Average (2YWMA)	1.20	3.90	9%
	Exponential Smoothing (Da=0.01, α=0.09)	1.02	3.23	8%

Note: ** is the best model with a minimum mean absolute deviation (MAD); Source: Own computation.

Based on the model result, LT model, and if producers continue with the usual production practice between 2021/22 and 2030/31; the hides production will rise from 4.64 million to 5.85 million pieces, which will increase by 26.18% from the base year, 2021/22 (Figure 6).

The Naïve model result indicated in Figure 7 that the annual trend of the sheepskin and goatskins production will continue with the same amount, that sheepskin and goatskin production will continue at 12.54 and 16 million pieces, respectively between 2021/22 and 2030/31.

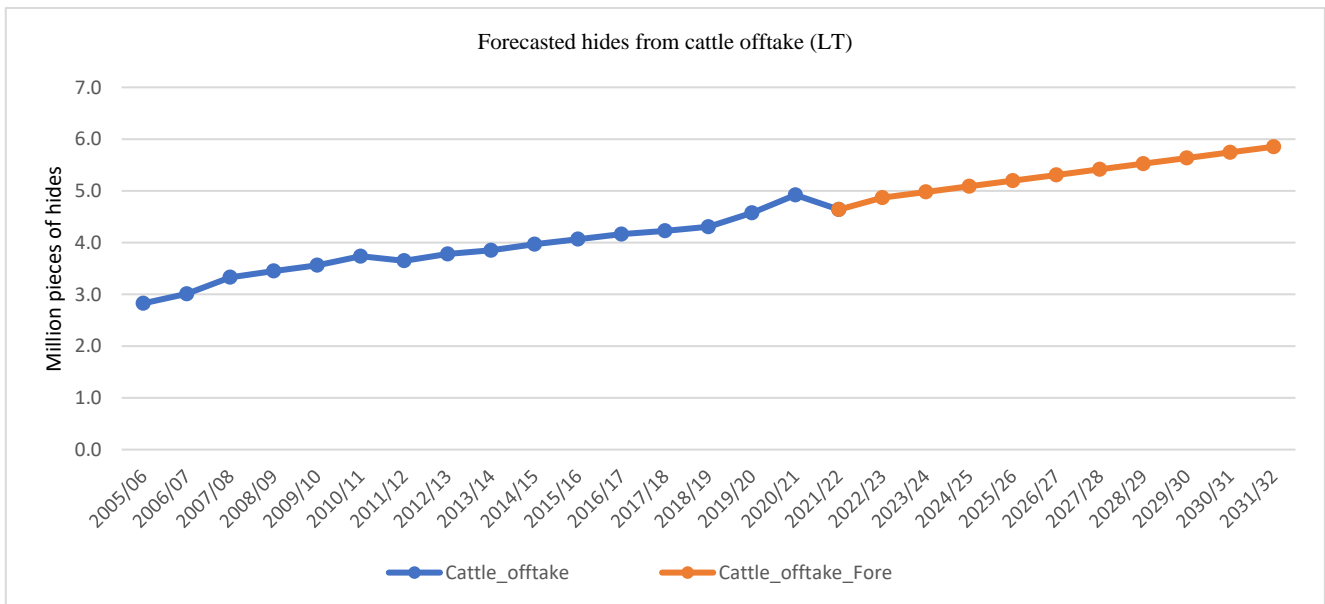


Figure 6. Forecasted Hides from cattle offtake; Source: computed from CSA/ESS data.

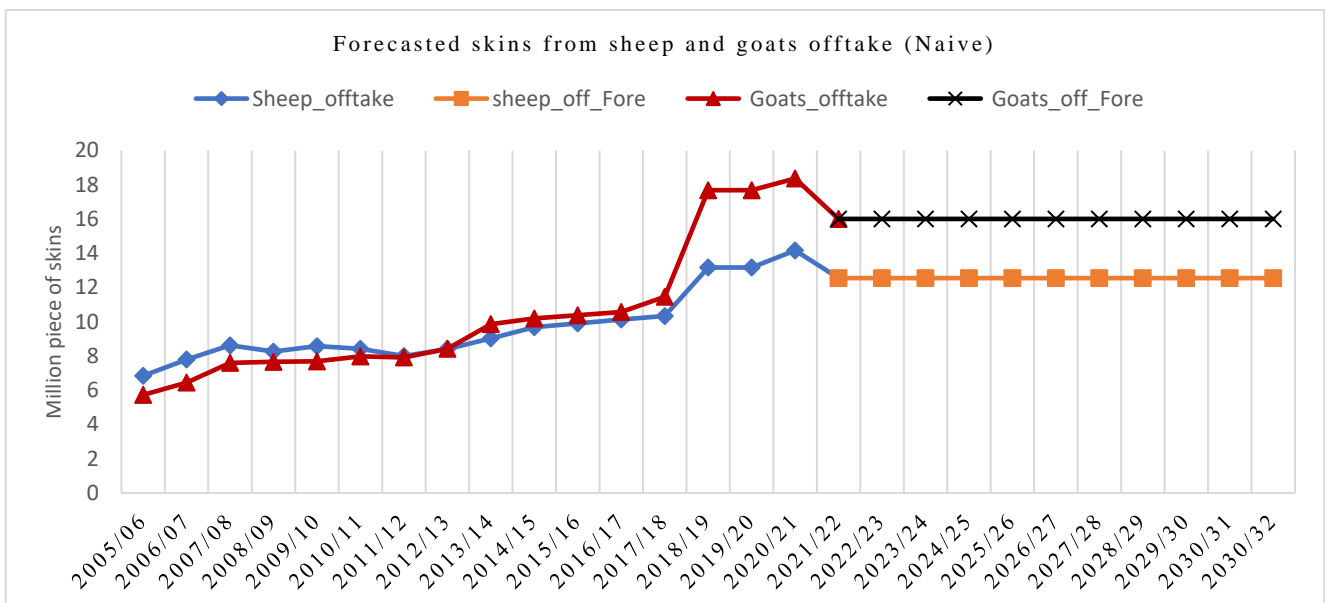


Figure 7. Projection of offtake livestock trends (pieces of Hides and skins); Source: forecast computed from CSA/ESS data.

Projection of Rate of HSs Utilization and Sale

The diagnostic measures for the best forecast selection model for the percentage of hides and skins utilization and sale I under rural households in Ethiopia showed in Table 3, the Two Years Weighted Moving Average (2YWMA) model is the best-fitted model for hides, and skins use ratio forecast. The MAD values for the 2YWMA model are 1.49, and 3.16 for the ratio of Hides, and skins utilization, respectively. The LT is the best method to forecast the sale rate for hides and skins.

Based on the minimum error value criterion, MAD values of the ratio of hides and skins sales ratio are 5.22 and 4.51, respectively.

The 2YWMA trend line of household hides use rate shows stagnant and insignificant upward movement from 2021/22 to 2031/32 (Figure 8); that hides utilization will increase from 61.5% to 62.17% for the coming ten years. Similarly, the 2YWMA trend line of skin household utilization will be stable and will continue at 50.96% for the upcoming years (Figure 9).

Table 3. Accuracy measure to select the best model for HSs utilization and sales rate in Ethiopia.

Item	Forecasting models	Criteria		
		MAD	MSE	MAPE
Hides utilization (Hides_cons)	Naïve	5.69	63.97	11%
	Linear Trend	4.55	33.64	10%
	Simple Moving Average (2yama)	1.77	4.21	4245%
	Weighted Moving Average (2YWMA)	**1.49	3.96	39.73
	Exponential Smoothing (Da=0.04, α=0.06)	5.03	59.41	9%
Skin utilization (Skin_Cons)	Naïve	5.75	67.77	11%
	Linear Trend	5.39	40.40	11%
	Simple Moving Average (4YMA)	3.26	31.62	2893%
	Weighted Moving Average (2WYMA)	**3.16	31.22	2854%
	Exponential Smoothing (Da=0.02, α=0.08)	5.72	60.38	11%
Hides sale (Hides_Sale)	Naïve	6.32	64.71	19%
	Linear Trend	**5.22	48.54	15%
	Simple Moving Average (2yama)	5.83	50.62	20%
	Weighted Moving Average (2YWMA)	5.46	42.47	18%
	Exponential Smoothing (Da .1, al. .9)	6.41	65.33	20%
Skin sale (Skin_ Sale)	Naïve	5.42	54.92	17%
	Linear Trend	**4.51	27.04	12%
	Simple Moving Average (2YMA)	5.34	46.19	17%
	Weighted Moving Average (2YWMA)	5.68	58.03	23%
	Exponential Smoothing (Da .1, al. .9)	5.45	54	17%

Note: ** is the best model with a minimum mean absolute deviation (MAD).

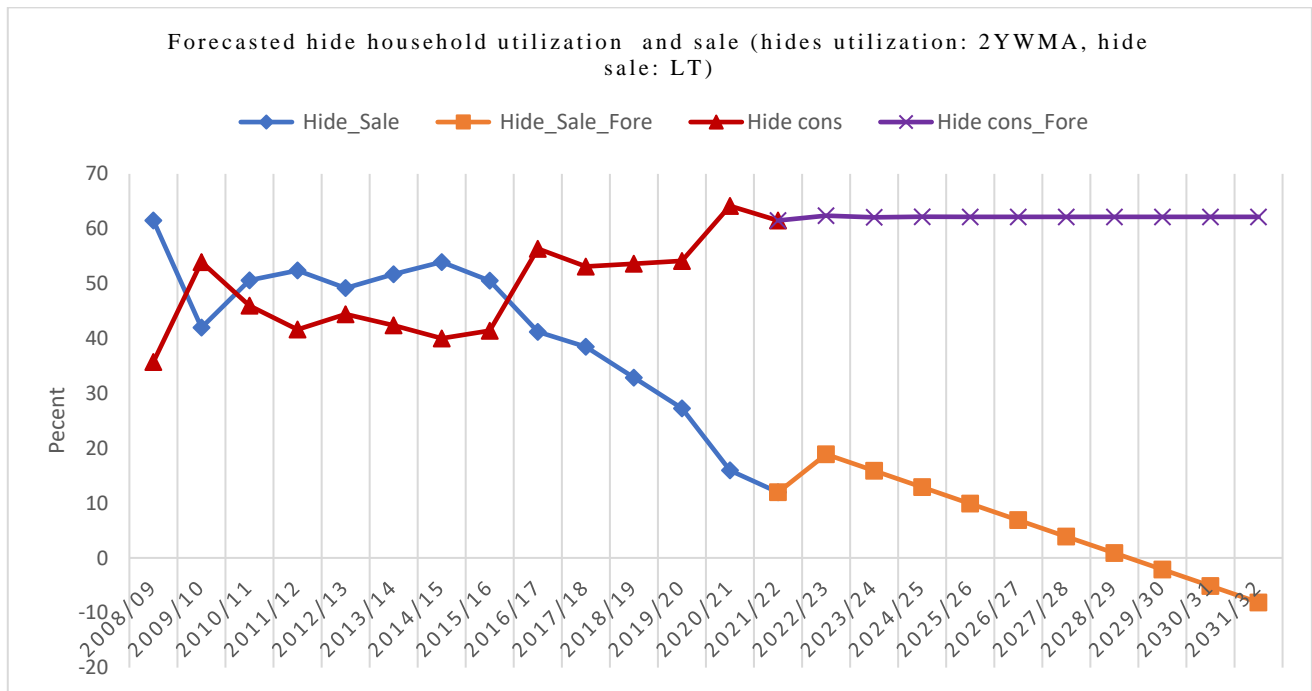


Figure 8. Forecasted rate of hides utilization and sale; Source: CSA/ESS.

According to a forecasted hides sale ratio trend indicated in Figure 8, the rate of sale of hides will decrease from 11.96% in the base year, 2021/22, to negative 8.12% in 2031/32, this indicates unless the government takes an action, the household will stop supplying hides to the market and the discarding will increase since 2029/30. Similarly, the forecasted skin sales percentage trend indicated in Figure 9 that it will reduce from 15.13% to 0.13% between 2020/21 and 2031/32.

All these outcomes will lead to a shortage of raw materials for tanneries and a loss for smallholder farmers, pastoralists, or agro-

pastoralists. The difference between the total of HSs produced percentage (100%) and the sum of the HSs utilization and sale percentages could result in HSs dumping. For instance, in 2031/32 the difference between total household hides produced, and sales plus consumption {consumption 62.17% + sale (-8.12%) = 54.05%} was 45.95%, indicating a high probability of dumping that could result in lack of getting Hides supply for industry and loss of income for smallholders. A similar finding (Tenaw et al., 2023) estimated that 45% of the 2019 HSs production from households did not collect due to different reasons.

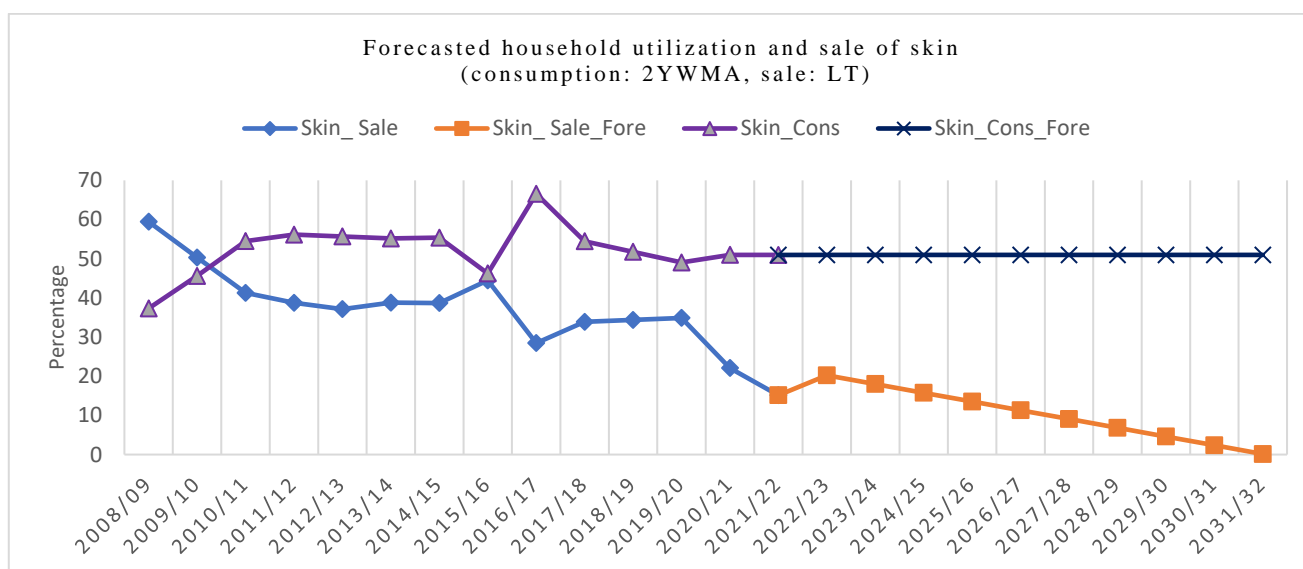


Figure 9. Forecasted rate of sheepskin and goatskin utilization and sale; Source: CSA/ESS.

Projection of HSs and LLP Export

The efficiency comparison of prediction methods for export volume and value of HSs and LLP in Ethiopia indicated in Table 4 that the Naïve method is the best of all methods for volume and value of the export with MAD values of 1,608.85 and 16.71, respectively.

The graphical trend analysis, Naïve model, for volume and income from export showed in Figure 10 that the export will never increase for the coming ten years with the existing opportunities and challenges, and the volume and income from export will continue with a fixed amount that 2,239.30 MT and 33.3 million USD, respectively between 2021/22 (the base year and 2031/32).

Table 4. Relative the efficiency of prediction methods for the export and price of HSs and LLP.

Item	Forecasting models	Criteria		
		MAD	MSE	MAPE
HS-EX_(MT)	Naive	**1,608.85	5,817,609.87	28%
	Linear Trend	2,262.10	7,260,953.98	47,958%
	Simple Moving Average (2yama)	1,956.86	8,827,664.23	38%
	Weighted Moving Average (2YWMA)	1,799.47	7,566,683.61	34%
	Exponential Smoothing (Da .1, al. .9)	1,639.27	6,116,524.96	30%
HS-EX_USD	Naive	**16.71	452.16	23%
	Linear Trend	27.34	996.29	43%
	Simple Moving Average (2yama)	1,956.86	8,827,664.23	38%
	Weighted Moving Average (2YWMA)	20.80	604.53	30%
	Exponential Smoothing (Da .1, al. .9)	17.76	477.70	25%

Note: ** is the best model with a minimum mean absolute deviation (MAD).

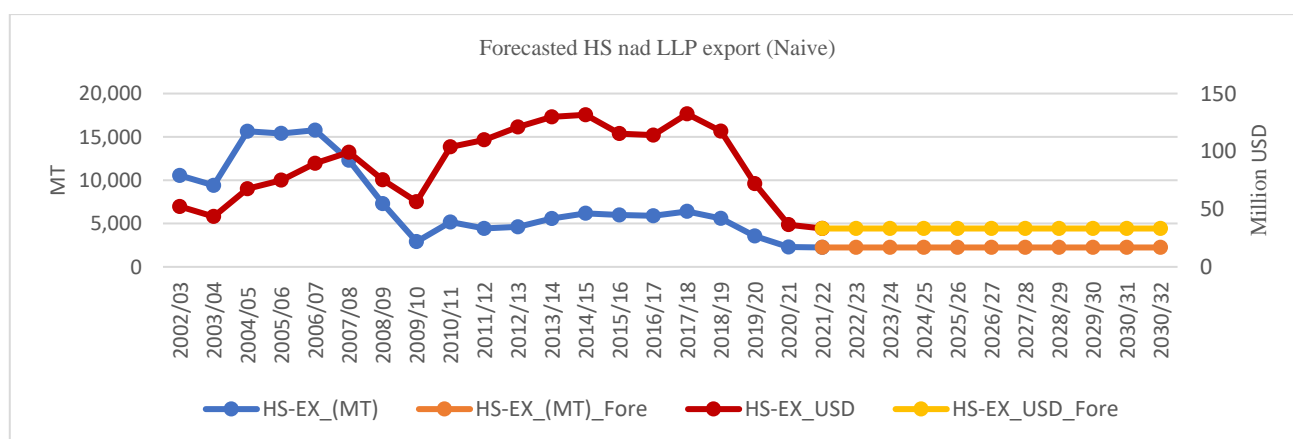


Figure 10. Forecasted HSs, and LLP export; Source: NBE.

CONCLUSIONS AND RECOMMENDATIONS

Despite Ethiopia has ample livestock population, the country has the potential to produce enough HSs to supply raw materials for tanneries and manufacturers. The raw HSs production has grown over the last decade and could meet the demand of leather industries, however, there was a tendency for the raw HSs sales rate in rural households to decline due to its poor quality and the absence of well-organized markets in those areas. Contrary to sales, rural households' HSs utilization rate is increasing because it is not marketable due to poor quality, low price offers, and the absence of an organized market for the products.

Ethiopian HSs and LLP have international demand; and the exports were volatile and showed an increasing trend up to 2017/18, the volume, value, and price of the exports showed a continuous reduction. The share of HSs exports from total Ethiopian exports also showed a decreasing trend and it was less than one percent in 2021/22. These might be due to poor quality supply to the international market, shortage of capital for tanneries, and different leather sector policies and strategies.

The study concludes, that Ethiopia gifted in livestock population, has the potential to produce HSs and contribute to the leather sector for local and international markets. Ethiopian HSs and LLP have international demand due to their unique quality attributes. The sector is recognized as one of the economic development sectors that the Ethiopian government considers the sector in different country's growth and development plans. All these are considered as an opportunity for the development of the HSs production and marketing. However, the sector faces different challenges related to production, marketing, and policy.

The HSs production faces pre-slaughter, peri/slaughter, and post-slaughter defects leading to downgrade and rejection. Pre-slaughter defects including scratches, skin diseases, and parasites are the most common causes of HSs defects. Due to backyard slaughtering flaying/knife cuts are the most common problem under peri-slaughter, and putrefaction is the most of post-slaughter defect. All these defects caused a shortage of quality raw materials for tanneries and made them to work under capacity which led to low production for export markets.

Ineffective and uncoordinated supply of raw HSs are the main market constraints for actors in HSs value chain. The absence of well-organized marketing linkage leads to low price offers to HSs producers and high market margins between producers and end buyers/tanners. Regarding policies-related challenges, limited support (technical, financial, and training, facilitating financial resources, identifying potential markets, capacity building, etc.) and the absence of a platform to exchange information and technical support are the main challenges for actors in the leather sector. Different policies and strategies (tax, FDI attraction, etc.) in different periods and shortage of chemicals adversely affected the leather sector, particularly tanneries. Most tanneries are operating below capacity due to a shortage of capital because bank loan policies do not consider the country's current inflation rate or the tanneries' potential for growth.

With these opportunities, challenges, and the absence of any government intervention hide production will increase, while skin production will continue but will never increase for the next ten years. The raw HSs sales rate will decline and eventually stop, which could result in the widespread discarding of HSs that we are already witnessing. The rate of household hides utilization will show stagnant and insignificant upward movement and skins utilization will continue but will never increase for the next ten years. Also, the HSs and LLP exports will never increase for the next ten years unless the government takes corrective measures. As a result of the rate low supply of raw HSs due to quality problems,

training manuals must be prepared and integrated with existing agricultural extension package programs. Livestock owners, local or village HSs collectors, traders, flayers, and abattoirs should also get continuous training to ensure the quality of HSs. Due to limited market access, and poor storage, and transportation systems, HSs putrefaction is the highest of post-slaughter defects; therefore, building or improving the marketing system, and facilitating/linking HSs value chain actors with markets is crucial. Availing of preserving inputs is essential to reducing decay on excess HSs supply, especially during the holidays.

Limited platforms for actors in the leather sector led to failure to get market, technical, and institutional support. Therefore. It is important to create/strengthen platforms for actors in the leather sector. Also, like other agricultural commodities (coffee, soybean, haricot bean, etc.) raw HSs should get separate collection points/markets. The leather sector is affected by different development policies and strategy interventions that distorted the raw HSs markets and adversely affected quality supply and cusses for low export. Therefore, revising the policies and strategies of HSs and LLP is important to maximize the potential income from the sector. Particularly, the export tax on semi-processed HSs and credit facilities for tanneries should be revisited.

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Conflict of Interest

I thus prove that there are no known conflicts of interest pertaining to this manuscript, nor has there been any significant financing for this work other than EIAR that would have had an impact on the outcome.

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