

1st Workshop on Eco-Tanning Processes In Kenya and East African Region

August 17-18, 2023 at Best Western Plus Meridian Hotel, Nairobi Kenya

Capacity Building on Eco-Tanning Processes for the Leather Value Chain Stakeholders



2023 Draft Report by

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Sustainable Manufacturing and Environmental Pollution Programme



Executive Summary

The global leather industry, while vital, contributes significantly to pollution, especially in developing nations. As part of Sustainable Manufacturing and Environmental Pollution (SMEP) program, UNCTAD organized a two-day workshop focusing on eco-tanning processes in Kenya and the broader East African region. This event, held on 17th-18th August 2023 at Best Western Plus Meridian Hotel, Nairobi-Kenya and online, was made possible through sponsorship from the UK's Foreign, Commonwealth and Development Office (FCDO) and co-organized by UNCTAD, the Technical University of Kenya (TUK), the Kenyan State Ministry of Agriculture and Livestock Development and the Tanners Association of Kenya (TAK).

The workshop aimed to enhance institutional capacities within the leather tanning industry and foster cooperation among key stakeholders, including the private sector, government, and academia. Discussions revolved around eco-tanning technologies, environmental challenges faced by tanneries and leather manufacturing sectors, and strategies to mitigate environmental impacts. Topics ranged from eco-preservation and eco-tanning technologies to circular economy opportunities for tannery waste, governance, regulations, tax incentives, environmental and occupational health and safety laws, and international certification standards. It also provided an inclusive platform of cooperation and coordination among stakeholders including the private sector, the Government, and academia.

In addition to discussions, two site visits provided valuable insights. Participants visited Alpharama Limited, Kenya's largest tannery, which is internationally certified to produce and export semi-processed and finished leather. The second visit showcased the Technical University of Kenya's engineering capabilities, emphasizing mechanical engineering and industrial spare parts production.

Key themes and opportunities identified during the workshop included:

- **Alignment with Kenya's Vision 2030 Initiative:** Emphasis on transforming Kenya into a manufacturing nation by 2030, with the leather sector receiving increased governmental support.

- **Synergy Between Livestock and Leather Industries:** Enhancing the supply of quality hides and skins through skills training and modernized flaying techniques.

- **Combatting Illicit Trade:** Addressing challenges related to illicit trade in hides, particularly with West African traders, to ensure adherence to quality standards and environmental practices.

- **Regulatory Challenges:** Tackling difficulties in complying with National Environmental Management Authority's (NEMA) rules and exploring self-regulatory mechanisms within the tanning sector.

- **Import Tariffs:** Advocating for revised import tariff policies to maintain the competitiveness of Kenyan leather both locally and globally.

- **Innovation and Research:** Promoting innovative eco-tanning processes, traceability, and the conversion of tannery waste into valuable resources. Commercializing research findings and bridging the gap between research institutions and market needs were highlighted.

In conclusion, participants expressed appreciation for the comprehensive workshop presentations and the unique opportunity for local tanners and leather goods traders to engage with government officials and academia. The workshop marked a significant step toward sustainable and environmentally responsible practices in the leather industry in Kenya and the East African region.

Keynote Address

Jonathan Mueke,
Permanent Secretary,
State Department for Livestock Development,
Ministry of Agriculture and Livestock Development.

All Protocols Observed

Ladies and Gentleman. Good Morning. I am greatly pleased to join you today in this important training workshop whose objective is to enhance the capacities of stakeholders throughout the Leather Value Chain to contribute to the development and growth of a sustainable green leather industry in Kenya and East African region. I hope we will have fruitful engagements that will address the challenges faced by the Leather Value Chain players, in particular, pollution control and environmental governance, and aspects, which impede manufacturing processes and trade in leather and leather products, both locally and internationally. It is also my hope that the workshop will initiate and enhance collaboration between industry players, policymakers, and academia/research, key to promoting the adoption of cleaner technologies and fostering international trade in leather products.

The Kenyan government has identified the development of the Leather Sector as one of the priority areas that offers an opportunity for industrialization, job creation, and diversification of exports. Therefore, the country has adopted several national and regional policies like Vision 2030, Big Four Priority Agenda for 2017-2022, Draft Kenya Leather Development Policy (2022), National Industrialization Policy (2012-2030), East Africa Community Leather and Leather Products Strategy and Implementation Road Map 2030, East Africa Community vision 2050 and Africa Union Agenda 2063 to grow its leather industry, increase competitiveness in leather and leather products, and boost exports and jobs creation.

The Kenya Kwanza government has included the Leather Sector as a priority area under the **Bottom-up Economic Transformation Agenda (BETA) 2022-2027**. The BETA 2022-2027 plan has identified priority interventions areas in the leather value chain, and is committed to set up more common effluent treatment plants and leather industry clusters in Athi River, Narok, Isiolo, Wajir, Nakuru, Kisumu, Eldoret and Mariakani, and to secure linkages with local and overseas markets. The sector's significance in the country's economic growth has been further emphasized by **President HE Dr William Samoei Ruto Pronouncement which set a target for the industry to produce 15 million pairs of back-to-school shoes and**

proposed a ban on shoe imports within two years.

Currently, there are 13 registered tanneries operating in Kenya, with an estimated annual installed capacity of 31,440 and 15,600,000 tons for hides and skins, respectively. These tanneries mainly export raw pelts, or semi-processed wet blue and crust leather with little or no value addition that meets international green standards. **The State Department For Livestock Development have identified and is addressing the many challenges facing the leather industry** such as: poor quality of raw material; limited capacity of tanners; lack of appropriate green technologies; high cost of production (effluent treatment, tanning chemicals, machineries, power, and high cost of capital); poor skills and inappropriate production technologies; quality compliance; weak legal and impediment regulatory framework; and unpredictable fiscal/taxation environment at national and regional levels that may hinder the sector competitiveness and growth.

Distinguished Guests and Participants. I wish to acknowledge the extensive research work performed under Sustainable Manufacturing and Environmental Pollution (SMEP) on the leather sector in sub-Saharan Africa and South Asia that has identified tanneries as a priority area for environmental stewardship efforts. It is important to

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highlight that leather and leather products from Kenya will only find it easy to penetrate and maintain the international markets once they comply with international standards through the integration of green tanning technologies and recycling of leather wastes. I am glad that an UNCTAD scoping mission to Nairobi in September

2022, identified strong stakeholder demand among public sector, research and private sector representatives for activities seeking to improve the environmental governance and competitiveness of the leather sector in Kenya and in the EAC regions.

I wish to thank the UNCTAD, the Technical University of Kenya (TUK), State Department for Livestock Development, and Tanners Association of Kenya (TAK), under the funding of SMEP programme of United Kingdom FCDO, of organizing this training workshop on “**Eco-Tanning Processes along the Leather Value Chain in Kenya and the East African Region**”. The objective of the workshop is to build capacity and provide training to stakeholders from government agencies, the private sector, and academia on proper strategies geared towards integrating and implementing green sustainable manufacturing processes and supply chain that meet the standards and certification criteria set out by international leather working groups. I hope the capacity building

will also improve incomes and livelihoods of leather value chain actors minimizing defects and wastage, enhancing skills, and enabling participation in international markets.

I consider this workshop timely and strategic in informing policy makers on potential areas that can be exploited to achieve sustainable and transformative development in the leather sector development.

As I conclude, let me appreciate the strong collaboration and continuous consultation between The State Department for Livestock Development, development partners (UNCTAD, SMEP and UNIDO), TUK, TAK and leather value chain actors towards enhancing the leather industry development agenda. I believe this collaboration will lead to improvement of the livelihoods of Kenyans and other citizens of EAC. We should therefore play our rightful role in order to make this a reality.

With those remarks, I hereby declare the “**1st Workshop on Eco-Tanning Processes along the Leather Value Chain in Kenya and the East African Region**” opened.

Thank you.

Introduction

Leather companies in Kenya and the EAC region involved in exports are under pressure to adopt clean technologies along their supply chains to meet international standards and respond to brand requirements for their products. For example, in the last two years, eight tanneries have shut down due to economic and environmental related issues in Kenya. Furthermore, the operating industries are still faced with myriad challenges ranging from poor quality of raw material to ineffective slaughter operations and preservations, limited capacity of tanners, lack of appropriate green technologies, poor remunerations to attract specialized and skilled labor, high cost of production (effluent treatment, tanning chemicals, machineries, power, and high cost of capital), poor skills and inappropriate production technologies for leather utilization; high cost of accessories, quality compliance, weak legal and impediment regulatory framework, and the unpredictable fiscal/taxation and regulatory environment at national and regional levels that hinder its competitiveness and growth (KAM, 2020).

Therefore, there is an urgent need for extensive capacity building along the leather value chains to help integrate and implement the globally acceptable green and sustainable tanning technologies and recycling of leather wastes into useful products in Kenyan and regional leather manufacturing industries to reduce their negative environmental effects. These initiatives could help improve resource productivity and eco-efficiency, reform the management of the environment, and achieve sustainable development, which will be key to ensuring the competitiveness of the leather industry. More importantly, Kenyan and East African leather products will only find it easy to penetrate and maintain the international markets once they comply with non-tariff barriers related to international standards and production environmental regulation through the integration of green tanning technologies and the recycling of leather wastes. UNCTAD scoping mission to Nairobi in September 2022, also identified strong stakeholder demand among public sector, research and private sector representatives for activities seeking to improve the environmental governance and competitiveness of the leather sector in Kenya and in the EAC regions.

In light of the above, the Technical University of Kenya (TUK), the Kenyan State Ministry of Agriculture and Livestock Development and the Tanners Association of Kenya (TAK)

organized a targeted capacity building workshop for stakeholders along the leather value chain, regulatory agencies, research and academic institutions, which was facilitated by UNCTAD with support from the UKAid SMEP Program.

The overall objective of the workshop was to build capacity by training key leather private sector players and general workers in the leather value chains, government representatives, regulatory authorities and Kenyan and regional academia on the integration and implementation of green and sustainable tanning technologies and leather trade. This included capacity building on the key aspects of eco-production and preservation methods, green sustainable eco-tanning technologies, eco-friendly and sustainable management of tannery wastes, leather product standards and marketability, research partnerships and collaboration between government institutions and private sector to enhance cleaner technologies and international trade in leather products. The capacity building made it possible for the beneficiary of the workshop to have more knowledge on the best and cleaner practices in leather tanning technologies, traceability, and pollution control, including the benefits and mitigating costs of meeting environmental standards such as ISO 14000 on the competitiveness in the global leather trade.

Workshop Approach

The 1st Workshop on Eco-tanning Processes in Kenya and the East African Region was organized as a hybrid event, featuring both in-person sessions in Nairobi, Kenya, and remote participation from individuals across the East African Region and beyond. Prior to the workshop, the organizing team conducted a two-month mobilization effort throughout the country. This initiative aimed to inform potential participants about the conference's objectives, identify potential presenters, and provide an overview of the conference activities. This proactive approach ensured that attendees came well-prepared and actively engaged during the in-person sessions.



The workshop spanned two days, each divided into two parts. Morning sessions were dedicated to presentations with opportunities for questions and answers (Q&A) or discussion sessions, as well as breaks between thematic areas. Afternoons were designated for physical site visits, with Day 1 involving a visit to a tannery in Nairobi and Day 2 showcasing the Technical University of Kenya's engineering labs. These visits added a practical dimension to the workshop, offering participants concrete insights into cleaner leather production and potential collaborations or local sourcing of equipment spare parts from engineering facilities.

The workshop featured a diverse lineup of key speakers, including Mr. Jonathan Mueke - Permanent Secretary, State Department of Livestock Development (represented by Mr. Joseph Mbogo - Director of Leather Development), Prof. Paul Shiundu - Acting Vice Chancellor of Technical University of Kenya (TUK), Mr. Joseph Mbogo - Director of Leather Development, Mr. Glen Wilson - UNCTAD, Elzette Henshilwood - South North (SSN) and SMEP, Dr. Dominic Menjo - Presidential Economic Advisor (Head of Agriculture Sector), Prof. Mwinyikione Mwinyihija - President, International Tanners Association, and others.



Additionally, academia members from various universities and research institutions in Kenya presented their innovations aimed at promoting cleaner production in the leather industry. Representatives from regulatory and policy agencies, such as the National Environmental Management Agency (NEMA), Kenya Revenue Authority (KRA), East African Community (EAC) Ministry, KEPROBA, Ministry of Energy, Kenya Bureau of Standards (KEBs), Kenya National Chamber of Commerce & Industry (KNCCI), Kenya Association of Manufacturers (KAM), Tanners Association of Kenya (TAK), African Leather and Leather Product Institute (ALLIPI), Ministry of Labour and Social Protection (Occupational Safety and Health), and Leather Working Group, also delivered presentations.



The workshop also allowed exhibitions of leather goods by the various tanneries and leather goods entrepreneurs. During the breaks, there was also a lot of networking for cooperation and coordination among stakeholders including the private sector, the Government, and academia.



Topical discussions during the workshop were categorized into 6 themes included:

THEMES EXPLORED DURING THE WORKSHOP

THEME I: Eco-Preservation of Green Hides and Skins

THEME II: Eco-Tanning Technologies and Leather Manufacturing Strategies

THEME III: Tanning Waste Management/ Modernization of Tannery Machinery/

THEME IV: Resource Conservation, Environment Protection and Regulations for Tanneries

THEME VII: Marketing, Exportation and Auxiliary Support for Hides, Skins, Leather Trade and Industrial Growth Support

THEME VI: Tannery Audit and Certification for International Leather Trade

Workshop Day 1 Outcomes

A. Crosscutting themes in the Leather Industry

The workshop started with introductory presentations of cross-cutting themes related to the current status of leather industry in Kenya and East Africa region by Kenya Leather Development Council (KLDC) and Directorate of Livestock Development, positioning the leather industry and the leather value chain within the Kenyan Government Bottom-up Economic Transformation Agenda (BETA) 2022-2027 by Presidential Advisor on Agriculture, appraisal of participants on the role of UNCTAD and the ongoing call on SMEP proposal call on tannery pollution intervention and leather entrepreneur perspective on the leather industry in Kenya by Chairman of the Kenya Tanners Association of Kenya.

Roadmap for Implementation of Presidential Directives on Leather and Leather Products Value Chain Development in Kenya.

Mr. Joseph Mbogo, the Director of Leather Development in Kenya, initiated the session by underscoring the remarkable priority accorded to the leather sector in the region over the past decade. This emphasis has led to the formulation of both general and sector-specific policies, which highlight and reinforce the significance of developing the leather industry value chain as a pivotal driver of economic growth. Among the noteworthy policies mentioned are the Africa Union Agenda 2063, East African Community Vision 2050, and the sector-specific East Africa Community Leather and Leather Products Strategy and Implementation Road Map 2030. At a national level, Mr. Joseph Mbogo underscored Kenya's Big Four Priority Agenda (2017-2022), as well as the National Industrialization Policy (2012-2030), as policies expected to propel industry growth by enhancing competitiveness in leather and leather products, promoting exports, and generating employment opportunities.

Mr. Joseph Mbogo stated, "Political goodwill is instrumental in fostering development and economic growth, and the Kenya State Department for Livestock Development is leveraging recent presidential directives on leather and leather products value chain development to formulate enabling goals, strategies, and policies that lay a robust foundation for sectoral growth."



During the remainder of the session, Mr. Joseph Mbogo elaborated on the current strategy for Kenya, focusing on the following aspects that constitute the roadmap for implementing the presidential directives issued on 25th July 2023 regarding leather and leather products value chain development in Kenya:

- **Policy and Legal Matters:** This includes expediting legal and policy issues. Notably, the Kenya Leather Development Policy is awaiting publication and dissemination to stakeholders. Other policies encompass the finalization of the livestock bill and the reinstatement of trading licenses in the Hide, Skin, and Leather Trade Act (CAP 359). Legal considerations comprise formalizing the allocation of land in the Kenya Leather Industrial Park (KLIP) to the Kenya Leather Development Council (KLDC), expediting investor occupation by non-EPZ manufacturers, and the establishment of the Leather Development Fund.

- Hides and Skins Production: This involves enhancing capacity through training in Technical and Vocational Education and Training (TVET) institutions, training of flayers at slaughter points, and facilitating the acquisition of equipment through subsidies, as well as local manufacturing of spare parts like flaying knives and de-hiders. The establishment of hides and skins aggregation centers (bandas) and the promotion of good quality hides and skins are also key priorities.
 - Leather Processing: This encompasses the completion and operationalization of the Kenya Leather Industrial Park (KLIP) at Kinanie in Machakos County, the expansion of leather processing capacity for Ewaso Ng'iro South Development Authority (ENSDA), and the identification of suitable sites for Common Effluent Treatment Plants (CETPs).
 - Leather Product Manufacturing: This aims to map and profile MSME clusters for the establishment of Common Manufacturing Facilities (CMFs) and to boost footwear production.
 - Marketing: The focus here lies on conducting market research and enforcing product quality standards to expand the market for leather products.
- This comprehensive roadmap aligns with the presidential directives and positions Kenya to harness the full potential of its leather and leather products value chain.

Positioning the Leather Industry and the Leather Value Chain within the Bottom-up Economic Transformation Agenda (BETA) 2022-2027 of the Kenya Kwanza Government.



The speech by Dr. Dominic Menjo, the Presidential Economic Advisor on Agriculture, centered around the strategic placement of the leather industry and its value chain within the framework of the Bottom-up Economic Transformation Agenda (BETA) 2022-2027 of the Kenyan government, known as Kenya Kwanza. This ambitious agenda comprises five key pillars: Agriculture, Micro, Small, and Medium Enterprises (MSMEs), Housing, Health, and the Digital Economy. These pillars were carefully derived from the campaign engagements with Kenyan citizens, seeking to understand their expectations and critical intervention areas for regional development. Notably, citizens in the Arid

and Semi-Arid Lands (ASALs) expressed a pressing need for support in the leather value chain.

“As we delve into the intricacies of the leather value chain, we must consider its transformative potential. How much leather and leather products are we importing while our hides and skins go to waste? When we export, how much of the true value of these exports do we retain as Kenyan citizens? Can we augment our income by adding value through packaging and branding? These are the questions that guide our thinking, ensuring that we extract maximum value from our resources” stated Dr. Menjo

Dr. Menjo's address strategically positioned the leather industry under the agriculture pillar, given its inherent connection to livestock production, and under the MSMEs pillar, where activities related to leather, leather products, and finished goods manufacturing thrive. The speech underscored the government's commitment to fostering increased production of high-quality hides and skins. Additionally, it emphasized the importance of capacity building for leather technicians and artisans through training and certification, particularly within the juakali sector. The proposal to involve Technical and Vocational Education and Training (TVET)

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institutions in this endeavor is of paramount significance. The introduction of a learning-to-apprenticeship model is set to dignify the working environment of MSMEs, transforming the juakali sector from a place of hardship to one of opportunity and progress.

Furthermore, the speech highlighted other critical intervention areas within the agriculture pillar, notably focusing on food security. It underscored that the challenge lies not in production but in

effective planning. For MSMEs, the government aims to create a conducive business environment through enabling legislation and financial support.

In sum, Dr. Menjo reiterated that the current strategic positioning of the leather industry within Kenya Kwanza's BETA agenda underscores a commitment to harnessing the potential of this sector for both economic growth and social upliftment.

The future of the leather industry in Kenya and the East Africa region

Dr. Ahmed A. Hassan, Ph.D., Manager Quality Assurance and Compliance, KLDC, representing CEO KLDC, commenced by emphasizing the pivotal role played by the livestock population in shaping the future trajectory of the leather industry. According to the presentation, the anticipated growth in livestock numbers across the East African Community (EAC) holds the potential for an increased leather supply. Kenya, in particular, boasts the largest livestock herd, followed by Tanzania and Uganda.

“To comprehensively envision the future of the leather industry, a holistic understanding of the entire production process, from raw hides to finished leather, is essential. This process encompasses the 'farm-abattoir & traders – tanning – manufacturing' chain”, as elucidated by Dr. Ahmed A. Hassan.

The presentation further shed light on the key stakeholders within the leather industry value chain. At the farm level, livestock owners must prioritize sound animal husbandry practices, including proper nutrition, to ensure the production of high-quality hides and skins. Abattoirs and traders need to be well-equipped with the requisite machinery and possess essential skills, particularly for tasks such as flaying. The tanning phase can yield wet-blue or crust-finished leather, which serves as the basis for the final step—manufacturing leather products.



In the context of Kenya's current situation, Dr. Ahmed A. Hassan, explained that there are 15 tanneries responsible for producing (i) 18,835 tons of wet-blue, aimed at preparing hides and skins for subsequent value addition, (ii) 24,727,800 square feet of crust leather, where manufacturers/tanneries possess insights into market needs and process the leather accordingly, and (iii) 14,865,600 square feet of finished leather, indicating that manufacturers have a comprehensive understanding of the finished goods and footwear markets. The potential for forward integration depends on the availability of markets for finished leather and crust. To stimulate production of finished leather products, the Kenyan government has proposed a strategy to cultivate local markets.

Table 1. Projection of livestock population in EAC (in million numbers)

SPECIES	Kenya			Tanzania			Uganda		
	2023	2024	2025	2023	2024	2025	2023	2024	2025
Cattle	21.20	23.30	24.80	25.00	27.50	30.00	14.20	14.62	16.04
Goats	24.80	27.30	29.80	16.70	18.40	20.00	16.00	17.6	19.20
Sheep	33.70	37.00	40.40	8.00	8.80	9.60	4.50	4.95	5.40
Camel	4.40	4.80	5.20	0.13	0.14	0.15	0.10	0.11	0.12

Source: MoALD, 2023

Towards this, KLDC is involved initiatives with key strategic objectives facilitating excellence in the leather industry, enhancing leather sector infrastructure, promoting leather processing and product manufacturing and promote leather marketing. Finally, Dr. Ahmed A. Hassan enumerated several initiative KLDC is undertaking towards improving the leather sector such as:

- In collaboration with relevant institutions, KLDC conducts training for new and existing players along the leather value chain.
- The Council facilitates the participation of leather sector players in marketing fora to connect with consumers at local, regional and international platforms.
- The Council also liaises with development partners to mobilize resources for the development of the leather sector.
- The technical wing of KLDC provides supervisory technical support for sector projects in a pre, peri and post-implementation phases. These projects include but not limited to: construction of leather processing units, effluent treatment and management system. Further, the Council equips potential investors with relevant information to warrant productive ventures in the leather sector and leather products sector.
- The Council advises the Government on matters pertaining to processing of, and trade in leather and leather products. We also give advice to leather Micro, Small and Medium Enterprises (MSMEs) on best practices to embrace in order to better their enterprises based on the changing customer preferences and market trends.

Sustainable Manufacturing and Environmental Pollution (SMEP) Program Initiatives towards Green and Sustainable Tanning and Leather Product Trading Technologies

The remarks by Mr. Glen Wilson, Program Officer, United National Conference on Trade and Development (UNCTAD) (online presentation) and Ms. Elzette Henshilwood - South North (SSN) and SMEP representative, focused around the Sustainable Manufacturing and Environmental Pollution (SMEP) program, its mission, collaborators, achievements, and future plans. A particular emphasis was placed on the ongoing call for proposals aimed at addressing pollution challenges within the leather manufacturing industry.

The SMEP Project is a GBP 20 million 5-year programme that aims to elicit solutions that could improve the negative environmental & socio-economic impacts associated with manufacturing and challenges associated with tannery, textile industry and plastic pollution, in Sub-Saharan Africa and South Asia. SMEP Project Management Agent (PMA) was presented and is a consortium of Pegasys and SouthSouthNorth (SSN). The SMEP Programme is funded by the Foreign Commonwealth and Development Office (FCDO) and is implemented in partnership with the United

National Conference on Trade and Development (UNCTAD).

“An initial research/scoping exercise identified opportunities in the commercial value chain where there are potential leverage points / areas where solutions or interventions can have significant impact on this current unsustainable pollution trajectory” Mr. Glen Wilson, UNCTAD

Ms Elzette Henshilwood further appraised the participants on the call for proposals for SMEP projects addressing pollution in the textiles and tanneries sectors launching in 2023 and two of the procurement themes (A) minimizing the use of and impact of hazardous chemicals during leather processing, and (B) understanding the entire textile value chain better, were presented as potential leverage points/areas where solutions or interventions can have significant impact on looming unsustainable pollution trajectory associated with the leather industry. In addition to these, the remarks highlighted other cross-cutting priorities of FCDO in the procurement process including decarbonization of the tanneries industry and the legal mandate of FCDO to reduce gender inequality and social exclusion through development assistance programmes. The current call which is generally about opportunity for solutions that address manufacturing pollution in tanneries and leather sectors are for Kenya,



Ethiopia, Tanzania, Bangladesh, and Pakistan). More details can be found at www.smepprogramme.org/procurement. The other themes are (C) operations & governance (D) knowledge & education. Finally, the procurement process, proposal evaluation process and key timelines was presented. More information can be found at the SMEP website www.emspprogramme.org

The Kenyan Leather Industry: The Perspective of Leather Processing Players

Mr. Edward Njoka, the Chairman of the Kenya Tanners' Association (TAK), addressed the participants, emphasizing the importance of adopting eco-tanning technologies in the leather

industry. He began by acknowledging the global demand for leather products and the growing shift toward sustainability. As Chairman of TAK, he recognized the urgency of incorporating eco-tanning practices into the industry.



Mr. Njoka's speech centered on two key aspects. Firstly, he discussed the international leather industry, highlighting that while it's a complex global ecosystem, some developed countries have been reluctant to address the environmental impact of leather production. In contrast, developing nations like Kenya have often shouldered these environmental burdens to cut production costs. However, Mr. Njoka stressed that this approach ultimately leads to environmental degradation, threatening the industry's sustainability.

He then underscored the growing global demand for leather and the increasing awareness of clean leather production technology. He viewed this as an opportunity for Kenya and other developing nations to enhance their competitiveness while securing a larger share of the global market. Sustainability, he

emphasized, was not just a trendy term but a strategic advantage.

“The leather industry is emerging in Kenya; we, however, have a shortage of professionals as we source for technicians to maintain machinery from India,” Mr. Njoka noted.

He called on learning institutions to redesign their training and research programs to meet the rising demand for professionals and advanced production technology in the leather sector. Mr. Njoka encouraged these institutions to collaborate with industry players to identify critical training needs and contribute to the development of curricula and policies in the industry.

In conclusion, Mr. Njoka urged all leather industry stakeholders to actively embrace sustainable leather production. He emphasized that this wasn't just a moral obligation but an economic imperative. Committing to eco-tanning technologies would not only lead to a cleaner and more environmentally friendly industry but also ensure the industry's continued relevance on the global stage.

Mr. Robert Njoka, the Chairman of the Kenya Tanners Association (TAK), reiterated the importance of sustainable production as a government policy. He emphasized that the discussion on adopting eco-tanning processes in Kenya and the East African region was critical to the industry's future.

B. THEME I: ECO-PRESERVATION OF GREEN HIDES AND SKINS

These presentations in this theme focused on various aspects of sustainable leather production, whereby the participants were appraised on the environmental impact of livestock production, eco-preservation techniques for hides and skins, and salt pollution management along the leather value chain. The common thread in these presentations was the importance of adopting practices that minimize environmental harm while maintaining the quality of hides and skins used in the leather industry.

Current Status of the Livestock Genetic Pools, Distribution and Environmental Impact on the Quality and Size of Hides and Skins and Leather in Kenya and EAC region

Dr. John O. Oloo (PhD, CPM, CCM), a senior lecturer in the School of Spatial Planning & Natural Resources Management at Jaramogi Oginga Odinga University of Science & Technology, delivered an online presentation that provided an extensive overview of the Livestock genetic pools, distribution, and their environmental impact on the quality and size of hides and skins in Kenya and the East African Community (EAC) region.

In his presentation, Dr. Oloo emphasized the vital role of rangelands, predominantly located in arid and semi-arid areas, in livestock production and trade dynamics. These rangelands, covering a significant portion of the Earth's land surface, play a crucial role in providing valuable resources such as meat, milk, leather, and wool, primarily through ruminant animals.

The presentation highlighted the intricate relationship between economic and ecological factors within semi-arid grazing regions. Economic returns were found to be closely linked to livestock numbers and the condition of pastures, while ecological resources were shown to be vulnerable to inappropriate utilization. Factors such as shrinking rangelands, increasing pastoralist populations, improved veterinary services, and mismanagement of water resources have contributed to the global growth of animal populations, leading to issues like overgrazing and desertification.

Dr. Oloo also delved into the historical evolution of rangeland conditions, influenced by both natural processes and human activities. Unfortunately, in the latter half of the 20th century, human and livestock impacts on these ecosystems became excessive and detrimental. Vegetation loss, primarily due to activities such as wood removal and

overgrazing, emerged as the primary cause of rangeland deterioration, despite some limited improvements in certain regions.



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Furthermore, the presentation explored the essential habitat requirements for wildlife and livestock, including access to food, water, shelter, and space. Dr. Oloo highlighted the varying dietary and water needs of different animal species, particularly ruminants like cattle and sheep, which typically consume around 2.5% of their body weight daily.

The presenter also discussed the classification of animals based on their foraging patterns, distinguishing between herbivores, grazers, browsers, intermediate feeders, carnivores, and omnivores. Additionally, the significance of cross-border livestock trade between countries such as Kenya, Ethiopia, and Somalia were highlighted, underscoring its impact on regional economies and livelihoods.

In conclusion, Dr. Oloo's presentation shed light on the critical issues related to livestock genetics, distribution, and their environmental effects, particularly in the context of Kenya and the East African region. The presentation concluded by raising important questions about how various

factors influence the quality of hides and skins in Kenya's leather industry.

The presentation also highlighted research gaps that require attention in improving leather industry:

- To what extent has shrinkage of pastures influence quality of hides and skins in leather industry in Kenya?
- To what extent has global warming and climate change influence the quality of hides and skins in leather industry in Kenya?
- To what extent has ecological or regional characteristics influence quality of hides and skins in leather industry in Kenya?
- To what extent has the concept of cross-breeding of animals influence quality of hides and skins in leather industry in Kenya?
- To what extent has inbreeding of animals influence quality of hides and skins in leather industry in Kenya?
- To what extent has the cross-border trade influenced the quality of leather in Kenya?

Current Eco-preservation Practices of Hides and Skins and their Environmental Challenges

Dr. Richard Oruko Ongon'g, the Assistant Director of Leather Development at the State Department for Livestock Development in Kabete, began by emphasizing that the use of fresh green hides and skins has several cost-saving benefits, reducing expenses associated with preservation, storage, and transportation. Additionally, it eliminates the need for soaking, making it a cost-effective approach. However, due to the fact that these raw materials are often sourced from distant areas, preservation becomes necessary to prevent unexpected putrefaction.

During his presentation, Dr. Ongon'g explored various methods for preserving hides and skins, discussing their advantages and drawbacks within the Kenyan context. Ground drying and air drying of hides and skins, while not requiring expensive equipment setups, result in higher labor costs and greater land requirements. These methods have become less popular because tanners need to use larger volumes of water during soaking to compensate for the moisture lost during drying, leading to increased production costs. Moreover,

these processes have the potential to introduce impurities into the leather, creating more waste and necessitating treatment.





Regarding chilling or freezing of hides and skins, Dr. Ongon'g explained that it is suitable for hides intended for consumption because it involves less water, no use of chemicals, and no total dissolved solids. However, its feasibility is limited by the high initial costs of electricity and installation capacity.

“Eco-preservation techniques need to be aligned to standards at the global level while adopting them to local environment. Hides produced at slaughter house should be also fit for consumption for them to be traded as food products” Dr. Ongon’

Dr. Ongon'g also highlighted organic preservation techniques that involve plant-based curing agents in the form of powders, extracts, or pastes. These methods are advantageous due to the biodegradable nature of the waste products they produce. Some of the curing agents are derived from plants like *Azadirachta indica*, *Tamarindus indica*, *Moringa oleifera*, *Citrus sinensis* peel, *Cassia fistula*, and *Acacia bussei/albida*, among others. Another approach he mentioned is the use of biocides, which employ microbes to inhibit the deterioration of hides. However, this method requires significant capital investment in microorganism culturing and is not commonly applied in the industry.

The most prevalent preservation method in Kenya, as noted by Dr. Ongon'g, is wet and dry salting. This method employs sodium chloride to inhibit bacterial growth. However, it presents challenges in the treatment and disposal of waste generated due to its effects on ecosystems and infrastructure. Dr. Ongon'g stressed the importance of aligning eco-preservation techniques with global standards while adapting them to the local environment. He also emphasized that hides produced at slaughterhouses should be suitable for consumption, underlining the significance of quality control in the leather industry.

Solid salt pollution management along the leather value chain (Preservation salt recovery and recycling)

During his presentation on solid salt pollution management along the leather value chain, Dr. Ndagili, from the School of Chemistry at TUK, commenced by highlighting a significant fact: from 1 tonne of raw hide, only 250 kg of finished leather, the actual product, is obtained. This process generates by-products, including approximately 48m³ of wastewater containing 200 kg of sodium chloride and 2-4 kg of organic salts, all mixed together. He then introduced various methods for recovering salts from the leather production process, with a specific focus on sodium chloride, which is used to preserve raw hide by preventing the growth of microorganisms.



Dr. Ndagili discussed several conventional methods that are currently in practice:

- Reverse osmosis, which can recover up to 80% of the salt used. However, due to the high solubility of NaCl, there is a need for pre-concentration of the wastewater to achieve the necessary levels, after

which the salt is collected as a residue from the evaporation of the reverse osmosis reject.

- Thermal evaporators and multiple effective evaporators, which are effective methods but have limited adoption due to the high cost of equipment and operation.
- Electro-coagulation, a method that involves the use of an electric current to neutralize particles and allow them to coagulate and separate from the water. However, this method can be expensive due to the need for electricity and may require the addition of some chemicals to ensure sufficient coagulation.

Dr. Ndagili then encouraged the adoption of eco-friendly technologies, including:

- Irradiation of hides, which allows for extended storage periods, although it comes with a high cost of equipment installation.
- Green hides, a method where no salt is used, and the dehairing process is achieved through the use of high

concentrations of soaking enzymes. However, this approach requires optimization of the time required for the process and consideration of the costs associated with microbial growth.

- Chilling of hides and skins, a technique

suitable for hides intended for consumption, as it involves minimal water usage and no chemicals. However, its feasibility can be limited by the initial high costs of electricity and installation.

The eco-friendly methods mentioned align with Chemicals Safety and Security programs, which promote environmental safety through the adoption of zero-chemical processes. When chemical usage is unavoidable, Dr. Ndagili suggested using them as sparingly as possible. He also provided an example of combining chemicals like ethylene acetic acid or selecting less hazardous alternatives from various databases, such as the Chemicals Substitution and Alternatives Toolbox (SAAToolbox) by OECD.

Dr. Ndagili encouraged “industry players to share their challenges in forums like this and concluded his presentation by emphasizing that collaboration should extend beyond the conventional curriculum. Field-lab interactions are crucial for optimizing off-the-shelf systems to meet the specific needs of the industry”.

C. THEME II: ECO-TANNING TECHNOLOGIES AND LEATHER MANUFACTURING STRATEGIES

Presentations in this session revolved around the adoption of eco-friendly practices and innovative technologies in various aspects of leather manufacturing, including hair removal, tanning processes, dyeing techniques, and the production of sustainable leather products like footwear. This theme reflects a commitment to environmentally conscious approaches within the leather industry.

Innovative enzymatic removal and recovery of hair from a pelt (Beamhouses processes)

Prof. Paul Shiundu, the Vice Chancellor of the Technical University of Kenya (TUK), commenced the workshop by introducing an innovative study focused on substituting chemicals with locally derived enzymes for the removal and recovery of hair from animal pelts. This initiative stems from the recognition that the East African leather industry has yet to fully realize its economic potential, partly due to environmental pollution and product quality challenges.

In Prof. Shiundu's presentation, it was underscored that these challenges have led to missed opportunities, such as the inexpensive export of raw materials and costly importation of finished leather products, resulting in an unfavorable trade balance. Additionally, valuable bio-renewable resources that could be generated from tannery solid waste have been lost. Prof. Shiundu emphasized the immense economic potential within Kenya's leather industry, citing the current revenue of KES 10 billion and the untapped potential of KES 100 billion.

According to Prof. Shiundu, "biotechnological innovation holds the promise of addressing these challenges related to environmental pollution and subpar leather quality. Our research presents an innovative green technology for de-hairing and descaling hides and skins, utilizing locally isolated enzymes derived from unique microorganisms as a cleaner and more sustainable alternative to conventional chemicals."

The presentation raised a fundamental question: how can the leather industry strike a balance between sustainability and profitability while mitigating environmental pollution? Notably, the de-hairing process emerged as a primary contributor to the pollution load in tannery waste, exceeding 80%. This process also releases noxious gases, leading to the closure of numerous Kenyan tanneries due to their inability to meet environmental standards set by the National Environment Management Authority (NEMA) of Kenya.



The new product, known as the "New Eco-friendly and Clean Method of Processing Hides and Fish Skins into Leather Using Alkaline Protease Enzyme," represents a paradigm shift in eco-friendly technology for leather processing and environmental conservation. While the use of enzymes in hides and skins processing is a global emerging trend, its full exploration and adoption in the region are yet to be realized.



The extracted enzyme solution(left), enzymatic dehairing in process (middle) and recovered hair and scales (right).

The advantages of enzymatic de-hairing and pelt recovery were highlighted during the session, including the production of superior leather, the potential elimination of toxic chemicals used in conventional de-hairing, the generation of biodegradable wastewater treatable through conventional biodegradation methods, and the production of high-quality recovered by-products like hair, wool, scales, fats, and fleshings, suitable for manufacturing various secondary products such as animal feeds, bioplastics, and textile raw materials. Importantly, conventional tannery machinery can be employed in this approach.

Prof. Shiundu concluded by expressing the need for multi-stakeholder collaboration to commercialize their product. This collaboration should involve academia for ongoing research, local tannery industry for pilot testing, financiers for large-scale enzyme production, and investors to bring the innovation to market. The economic significance of leather was emphasized through the saying, 'the value of green leather from any animal is more than the value of its meat and flesh.'



This study was presented as a successful example of academia-industry collaboration, a noteworthy achievement in Kenya. Other researchers involved in this initiative include Prof. F.J. Mulaa and Prof. J.M. Onyari from the University of Nairobi, Dr. W.C. Wanyonyi of the University of Kabianga, and various postgraduate students, along with the now-closed Leather Industries of Kenya (LIK).

Wet-white leather and non-inorganic dyes (tan, crust and leather finishing)



Dr. Arthur Onyuka, the Assistant Principal Research Scientist at the Kenya Industrial Research and Development Institute (KIRDI), began his presentation by introducing KIRDI as the National Industrial Research, Technology, and Innovation Institution. Established in 1979 under the STI Act, Cap 250, Laws of Kenya (currently KIRDI Act 2022), KIRDI is tasked with conducting research and development in industrial and allied technologies. Dr. Onyuka emphasized KIRDI's role in the tanning sector, particularly in the Mechanical & Chemical engineering, Building materials, Food, Textile and Leather Technologies, and Energy and Environmental sustainability areas. He also mentioned that KIRDI operates a leather processing plant on its premises in South C, providing support to SMEs in the leather sector through various means such as research and development, technology transfer, incubation, training, curriculum development, quality control, and fabrication of tanning drums.

Dr. Onyuka then delved into ongoing research areas at KIRDI, which include value-added products from tannery and leather waste, efficient resource utilization in the leather industry, enzyme-based unhairing systems, high-performance waterproof upholstery and garment leather, and the production of value-added exotic leathers.

He proceeded to discuss the prevalent use of Chrome in over 90% of leather production due to its positive effects on leather. Chrome-tanned leather offers durability, stability over a wide temperature range, hydrothermal stability, shorter tanning periods for faster production, versatility for dyeing and embossing, and stability in acidic and alkaline conditions. However, the environmental hazards associated with Chrome, including risks to human and aquatic life, toxic/hazardous solid waste production, non-biodegradability, and high effluent treatment costs, have raised concerns. Consumer pressure and strict regulatory requirements have further intensified scrutiny of its environmental impact.

Dr. Onyuka highlighted the importance of eco-labeling and climate impact assessments for products like leather, which can influence export and import restrictions. He introduced the concept of eco-friendly leather, particularly Wet-white leather, which avoids the use of Chrome in the tanning process, resulting in leather without the characteristic blue color. The presenter introduced various alternative tanning options, including Aluminum, Titanium, and Zirconium salts, Phosphonium salt (THPS), Syntans, Aldehydes (glutaraldehyde derivatives), Oxazolidines, Polyacrylates, and Silica gel (silicon dioxide). These processes often involve a combination of agents, with deliming being a crucial step to maintain a pH level between 3.5 and 5 for Wet-white leather.

While Wet-white leather offers environmental benefits such as reduced chromium effluent discharge, non-hazardous and biodegradable solid waste, lower COD load in effluent, and reduced chloride in effluent discharge (when pickling is omitted), it comes with the drawback of lower thermal stability (75–85°C) compared to wet blue

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(100–110°C), which has somewhat limited its popularity in the industry.

Dr. Onyuka emphasized that many high-end consumers are hesitant to purchase Chrome-tanned

leather products, especially for luxury goods. Industries keen on utilizing Wet-white or crust leather include the automotive sector, upholstery furniture, garment and clothing industry, and footwear manufacturing for shoe uppers.

Non-conventional and innovative leather tanning technologies (Organic tanning)

Mr. Newton Owino, the Director of Alisam Products Development and Design, Kisumu, provided an overview of his registered mini tannery specializing in exotic leather, including fish leather, rabbit, and chicken. He began by highlighting the significant issue of fish waste in Kisumu, with approximately 9 fish filleting industries generating around 150,000 metric tonnes of waste annually, 80% of which is fish skin. These industries, located near Kisumu airport, posed problems as scavenger birds flying near the ground could interfere with aircraft taking off and landing. Alisam was established to address this waste management challenge and specializes in tanning fish skin, chicken skin, and rabbit fur.

Mr. Owino explained the tanning process as a series of steps involved in converting animal hides/skins into finished leather. It involves the reaction of collagen fibers in the hide/skin with tannins or other agents. He introduced non-conventional tanning techniques, often referred to as Sustainable Green Tanning Technologies (SGTT), which utilize tannins naturally found in the bark and leaves of various plants. These eco-friendly methods result in the release of fewer pollutants into the environment.

Tannins, water-soluble phenolic compounds, are essential for converting skins/hides into leather. Hydrolysable tannins, found in dicotyledonous plants like cassava, sumach, myrabolans, or chestnuts, are suitable for producing light leather. On the other hand, condensed tannins, the most common type found in almost all plant families, including banana, mimosa, quebracho, and cassava, are suitable for heavy leather. Mr. Owino explained that methods like High-Pressure Liquid Chromatography (HPLC), Mass Spectrophotometer, and Circular Dichroism are employed to determine the tannin content in plants. He provided average tannin content figures for cassava as hydrocyanic acid and banana

extracts as phenolic acids, which were comparable to usable levels of tannin in chrome salts.



He went on to describe SGTT as a two-step process involving penetration (the diffusion of tannins into the skin) and fixing (making the penetrated tannins bind with collagen to form a stable material). These processes are influenced by factors such as pH, temperature, and acid and salt content in the tanning liquor.

Mr. Owino explained that at Alisam, tanning is determined by export market restrictions they serve. They aim to minimize environmental impact by avoiding the use of salts as much as possible. The preservation process involves using an ash

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solution to render the skin temporarily imputrescible, and soaking is done using only water for washing and rehydration. Bating involves introducing papain to remove proteins and soften the pelt. Pickling is achieved using strong natural acids, particularly from citrus plants, to lower the pH value. Depickling is done using natural alkaline materials to raise the pH out of the acidic region. Finally, tanning utilizes plant-based tannins to produce strong, flexible leather that resists decay and spoilage. With banana and cassava extractive tanning agents, they could produce leather sheets

with specific thickness, softness, tear strength, tensile strength, and elongation.

Mr. Owino concluded his presentation by highlighting the benefits of organic leather tanning, including being eco-friendly, more durable, easier to care for than regular leather, resistant to staining, and cost-effective. He also emphasized the use of locally available plants as tannin sources to avoid increasing production costs and acknowledged the extensive consultation they undertook, notably with KIRDI (Kenya Industrial Research and Development Institute).

Eco-sustainable Footwear Technology and Leather Products Manufacturing

Mr. John Otieno Okumu, Manager of Promotions and Marketing at the Kenya Leather Development Council (KLDC), addressed the crucial concept of eco-sustainability within leather-based industries. He emphasized the importance of balancing the production of leather goods with environmental considerations and ethical principles. An essential aspect of achieving eco-sustainability is recycling leather scraps, which can significantly reduce waste and the industry's environmental impact.

Mr. Okumu explained the recycling process, which involves shredding leather scraps and combining them with a polyurethane binder to create a sheet-like structure. Coating this structure with polyurethane provides it with the appearance of genuine leather. This innovative technique not only minimizes waste but also offers an alternative to traditional leather production methods that can have detrimental environmental effects.

He discussed two prominent types of recycled leather: Bonded leather and Bicast Leather. Bonded leather, also referred to as reconstituted leather, is created by mixing shredded leather fibers with natural rubber or a polyurethane binder to form a layered structure. While it may not possess all the qualities of untreated leather, it still serves a purpose in products such as fashion accessories and home decor. Bicast leather, on the other hand, consists of a split leather backing covered with an embossed layer of polyurethane or vinyl. Originally developed for glossy shoes in the apparel industry, bicast

leather later found applications in the furniture industry.



Mr. Okumu acknowledged that while recycled leather contributes to eco-sustainability, it may not match the durability and resilience of genuine leather. It might be more susceptible to issues like cracking, peeling, stains, and water damage.

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Therefore, its application is better suited for items where these limitations are not a hindrance.

His presentation highlighted a promising pathway for the leather industry to align its practices with

environmental preservation. By recycling leather scraps and offering innovative alternatives like bonded leather, the industry can play a pivotal role in shaping a more sustainable future.



Leather scraps



Bonded leather



Bicast leather

D. THEME III: CIRCULAR ECONOMY OF TANNERY WASTES MANAGEMENT/ MODERNIZATION OF TANNERY MACHINERY

Presentations in this theme highlighted the potential innovations from academia adopting circular economy principles, reducing waste, and modernizing practices to align with environmental sustainability and efficiency within the leather industry.

Enzymatic Degradation of Hair Wastes from Tannery Industries Effluent



Dr. Arthur Onyuka, an Assistant Principal Research Scientist at KIRDI, discussed the challenges posed by various processes in the leather industry, particularly emphasizing the environmental issues associated with liming. Liming is a significant contributor to pollution in the industry and has led to many Kenyan tanneries facing closure or requiring improvements. During the liming process,

contaminants such as biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved solids (DS), soluble solids (SS), Organic N, $\text{NH}_3\text{-N}$, alkalinity, and sulfide are released into liquid waste streams, while solid waste, including hair, lime, and organic matter, is generated as sludge. Gaseous emissions, including hydrogen sulfide (H_2S), are also a concern.

Dr. Onyuka highlighted alternative methods in the industry that aim to reduce the environmental impact, particularly in the dehairing process. These processes utilize enzymes and other techniques to save hair and prevent it from entering the effluent. Some methods mentioned include immunization (using substances like Sirolime/Blair-hair), painting, enzyme-assisted chemical unhairing, and solo enzyme unhairing, which employs the enzyme Dispase. Dispase is a mixture of proteolytic enzymes that target the hair's base, causing it to loosen and fall out of the follicle. While these methods can recover approximately 5-10% of hair, they offer several benefits, such as reducing the environmental costs associated with effluent

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treatment, decreasing the organic load in wastewater, and potentially generating income from the sale of recovered hair.

Dr. Onyuka also discussed the valuable nitrogen content in hair, which can reach up to 15% with a high C:N ratio of 30-35:1, making it suitable for use as a soil amendment. He highlighted his research on composting removed hair, including optimization techniques and the utilization of the enzyme Keratinase. Keratinase can break down

hair without complete dissolution, leading to the production of an effective, stable, slow-release fertilizer that is environmentally safe, cost-effective, and adaptable within tannery infrastructure.

In conclusion, Dr. Onyuka emphasized the significant role of the leather sector in the livestock industry, contributing to economic growth, employment opportunities, and livelihood support.

Microbial recovery of Lime from beamhouse effluent

Dr. George Okwadha, a Senior Lecturer in Water and Environmental Engineering at TUK, opened his presentation by emphasizing the critical need for appropriate and efficient waste management practices to achieve sustainable manufacturing. He highlighted that converting waste into valuable products is a key strategy in this regard, as it leads to cost savings and positively impacts business operations. Dr. Okwadha specifically focused on the recovery of lime, a crucial component widely used in leather tanning facilities, with the added benefit of being able to transform recovered lime into coast calcium, a material used in the building industry for plastering, reducing the need for paint.

Dr. Okwadha emphasized the principle that "waste is only waste if it is wasted"



The lime recovery and recycling process discussed by Dr. Okwadha centered around the utilization of non-pathogenic facultative bacteria known as

Microbial Carbonate Precipitation (MCP). He explained that MCP can be achieved through various pathways:

- Aquatic environments: Algae and cyanobacteria, during photosynthesis, utilize dissolved CO₂, triggering a series of reactions leading to the precipitation of CaCO₃ in calcium-rich environments.
- Sulfate reduction: Heterotrophic organisms can induce MCP by reducing sulfate, with bacterial cell surfaces removing divalent cations. In anaerobic environments, sulfate-reducing bacteria (SRB) reduce sulfate to H₂S, releasing HCO₃⁻ ions. When hydrogen sulfide degasses, pH increases, promoting CaCO₃ precipitation.
- Urea hydrolysis: Ureolytic bacteria such as *Sporosarcina* (*Bacillus*) *pasteurii*/*Bacillus sphaericus* are alkalophilic, facultative, non-pathogenic bacteria. They utilize the urease enzyme to hydrolyze urea, producing NH₃ and CO₂, leading to a rise in pH in the presence of Ca²⁺ ions, resulting in CaCO₃ precipitation.

Dr. Okwadha highlighted that the recovered lime can be cleaned, dried, and reused, resulting in both economic savings and environmental sustainability. He concluded by stating that the process is ready for adoption at facilities if tanners provide ponds for a pilot study.

Recycling of chrome trimmings & shavings leather wastes to make fertilizer



Dr. Joel Mwendu, Ph.D., a senior lecturer at the Leather Department of the University of Nairobi, commenced his presentation on the recycling of leather waste to produce fertilizer by addressing the issue of substantial quantities of chromium III-contaminated solid waste generated during the leather tanning process. He underscored that a medium-sized tannery can produce an average of 8.5 tons per day of leather waste. Dr. Mwendu pointed out the limitations of traditional methods

of tannery solid waste disposal, namely landfilling and open dumping. These methods not only contribute to increased environmental pollution but also face challenges related to the availability and cost of land.

Dr. Mwendu's presentation drew upon six major tanneries in Kenya as examples, revealing that the predominant methods of tannery waste disposal in the country involve landfilling and open dumping, with no significant recycling or waste reuse practices in place.

“Clean tanning technologies have been recommended as a chrome substitute, but chrome tanning cannot be wished away since it remains the most common method of producing leather. This presentation describes a sustainable and environmentally sound technology for dechroming and modifying chrome leather waste to form fertilizer” stated Dr Joel Mwendu, Ph.D.

He then proceeded to describe a sustainable and environmentally friendly technology for dechroming and modifying chrome leather waste to create fertilizer. The steps involved in this process included sample preparation and characterization, detanning of chrome tannery waste using pure lime mixed with water, chromium extraction using formic acid, hydrolysis and modification of dechromed waste using orthophosphoric acid and epichlorohydrin (EPICH), dewatering, and the formulation of the new organic fertilizer by blending the EPICH-modified collagenic material with shredded maize cobs.

The presentation highlighted the nutrient content of the resulting organic fertilizer, emphasizing that the EPICH-modified fertilizer exhibited higher concentrations of nitrogen, phosphorus, magnesium, and calcium compared to the unmodified fertilizer. Dr. Mwendu also shared that when tested on vegetables, the new fertilizer yielded the best results, underscoring its potential as a sustainable and effective solution for managing leather waste while producing valuable agricultural fertilizer.

Nutrient content of the new organic fertilizer: unmodified, EPICH modified, and the filler

Type of nutrient	unmodified collagen hydrolysate	Modified collagen hydrolysate	Filler
Total N (%)	35	44	2.8
Available P (% P2O5)	8.27	21.02	14.04
Exchangeable K (% K2O)	0.25	0.1	0.3
Mg	0.002	0.2	7.5
Ca	0.03	1.8	1.6
TOC (%)	22.15	27.0	38.12
C:N ratio	0.47	0.61	13.61
pH	6.79	6.79	6.76

Bioremediation of chromium effluent and biogas generation



Dr. Henry JO Ogola, a senior lecturer from the School of Food and Agricultural Sciences at JOOUST, commenced his presentation by emphasizing the significance of managing chrome liquor derived from tannery waste due to the potential health and environmental risks it poses.

He underscored that while no single process can comprehensively address this issue, it is imperative to explore various environmentally friendly methods to mitigate the hazardous nature of these wastes. Dr. Ogola's research focused on evaluating the impact of mixing donkey dung with chrome liquor as a potential solution.

The investigations were conducted in a batch setup, using 500 mL anaerobic digestion glass bioreactors. Samples were collected at various intervals (days 0, 7, 14, 21, and 30), and their physico-chemical and biological characteristics were analyzed. The study compared chrome liquor from two different facilities—one in South Africa, which incorporated aspects of tannery effluent recycling, and one in Kenya without recycling.

The research findings indicated that the optimal conditions for chromium reduction in terms of hydraulic time, pH, and organic load were observed between 7 to 14 days, at an acidic pH range of 3.8 to 5.0, and with an organic load of 15 g. Dr. Ogola suggested further research to refine these optimal conditions. The results demonstrated the potential of anaerobic bacteria found in donkey dung and tannery effluent to effectively reduce high levels of total tannery chromium effluents and generate biogas in Sub-Saharan Africa.

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Both samples exhibited fermentation and digestion processes, with a notable decrease in pH influencing the dominance of the latter. By day 21, there was up to a 99% reduction in total chromium levels in samples supplemented with donkey dung, compared to only a 60% reduction in control samples by the end of the experiment. Hexavalent chromium levels dropped to zero in all relevant samples by the 7th day of the experiment. However, the addition of donkey dung led to an exponential increase in Cr (VI) while total Cr levels decreased by day 30 in both bioreactors.

Additionally, higher supplementation of donkey dung resulted in greater methane potential.

“Anaerobic digestion can effectively alter the chromium levels in the dung” stated Dr. Ogola

Dr. Ogola recommended further research to characterize the substrate and digestate to determine the prevalence of chromium (III) and chromium (VI), underscoring the potential effectiveness of anaerobic digestion in altering chromium levels in dung.

Sustainable modernization and upgrading of tanning machinery and integration renewable energy in leather industry

Mr. Moses Nyang’au, Assistant Lecturer, Department of Manufacturing and Mechanical Engineering, began his presentation by informing the workshop participants about a fact-finding visit conducted on May 25, 2023, by a team from select departments at the Technical University of Kenya (TUK). This visit was part of a collaborative effort between TUK, the State Department of Livestock Development (SDL), the Tanners Association of Kenya (TAK), and the United Nations Conference on Trade and Development (UNCTAD). The primary objective of this mission was to gain a deeper understanding of industry practices and the various challenges faced by leather processing facilities. Additionally, it aimed to identify potential opportunities for collaboration and partnership between the educational institution and the leather industry.

Teaching Factory (CEI&TF) at TUK and the leather processing factories.



Mr. Nyang’au expressed his appreciation for the hospitality and valuable insights provided by the visited facilities, which included Reddamac Leather Centre, Aziz Tanneries Ltd, and United Tanneries Ltd. He noted that specific reports were prepared for each of these companies and shared accordingly. Across all the facilities, he stressed the importance of adopting standard operating procedures and industry best practices to streamline operations and minimize waste generation. Furthermore, he provided a summary of the general observations made during the visits and highlighted potential areas of collaboration between the Centre for Engineering Innovation and

Mr. Nyang’au emphasized that TUK possesses the necessary capacity and willingness to collaborate with the industry, particularly in the areas of mechanical and electrical engineering equipment maintenance. He identified various solutions for common issues faced by the industry, such as addressing rust on metallic equipment and addressing maintenance needs for various machinery components. He highlighted that CEI&TF is equipped with state-of-the-art equipment capable of designing and manufacturing solutions for these problems, reducing the need for importing spare parts from other countries.

“TUK is an institution of Education and Training for the Real World! That is why we have a teaching factory as a full-fledged directorate” – Mr. Nyang’au

Recognizing the need for advanced research in the leather industry, Mr. Nyang’au called for government and development partner support, both technically and financially, to ensure the sustainability of the sector. He emphasized that such support would lead to cost reduction, increased productivity, enhanced skills development, and improved overall health outcomes. He also pointed out the significant

research potential in finding beneficial uses for solid waste generated by these facilities, including applications in fiber products, protein strands, canine feed, and soft boards.

In terms of academia-industry collaboration, Mr. Nyang’au clarified that collaboration doesn't solely entail financial transactions but can also involve allowing TUK students to engage in internships and attachments at these facilities, which would be mutually beneficial.

He concluded his presentation by extending an invitation to the workshop participants to visit the CEI&TF laboratory at TUK, underscoring the institution's commitment to providing education and training for the real world.

E. FIRST FIELD VISIT TO ALPHARAMA - LWG CERTIFIED TANNERY IN KENYA



the various stages of leather production. It was explained that most grade 1 skins and hides are sourced from regions such as Nakuru and Laikipia, primarily from the Kenya highlands. Skins are procured on a per-piece basis, while hides are acquired based on their weight, with poor-quality hides being returned to the suppliers. Inquiring about the specifications of the salt used in the curing process, the participants were informed that Alpharama determines the type of salt based on the size of the salt crystals.

On the first day of the workshop, the participants embarked on a field visit to Alpharama Ltd., a tannery located in Athiriver, Machakos County. Alpharama Ltd. is recognized as one of the certified members of the Leather Working Group (LWG) in Kenya, maintaining this certification continuously since 2013. Furthermore, it stands as a prominent leather producer and exporter within Kenya. This visit offered an invaluable opportunity for the attendees to gain insights into the leather manufacturing process and to explore different types of tannages. Additionally, it provided a chance to learn about the management practices essential for achieving LWG certification.

During the visit, the representatives from the tannery guided the workshop participants through



wastewater treatment system where wastewater from different sections is segregated, pre-treated, and eventually combined in an aerated lagoon before disposal. However, the exact volume of wastewater generated per day was not clear, and this was identified as an important parameter for wastewater plant operations. The tannery maintains a water laboratory for quality control of water.



The topic of eco-tanning was raised, and it was clarified that the majority of the leather undergoes chrome tanning. Although a section for vegetable tanning was shown, it was mentioned that this product is still in the developmental stage, tends to be more expensive, and eco-tanned leather is typically produced upon specific orders.

A discussion ensued regarding tannery waste management, with various strategies employed by Alpharama being explained. The tannery has made notable efforts to reuse and recycle waste wherever feasible. For example, salt from the curing section can be returned to the supplier, and beamhouse wastewater is recycled. Offcuts are exported and sold to gelatine manufacturers for use in food products and medicinal purposes, including South Africa. Alpharama also boasts an intricate

Solid waste that cannot be reused is disposed of in approved landfills. While the workshop attendees acknowledged Alpharama's commitment to waste management, concerns were raised about the potential environmental contamination, particularly regarding groundwater, due to landfill leachates. The need for stakeholders to discuss environmentally friendly alternatives was recognized as crucial.

Alpharama representatives proudly displayed samples of a diverse range of their final leather products, suitable for various purposes including shoes, bags, automobiles, and clothing. Participants inquired and were informed that the leather is available not only for export but also for local consumption in Kenya.

Workshop Day 2 Outcomes

A. OPENING REMARKS



During the opening remarks of the second day, Professor Isaac Orina, the Deputy Vice-Chancellor for Research and Technology Development at the Technical University of Kenya (TUK), expressed his gratitude for the opportunity granted to TUK to take a leading role in leather research. He

emphasized that TUK's leadership, particularly in the context of leather research, is focused on developing cutting-edge technologies.

Prof. Orina referred to a presentation by Prof. Shiundu, the Acting Vice-Chancellor of TUK, as an example of how the university's leadership is actively guiding leather research and advancing in this field. He then drew attention to the statistics of the leather industry, noting that there exists a significant 60% gap in the market that needs to be addressed. He stressed the importance of filling this remaining 40% gap and underscored the necessity for research efforts by various stakeholders. Prof. Orina expressed his satisfaction that TUK is taking the lead in this regard.

Furthermore, Prof. Orina mentioned the ongoing SMEP (Sustainable Manufacturing and Environmental Pollution Program) call for proposals related to leather and tanning industries. He disclosed that a few TUK staff members are actively participating in this initiative and expressed hope that the university would be able to advance its research further should their proposals be successful.

In conclusion, Prof. Orina officially inaugurated the workshop's second day and assured the attendees that TUK is fully committed to collaborating with academic staff, other stakeholders, and government sectors to drive advancements in leather technology and harness the economic potential associated with the leather industry in the country.

B. THEME IV: Governance and regulations for Tanneries

Presentation in this session covered various aspects of governance and regulations related to the tannery industry and leather trade in Kenya, focusing on sustainability, environmental protection, safety, standards, and renewable energy adoption.

Kenya Revenue Authority (KRA) – Tax incentives for sustainable leather tanning, manufacturing or recycling (Green Technology) industries.

In her presentation, Ms. Grace Lekasi, Customs Department (KRA), provided a comprehensive overview of the Kenya Revenue Authority (KRA) and its significant role in national development. She acknowledged the privilege granted to the Technical University of Kenya (TUK) to lead research efforts in the leather sector and the valuable partnership between KRA, TUK, the State Department of Livestock Development (SDL), Tanners Association of Kenya (TAK), and the United Nations Conference on Trade and Development (UNCTAD).



Ms. Lekasi detailed the structure of KRA, which was established in 1995 under the Ministry of Finance, comprising eight departments with distinct responsibilities and hierarchical structures. She emphasized that KRA's contributions to national development can be categorized into four pillars:

- ✓ Domestic Resource Mobilization (DRM): Ms. Lekasi underscored the significance of tax collection in Kenya's development. KRA is entrusted with the duty of collecting taxes across various sectors while adhering to the legal framework.
- ✓ Border Management: Enhancing border security and curbing illicit trade are pivotal

aspects of KRA's mandate. Strengthening security at border stations is vital for safeguarding national interests.

- ✓ Trade Facilitation: Simplifying customs processes to encourage business activities and enhance the ease of doing business in Kenya is a key focus for KRA, as it directly contributes to economic growth.
- ✓ Ease of Doing Business: Streamlining taxation procedures and expediting VAT refunds, particularly for exporting firms, is vital to support economic activities and business liquidity.

Ms. Lekasi highlighted the Customs & Border Control Department's critical role within KRA, encompassing several key responsibilities:

- ✓ Collecting and Accounting for Government Revenue: The department's core function involves collecting and accounting for various sources of government revenue, including import duty, excise duty, VAT on imports, and agency revenue.
- ✓ Trade Facilitation: Beyond revenue collection, the department actively promotes economic interests and trade development by simplifying customs processes.
- ✓ National Security: Enforcing prohibitions and restrictions is essential for safeguarding national security interests.
- ✓ Protection of Society: Protecting domestic industry and ensuring the health and safety of citizens are paramount.

Ms. Lekasi provided insights into the legal provisions governing the leather trade, referencing pertinent acts and regulations such as the East African Community Customs Management Act (2004) and the East African Community Common External Tariff (EAC CET 2022).

Regarding the taxation of hides and skins, Ms. Lekasi explained the government's policy shift, which had initially increased export duty from 40% to 80% with the aim of promoting local value addition and protecting domestic markets.

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However, this policy led to a decline in exports. In 2023, the Finance Act reduced export duty to 50% or \$0.32/kg, whichever is higher.

Ms. Lekasi also emphasized the various tax incentives available to the leather industry, including green channeling for compliant traders, special economic zones (SEZs) with capital expenditure deductions and reduced corporate tax rates, exemptions on dividends, inputs/raw materials, profit/gains, and remission on import duty rates for raw materials.

The presentation delved into the Customs & Border Control Department's vital trade facilitation initiatives, such as exports management, process automation, compliance with rules of origin, the utilization of bonded warehouses, and the implementation of the Authorized Economic Operator (AEO) program. Additionally, Ms. Lekasi highlighted taxpayer services (TPS) and the promotion of special economic zones (SEZs) to attract investments, foster technology development, and promote regional industrialization.

She concluded by stating, "These efforts put in place by the KRA align with Kenya's commitment to sustainable growth, economic development, and environmental responsibility."

In conclusion, Ms. Grace Lekasi conveyed a comprehensive understanding of KRA's role and the Customs & Border Control Department's

initiatives, emphasizing their significant contributions to revenue collection, trade facilitation, and national development.

During the Q&A session following Ms. Grace Lekasi's presentation, three key issues emerged for discussion:

- **Stakeholder Engagement in Tax Setting:** Attendees raised questions regarding the extent of stakeholder engagement when setting taxes in the leather industry. It was clarified that while KRA does not directly set tax rates, it does contribute by providing statistics on the impact of various tax regimes, such as the volume of product available in the country and the effects of tax changes. These statistics are submitted to the Ministry of Finance and debated in parliament. Once tax rates are established, KRA is responsible for implementation.
- **Weekly Stakeholder Meetings:** Attendees learned about KRA's weekly stakeholder meetings, which include investors and traders in the leather sector. These meetings have fostered productive engagement in the past 1.5 years, with traders becoming well-informed about the basis for taxation of leather goods. Traders are now more proactive in seeking information, such as product classification, to avoid penalties.
- **Success of Tax on Raw Hides and Skins:** The effectiveness of the tax on raw hides and skins in promoting internal manufacturing of leather and leather

Sustainable Manufacture of Leather, Environment Protection and Management of Tanneries

Mr. David Ong'are, Director of Compliance, Enforcement & Field Operations at the National Environment Management Authority of Kenya (NEMA), commenced his presentation by addressing the significant issue of tannery closures in Kenya due to noncompliance with NEMA's waste

disposal standards. A focal point of concern, as he articulated, is the absence of acceptable effluent treatment plants (ETP). According to the presentation, NEMA holds the responsibility of ensuring sustainable discharge of tannery effluents and the proper disposal of sludge and solid waste within the country.



“Tannery effluent disposal is a huge challenge because NEMA is in the middle of the leather industry (tanners) and the public. NEMA may seem to frustrate the development of tanneries by enforcing related policies and regulations while at the same time, they receive many complaints from the public especially due to the smell from tanneries” - Mr David Ong’are

Mr. David Ong’are stressed the importance of considering sustainable tannery effluent disposal as a collective responsibility involving all stakeholders:

- ✓ The leather industry should take proactive steps to enhance the industry's image.
- ✓ The leather sector might establish a working group with the aim of self-regulation. Membership in this group would necessitate adherence to the required regulations.

- ✓ County governments should invest in environmentally friendly zoning plans, with tanners complying with these plans.
- ✓ According to Kenya's 2010 constitution, everyone has the right to a healthy and clean environment, and NEMA is tasked with enforcing this right, including issuing licenses.
- ✓ Tanners should conduct environmental impact assessments (EIAs) and environmental assessments (EAs) to ensure environmental safety both during a tannery's operations and post-decommissioning.
- ✓ It is imperative for players in the leather industry to be well-versed in relevant policies and regulations and adhere to them.
- ✓ There is a need to raise awareness about environmentally friendly practices within the leather industry.
- ✓ Operationalizing Technical Packaging (Tec Pac) schemes.
- ✓ Encouraging honest dialogue between tanners and NEMA; if dialogue fails, NEMA must enforce the law.

During the Q&A session following Mr. Ong’are's presentation, several key points were raised:

1. **Minimum Land Requirement:** A question arose regarding regulations specifying the minimum land requirement for establishing a tannery. It was clarified that there is no specific law regarding this, allowing investors to install facilities of varying capacities as long as they comply with existing regulations.
2. **Centralization of NEMA Services:** Centralization of NEMA services was mentioned as a challenge for new investors seeking approvals and certification. It was noted that NEMA has taken steps to address this by establishing offices in all 47 counties in Kenya. Additionally, investors can seek information and consultations through NEMA's website.
3. **Tannery Closures:** The mass closure of tanneries in the past was deemed a regrettable decision by NEMA, leading to significant job losses. Presently, NEMA is engaged in dialogues with tanners, seen

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as a positive step in the right direction. These dialogues are expected to involve full disclosure, including compliance plans and improvement orders.

4. **Benchmarking with Other Countries:** The importance of benchmarking with other developing countries like Ethiopia and Bangladesh, which have succeeded in the import-export deficit, was emphasized. Such benchmarking can provide valuable insights into best practices for NEMA and other government agencies. It could guide tanners in addressing compliance issues towards improvement.
5. **Public Sensitization:** Sensitization of the government and the public was identified

as a necessary step to shift the mindset from viewing leather factories as criminals to recognizing that the processing areas/zones may have the natural smell of leather.

6. **Zonation Planning:** Developing and adhering to zoning or special planning was proposed to ensure that tanneries are situated appropriately, reducing conflicts between the public, NEMA, and tanners.
7. **Balancing Sustainable Development:** Achieving sustainable development was acknowledged as a complex endeavor, requiring a balance between public and industry support.

Sustainable Occupational Safety and Health Management in tanneries

Dr. Andrew Muruka, the Deputy Director and Head of the National Institute for Occupational Safety and Health (NEMA), began his presentation by shedding light on the extensive scope of Occupational Safety and Health (OSH) regulations in Kenya. These regulations are guided by ratified ILO conventions, the National Occupational Safety and Health Policy of 2012, the Constitution of Kenya of 2010, the OSH Act of 2007, the Work Injury Benefits Act of 2007, and around 15 other subsidiary legislations. These legislations place obligations on employers to register workplaces with the authority, ensure the safety, health, and welfare of all employees, protect non-employees from health and safety risks, conduct appropriate risk assessments, and take immediate measures to halt any operation or activity posing significant and serious safety or health risks and evacuate individuals from danger.

Dr. Muruka outlined specific considerations for manufacturing facilities, including:

- **Fire Safety:** Workplaces are mandated to establish fire assembly points, conduct annual fire safety audits, designate a fire safety team, and strategically place firefighting equipment within the facility. Additionally, the facility should maintain a minimum of 10,000 liters of water and conduct yearly fire drills.
- **First Aid:** Establishing first aid protocols, including the availability of first aid kits, informative leaflets, and training for first

aiders through DOSHS-approved training institutions.



- **Safety and Health Audits:** Conducting safety and health audits every 12 months by approved safety and health advisors.

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- **Environmental Monitoring:** Regular monitoring of air quality and noise levels every 12 months.
- **Welfare Facilities:** Providing essential welfare facilities such as a consistent supply of quality drinking water, washing facilities, appropriate clothing accommodations, seating facilities, personal protective clothing, and appliances.
- **Safety and Health Policy Statement:** Developing a comprehensive Safety and Health Policy Statement and effectively communicating it to all employees.

Dr. Muruka also provided guidance on procedures to follow in the event of workplace accidents or occupational diseases. All such incidents, whether non-fatal or fatal, must be reported to the Directorate of Occupational Safety and Health Services (DOSHS) within 7 days and 24 hours, respectively. Employers are required to provide information, instruction, training, and supervision necessary to ensure the safety and health of all employees. Workplaces with 20 or more employees must establish a health and safety committee, ensuring equal representation from both management and workers, with the management side including the occupier or their appointed representative, and worker representatives selected by the workers, considering gender and departmental balance.

Dr. Muruka acknowledged that the leather industry presents significant occupational safety and health challenges, particularly concerning waste

materials. Particulate matter dust (<10 µm), leather fibers (30–1200 µm), and effluents, which contain various chemicals including heavy metals, acids, and dyes, are major concerns in the industry. Dr. Muruka went on to discuss specific hazards in the tannery sector, categorizing them into accident hazards, physical hazards, chemical hazards, biological hazards, and ergonomic hazards.

In terms of occupational diseases, Dr. Muruka highlighted that the International Agency for Research on Cancer (IARC) has classified wastes from leather industries as human carcinogens, leading to various cancers. He provided insights into potential chemical hazards linked to specific cancers, emphasizing the need for strict chemical management practices.

Dr. Muruka outlined obstacles faced by companies in chemical management, including a lack of information about the quality, quantity, characteristics, and hazards of chemicals, low-quality or inadequate characteristics of purchased chemicals, poor labeling, limited resources, a lack of systematic organizational procedures and documentation, and insufficient priority and responsibility given to managing chemicals.

In closing, Dr. Muruka emphasized that sustainable OSH management in tanneries should be guided by a competent person, adhering to the Guidelines on Occupational Safety and Health Management Systems (ILO OSH 2001) and ISO 45001. Continuous improvement of facility policies should be achieved through the adoption of the Deming cycle, which comprises planning, doing, checking, and acting.

Standards in Leather goods trade: The role of Kenya Bureau of Standards (KEBS)

Mr. Elisha Kogo, who represented the Kenya Bureau of Standards (KEBS), delivered an informative presentation outlining the role of KEBS in ensuring product quality and safety in Kenya. He covered topics such as the hierarchy of standards and the certification process.

Mr. Kogo explained the hierarchy of standards, emphasizing their significance in maintaining product quality and safety:

- ✓ **International Standards (ISO):** These standards are globally recognized and accepted across borders and industries. They provide a universal framework for ensuring quality and safety.
- ✓ **Regional Standards (EAC and African):** Regional standards are tailored to specific geographical areas, such as the East African Community (EAC) and the African continent. They address the unique needs and challenges of these regions.
- ✓ **National Standards:** National standards are established and enforced at the country level, ensuring that products within Kenya meet specific quality and safety requirements.

“KEBS plays a critical role in maintaining and enhancing product quality and safety within Kenya. The hierarchy of standards, certification processes, and the development of industry codes of practice all contribute to ensuring that products meet the required standards.” Mr Elisha Kogo

Mr. Kogo also detailed the certification process that products must undergo to meet quality and safety standards:

Product Evaluation and Testing: To obtain certification, products must undergo rigorous evaluation and testing to ensure they meet predefined standards and criteria.

S-Mark: The "S-mark" serves as a certification mark signifying a product's compliance with the necessary quality and safety standards. It is a

requirement for local distribution, assuring consumers that the product is safe and reliable.



Food Fortification (FFLs) - Mr. Kogo highlighted the importance of food fortification, which involves adding essential nutrients to food products to enhance their nutritional content. This practice contributes to improved public health by addressing nutrient deficiencies.

Diamond Mark of Quality - The "Diamond Mark of Quality" represents a high standard of quality for certified products. It symbolizes excellence and reliability for consumers.

Import Standardization Mark - An import standardization mark indicates that imported products comply with specific quality and safety standards, assuring consumers that imported goods meet local requirements.

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Code of Practice for Industry/Tanneries - Mr. Kogo informed the audience that the development of a code of practice for the industry or tanneries is currently underway. This code will outline guidelines and best practices to ensure quality and safety in these sectors.

Involvement of KEBS - Mr. Kogo emphasized KEBS's pivotal role in the development and enforcement of standards within Kenya. The organization ensures that products circulating in the country adhere to national quality and safety requirements.

ISO Membership - Kenya's status as an "O member" of ISO indicates active participation in shaping international standards. This involvement

demonstrates Kenya's commitment to upholding quality and safety standards at the global level.

In conclusion, Mr. Elisha Kogo underscored KEBS's critical role in maintaining and enhancing product quality and safety within Kenya, highlighting the hierarchy of standards, certification processes, and the development of industry codes of practice as key contributors to ensuring product compliance with required standards.

During the Q&A session following Mr. Kogo's presentation, it was clarified that all standards, including Kenya, regional, African, and international standards, are available at the KEBS Library, which is located at the Nairobi headquarters, along Popo Road in South C.

Sustainable use of solar as alternative energy in the tanning Industry



Eng. Nzioka Stephen, Deputy Director of Renewable Energy at the Ministry of Energy and Petroleum, began by emphasizing the critical role that accessible and cost-effective electricity plays in advancing Kenya's socio-economic development. He highlighted two significant challenges: power disruptions during peak hours and steep tariffs, which hinder the desired progress. While acknowledging the absence of a clear policy on

Captive Power, Eng. Nzioka pointed to the use of Energy (Electricity Licensing) Regulations 2012 and mini grid regulations as guiding frameworks for its formulation.

To address issues arising from the installation of Captive Power from non-renewable sources like coal, Eng. Nzioka proposed policy guidelines for the sustainable use of Captive Power. He emphasized

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the importance of licensing regulations and encouraged the adoption of renewable energy sources to enhance environmental integrity, energy security, and economic competitiveness.

Eng. Nzioka also discussed the tanning industry's energy consumption, noting that energy costs typically constitute approximately 3% of a tannery's total expenses. He stressed the potential for sustainable energy sources like solar power to replace fossil fuels, leading to energy savings and a reduced environmental impact.

The integration of renewable energy technologies, particularly solar systems, was presented as an effective strategy for achieving energy efficiency in the tanning process. Eng. Nzioka acknowledged challenges such as the intermittent nature of renewable sources, high initial capital costs, limited suitability for high-energy demand industries, and the need for significant installation space.

In his closing remarks, Eng. Nzioka emphasized the vital importance of sustainable energy practices, especially in industries like tanning, to drive economic growth while minimizing environmental impact. He advocated for clear policies, the integration of renewable energy sources, and innovative solutions to overcome challenges. Eng. Nzioka highlighted the role of experts in guiding the industry toward a more sustainable and energy-efficient future.

During the Q&A session following Eng. Nzioka's presentation, several points were raised and discussed, including concerns about the cost of power in Kenyan tanneries, the use of renewable energy, climate change impacts on power sources like hydropower and geothermal, and challenges associated with geothermal power, including steam depletion, seismic risks, and faulting issues

C. THEME V: TANNERY AUDIT AND CERTIFICATION FOR INTERNATIONAL LEATHER/PRODUCTS TRADE

The session shed light on the pivotal role of organizations like the Leather Working Group in ensuring that tanneries adhere to international standards, fostering responsible and sustainable practices in the leather industry. In addition, it also highlighted the emerging innovations from traditional branding methods to cutting-edge tracking and tracing technologies, that can contribute to the growth and success of this vital sector.

Leather Working Group (LWG), Audit & Certification

Mr. Stuart Cranfield, Director of standards and assurance, Leather Working Group (LWG, who brings 37.5 years of experience in the textiles, leather, and synthetic leather industry delivered an enlightening online presentation on the LWG and the certification process. He began by introducing the LWG, an international non-profit initiative established in 2005 with a mission to promote sustainable and environmentally-friendly leather production. The LWG operates as a collaborative effort between footwear, apparel, and upholstery brands, along with leather manufacturers, to encourage the responsible use of leather.

According to Mr. Stuart's presentation, the LWG has evolved into the world's largest voluntary self-regulation organization within the leather industry, representing over 2000 stakeholders from more

than 60 countries. He emphasized the pivotal role of certification in the development and implementation of credible sustainability systems as a crucial element in global sustainability efforts.

“Voluntary sustainability standards now form the backbone of responsible sourcing practices for companies across the supply chain in most sectors — and are being integrated into legislation as effective instruments to fulfil policy objectives” - Mr Stuart

Mr. Stuart highlighted the significance of voluntary sustainability standards in responsible sourcing

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practices, asserting that they now underpin ethical supply chain management in numerous sectors and are even being incorporated into legislation to fulfill policy objectives. He stressed that LWG

certification offers substantial benefits to suppliers, as evidenced by a survey showing that a substantial portion of the market prefers certified suppliers.

Certification – Brands and retailers



Moving on to the certification process, Mr. Stuart explained that a valuable starting point is a self-assessment using the "Tannery of the Future" tool. This tool enables leather manufacturers to assess the state of their systems, identify areas for improvement, and evaluate their readiness for an LWG audit. He underscored that while this tool is not a substitute for an LWG audit, it can grant a complimentary 2-year membership to the LWG.

The presentation covered various sections of the certification process, including: General Facility Details, Subcontracted Operations, Social Audit, Operating Permits, Production Data, Incoming Material Traceability, Outgoing Material Traceability, Environment Management Systems (EMS), Restricted Substances, Energy Consumption, Water Usage, Air & Noise Emissions, Waste Management, Effluent Treatment, Health, Safety, & Emergency Preparedness, Chemical Management, and Operations Management

Mr. Stuart emphasized the critical importance of ensuring compliance in all sections because failure in any one section results in an overall audit failure.

He noted that each section is scored, and the scorecard, along with the list of all certified suppliers, can be found on the LWG website.

In conclusion, Mr. Stuart highlighted that only independent auditors approved by the LWG are authorized to conduct tannery audits. Those interested in initiating the certification process should contact one of these approved auditors via the LWG website.

During the Q&A session following Mr. Stuart's presentation, several key points were raised:

- Alpharama Limited is currently the only LWG-certified tannery in Kenya.
- While there are currently no auditors based in Africa, the LWG welcomes qualified experts from Africa to apply to become auditors. Information about this process is available on the LWG website.
- Participants inquired about the possibility of capacity building for auditors in the African region, particularly through training programs for African auditors.

From hot iron branding to microchip to satellite linkage-animal industry in Kenya



Dr. David Ojigo, representing the African Leather and Leather Products Institute (ALLIPI), delivered a captivating presentation that delved into the fascinating history of livestock branding in Kenya. He traced its origins to a time before 1907 when cultural norms and values held significant sway. This age-old practice served a multitude of purposes, including dowry payments, compensation procedures, and the facilitation of barter trade. It involved the application of distinct marks using techniques like ear notching and skin cuts, serving as essential tools for quantifying ownership and resolving disputes.

The narrative underwent a transformational shift in 1907 with the introduction of the Branding of Stock Act, a landmark legislation that ushered in national organization and standardization. Dr. Ojigo elaborated on how this legislative stride effectively curbed theft, managed animal movement, and improved breed quality by enabling traceability and source identification for both live animals and their derived products. Interestingly, regional disparities emerged, with the adoption of these practices being more pronounced in the southern regions of the railway line than in the north.

The subsequent years, spanning from 2006 to 2016, witnessed disruptive changes driven by economic factors, including the evolving role of international trade, imperatives for disease control, and concerns related to food safety. Technological innovations such as boluses, microchips, and RFID tags were introduced, revolutionizing the landscape of livestock management. The period from 2017 to the present witnessed even more rapid technological advancements, underpinned by visionary strategies such as the Agricultural Sector Transformation and Growth Strategy (ASTGS) and the Animal Identification and Traceability (ANITRACK) policies. The forces of globalization, with heightened market demands, prompted the integration of advanced technologies to address challenges posed by population growth, food safety standards, environmental preservation, and the impacts of climate change.

Dr. Ojigo emphasized “Technologies like microchips and satellite-linked tracking systems are not only helpful in collecting data but also offer insightful analyses for informed decision-making.”

He underscored the remarkable journey of livestock branding in Kenya, transitioning from traditional cultural practices to seamless technological integration. Dr. Ojigo stressed the wide availability of technology while emphasizing the critical need for effective management and harmonious collaboration between ICT professionals and experts from the animal sector.

Furthermore, he emphasized the necessity for adaptable regulatory frameworks to keep pace with the dynamic technological landscape. The potential benefits are vast, including expanded trade opportunities, increased employment prospects, environmental preservation, and strengthened livestock value chains. Notably, the adoption of technology in the northern regions of the railway line holds tremendous promise for economic advancement, breed enhancement, product characterization, and the sustainable growth of the entire livestock industry.

D. THEME V: MARKETING, EXPORTATION AND AUXILIARY SUPPORT FOR HIDES, SKINS, LEATHER/PRODUCTS TRADE AND INDUSTRIAL GROWTH SUPPORT

Presentations in this theme comprehensively covered various crucial components essential for the growth and prosperity of Kenya's leather industry. It began by examining the complete leather production process, from its inception to processing and eventual distribution, shedding light on the distinct roles assumed by different East African nations. Additionally, it emphasized the significance of effectively marketing and branding hides, skins, and leather products, catering to both local and global consumer bases. The theme also delved into the array of strategies and supportive mechanisms employed to bolster the sales of these products, be it within the nation's borders or beyond. Moreover, it touched upon the crucial advocacy role played by a Policy Lobby Group dedicated to the interests of Leather Tanning and Manufacturing Industries in Kenya. This group champions the cause of these sectors by advocating for favorable policies and regulations that facilitate their growth and development. Lastly, the theme ventured into the International Market for Organic Tanned Leather and Products. It explored the myriad opportunities and challenges associated with exporting organically tanned leather and related items to global markets. This included discussions on market demand, certification requirements, and sustainable practices to ensure success in the international arena.

Leather value chain in the East African Community (EAC)



During the session on the Leather value chain in the East African Community (EAC), Mr. Dennis Osoro, representing the State Department of EAC in the Ministry of EAC, ASALs, and regional development, initiated the discussion by providing insights into the composition and strengths of the EAC, highlighting its potential for trade and investment. The EAC comprises the Republics of Kenya, Burundi, the Democratic Republic of Congo, Rwanda, South Sudan, Uganda, and the United Republic of Tanzania. Mr. Osoro underscored several advantageous factors, including favorable government policies, strategic infrastructure development, abundant raw materials, a sizable market with increasing demand for goods and services, ambitious entrepreneurship, and a consistent focus on human capital development.

Zooming in on the leather value chain, Mr. Osoro elaborated on the numerous opportunities that the EAC offers for the leather industry. He emphasized that the EAC's Industrialization Policy and Strategy (2012-2032) has prioritized the leather value chain with the aim of adding value and diversifying products. Given the region's substantial livestock population, he emphasized the potential for the EAC to move beyond exporting wet blue leather, primarily the output of tanneries, and venture into

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producing finished leather goods for both regional and international markets. Furthermore, Mr. Osoro highlighted the Leather Products Strategy and Implementation roadmap (2020-2030), which seeks to enhance policy coordination within the leather value chain and address industry challenges such as subpar hides and skins, inconsistencies in standards application and enforcement, and the gradual harmonization of standards. He noted ongoing efforts to monitor and track the implementation of action plans related to this strategy.

Mr. Osoro also provided insights into regional trade regimes that facilitate trade and investment in the EAC, including the EAC Common External Tariff (CET), the elimination of Non-Tariff Barriers (NTBs), the EAC Special Economic Zones policy, the EAC Single Customs Territory (SCT), and the establishment of One-Stop Border Posts (OSBPs). He delved into the specific tariffs related to hides and skins, which encompass various stages of application and duty remission.

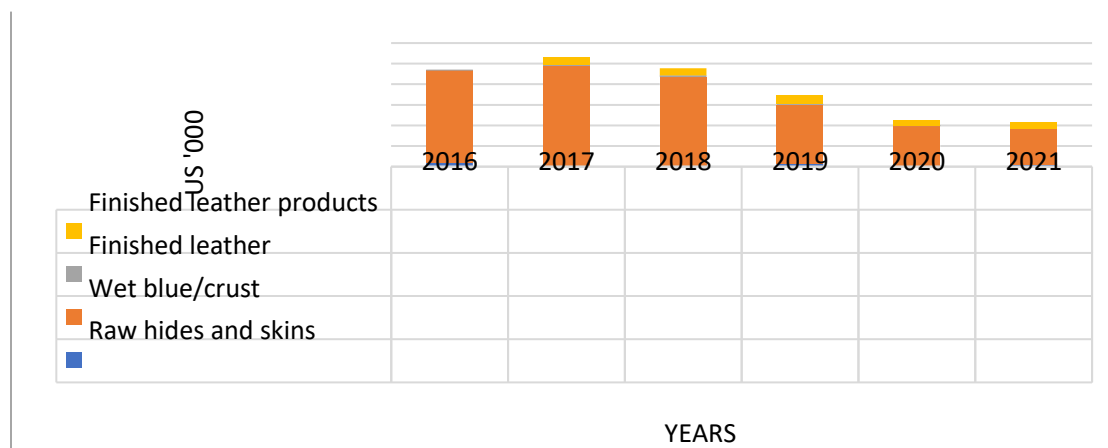
Hides & Skins and leather marketing and export (branding)



Mr. Ken Kamau, from the Kenya Export Promotion & Branding Agency (KEPROBA), kicked off the

discussion with an engaging question: Can you brand leather? The attendees actively shared their perspectives, and a consensus was reached that while you can brand finished leather products, branding the raw leather itself is not feasible. Mr. Kamau then proceeded to elucidate the role and functions of KEPROBA, which extends its services to market the Kenyan brand across various sectors, including the leather industry. He outlined the agency's range of services, encompassing market intelligence, international market development and promotion, product development, export trade information services, advocacy for policy formulation and review, and nation branding.

The session also delved into the trends and performance of leather and leather product exports from Kenya for the period spanning 2016 to 2021. The data revealed that wet blue/crust accounted for the largest share, approximately 87% of total exports on average, while finished leather constituted about 1%. Finished leather products and raw hides and skins made up 9% and 3%, respectively. Additionally, the export of leather goods showed a consistent decline during this period, dropping from around 50 to 20 million USD. Mr. Kamau explained that the country had taken steps to address this decline through the current leather export strategy outlined in the Integrated Natural Export Development and Promotion Strategy (INEDPS). He noted that some finished leather products had surpassed the export targets set by INEDPS for 2022.



Kenya's leather industry exports (2016-2021)

Current leather export strategy INEDPS (2018-2022)

Products	Target 2022 USD million (5% market share of export opportunity)	Current Performance 2022 (USD million)	Export Markets
HS 42 Articles of leather Saddlery and Harness; Travel Goods, Handbags, and Similar Containers, Articles of Animal Gut (Other than Silkworm Gut)	1543	2061	Italy, USA, Germany, UK, Rwanda, Burundi, South Sudan, Belgium, Sweden, France
HS 64 Footwear, Gaiters and the like parts of such articles	2307	24,878	Africa, Uganda, Rwanda, Tanzania, Burundi, DRC, South Sudan, Niger, Somalia

“Kenya has not yet explored other large leather markets like Japan, the Middle East, UAE, and COMESA. The Kenya Kwanza government through the transformative Bottom-up agenda has proposed interventions/activities aimed to increase the export of Kenyan leather products, with a focus on the finished leather products” - Mr. Ken Kamau

He underscored the government's commitment, particularly under the transformative Bottom-up agenda, to implement interventions aimed at boosting the export of Kenyan leather products, with a specific focus on finished leather products.

These planned interventions revolve around sustainable production, advocacy, awareness creation, collaborations, and marketing. Key initiatives include advocating for improved raw material quality, ensuring the sustainability of the leather cluster working group, export awareness programs to enhance production processes and adapt to evolving preferences, global marketing campaigns to raise awareness of Kenyan leather globally, collaboration with global brands for footwear and leather product design and production, developing a Kenya leather brand strategy, facilitating market access through trade agreements, export training, and product adaptation for international markets, creating buyer personas for exported leather products,

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promoting Kenyan leather at international trade fairs and exhibitions, and conducting a comprehensive global market survey of leather and leather products. Mr. Kamau concluded by providing a market research cheat sheet,

emphasizing the importance of understanding buyers, their locations, purchasing habits, preferred channels, timing, frequency, sources, pain points, and identifying Kenya's export-ready companies and their current capacity.

Marketing of leather and leather products support



In the session on Marketing of Leather and Leather Products Support, the presentation was delivered by Ms. Grace Mbugua, representing the Kenya National Chamber of Commerce and Industry (KNCCI). She commenced by underlining the pivotal role that KNCCI plays in fostering the growth of Kenya's leather sector, emphasizing their multifaceted approach. KNCCI's engagement encompasses advocacy, networking, capacity building, facilitation of market access, financial collaborations, research, and public-private partnerships. This holistic strategy reflects KNCCI's dedication to creating an enabling environment for the prosperity of the leather industry.

Ms. Grace Mbugua directed attention to the thriving global leather goods market, projected to reach a substantial value of USD 735 billion by 2032. In this context, she stressed the

significance of comprehending the target audience, taking into account demographics, psychographics, preferences, trends, and pain points. She urged participants to harness effective branding as a means to distinguish themselves and establish trust in terms of quality, two crucial factors within the competitive market landscape.

"Effective branding is what will set you apart in the competitive market pace. Ensure you build and maintain a brand that stands out in quality and keep the consistency for you to win your clientele's trust." Grace Mbugua (KNCCI)

Ms. Grace Mbugua introduced various marketing strategies for the leather industry, highlighting ethical sourcing practices, influencer marketing, and the importance of an online presence. Visibility on platforms such as websites, Instagram, and Facebook, coupled with content marketing to educate customers about leather care, fashion trends, and styling tips, were emphasized. She stressed that customer and client education are pivotal components for creating brand awareness.

Furthermore, Ms. Grace Mbugua underscored the profound impact of the leather sector, including its role in supporting livelihoods, its biodegradability, and its contribution to industrialization. She acknowledged the existing challenges in the sector, including limited investments in publicity, financing constraints, issues related to quality control, and the need for color consistency, all of which require focused attention.

Policy lobby group for leather tanning and manufacturing industries in Kenya



Ms. Miriam Bomett, Deputy Head of Policy, Kenya Association of Manufacturers (KAM) started the session by giving a brief overview of the Kenya Association of Manufacturers (KAM), that it was established in 1959 and serves as a unified voice for the manufacturing and value-added sectors in Kenya. She added that the manufacturing sector significantly contributes to the economy, with immediate impacts and multiplier effects across various sectors. Thus, KAM addresses crucial industrial needs such as policy analysis, trade advocacy, business facilitation services, and business development services.

Ms. Bomett noted that presently, the manufacturing sector contributes 7.8% to GDP, generating Ksh. 1 trillion in value added,

employing 314,000 people, and contributing 18% to national taxes annually. The Manufacturing 20BY30 initiative aims to increase the sector's GDP contribution to 20% by 2030, anticipating substantial impacts, including Ksh. 5 trillion in value added, 1 million jobs, and Ksh. 1 trillion in taxes.

“The goal is to enhance value addition in the leather sector by maximizing the use of locally produced hides and skins, establishing operational tanneries, boosting leather footwear production, increasing employment, and generating significant revenue from exports.” – Ms Biwott (KAM)

Ms. Bomett emphasized that by undertaking extensive research on the various aspects affecting the leather industry, KAM is driven by facts-based decision making as shown by the various reports above in Figure 1 and 2.

Within the Leather Sector, KAM envisions Kenya as a hub for leather value addition in Africa. Currently, despite Africa owning 20% of the global livestock population, it only accounts for 4% of leather production. Proposed interventions in Kenya include restructuring the leather trade, improving hide and skin quality, establishing a Leather Park, curbing unauthorized footwear dumping, implementing data-driven decision-making, enhancing capacity through training, and expanding market accessibility through trade agreements like COMESA¹, AGOA², and AFCTCA³. Ms. Bomett further added that in order to achieve these goals, fiscal measures such as a duty framework, reduced production costs, and improved regulations are crucial. Enhancing the regulatory environment involves supporting livestock farmers and entrepreneurs, investing in effluent treatment plants, focusing on manufacturing, bridging gaps in investment areas, particularly in the soles and uppers, and providing policy review and finalization.

¹ stands for the Common Market for Eastern and Southern Africa

²African Growth and Opportunity Act

³ African Continental Free Trade Area



Figure 1



Figure 2

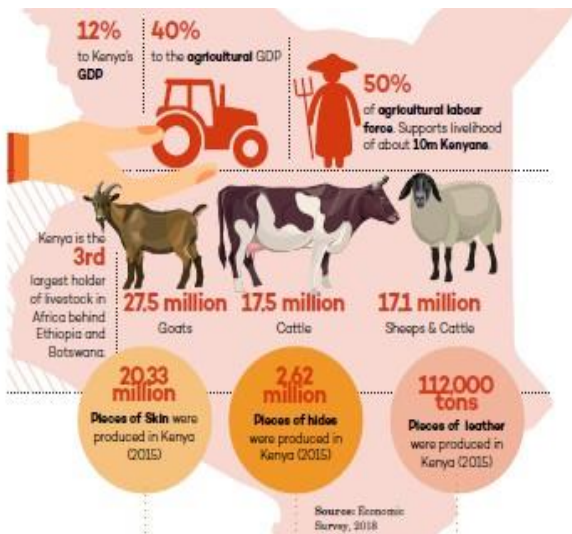
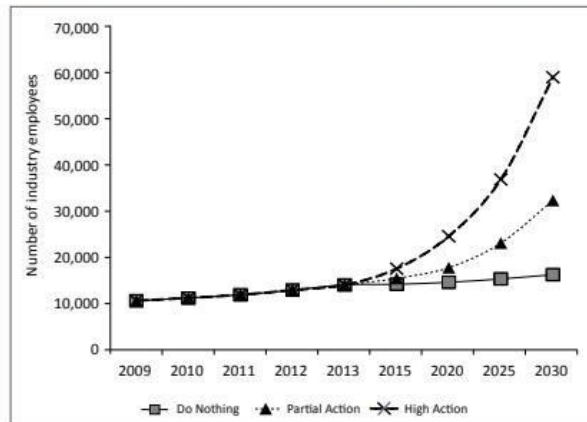


Figure 1: Leather industry employment projections 2015-2030



Source: ETG Projections

Ms. Bomett's closing remarks highlights KAM's efforts in the leather sector as seeking to transform Kenya into a prominent player in leather value addition. That, by addressing various

aspects from quality enhancement to market access, the sector aims to significantly contribute to the economy, generate employment, and position Kenya as a key player in the global leather industry.

International market for organic tanned leather/products



Mr. Newton Owino, the Director of Alisam Products Development and Design, Kisumu, reiterated that green leather can be categorized as leather made from organic-based materials and non-animal-based leather. Organic based leather fabric is made up of 70% renewable materials and provides increased performance as well as environmental protection. Mr. Newton Owino highlighted the key factors for the growth of the organic based leather market to include high demand for renewable and sustainable products, greater environmental sensitivity and awareness on climates impact of products, strong implementation of stringent regulations and standards including the Product Environmental Footprint (PEF) standards being developed by the European Union, several campaigns associated with organic based leather across the world, and increased usage of organic based leather in footwear, furniture, vehicle door panels dashboard, rear self, seat coverings, bags, wallets etc.

The presenter introduced Global Green Leather Alliance, a consortium of 27 green tanning facilities from all over the world established in 2018. The body brings together organic tanners with the aim of linking markets for the organically tanned and enable members access different countries streamlining the standards and protocols of the different countries for export purposes. The group has engaged Polaris, a company based in Costa Rica, for market research and analysis. According to Polaris market research analysis, the market was valued at USD 16530.00 million in 2021 and is expected to reach USD 35952.21 million by 2029. Registering a (Compound Annual Growth Rate) (CAGR) of 10.2% between 2022 – 2029. The market analysis also highlighted critical drivers, strengths, opportunities and challenges for organic leather which Mr. Owino briefly discussed.

Conventional chrome tanning has adverse impacts where 90% of a conventional tannery's overall pollution come from pre-tanning and tanning. Salt, lime sludge, sulphides and acids contaminants in the tanning processes have long been linked to lung cancer. The increased awareness regarding the adverse effect of leather and rising demand for environment-friendly products further boosts the demand for organic-based leather market. Since plant parts are used to make organic-based leather, process by-products are generally safe on the environment and the wastes can be upscaled into something useful without consuming a lot of resources. This niche market also creates a great opportunity for research and development. Initiatives and programs that can raise awareness to the availability of eco-friendly leather, broaden knowledge on appropriate raw materials to use for organic tanning, and the market opportunities are likely to benefit market players.

According to the market analysis research, the sector is not lacking in challenges especially issues associated with processing. Although organic-based leather has been shown to be superior, they still require modern machines for processing to get a leather that is fine and durable to meet the stringent luxury quality standards that clientele request. Furthermore, the chrome tanned leather markets have a substantial client base, posing a

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significant challenge for organic-based leather producers. Large worldwide companies such as H & M, Huga Boss, and Volkswagen are attempting to identify themselves as early adopters of organic-based leather, yet only a few small-scale producers create these products on a wide scale this has limited the potential for large scale adoption.

Mr. Owino concluded by introducing the workshop participants to some of the major players operating on the organic based leather market including Toray industries (Japan), Bolt Threads (USA), Ananas Anam (UK), Modern Meadows (US), Nat – 2 (Germany), My coworkers (US), Ecco Leather (Netherlands), VEGEA (ITALY), ARD (Canada), Flokser A.S (Turkey), Parexel International Corporation (US), and Atlas Hessen Biotech (Germany).

To higher education institutions (H.E.I) Leather Sector of Kenya and Sudan to optimization towards value addition.

In his presentation on higher education institutions (H.E.I) in Kenya and Sudan, Professor (Dr.) Mwinyikione Mwinyihija, formerly the Executive Director of the Africa Leather and Leather Products Institute, focused on the optimization of the leather value chain, emphasizing the need, methods, and economic benefits associated with this process.



In a concise summary, the paper addressed the core issue of optimizing the leather value chain, with a particular emphasis on the significance of hides and skins' quality in leather manufacturing for various applications. Professor Mwinyihija highlighted that the quality of hides and skins can be compromised by factors such as livestock parasites, scratches resulting from husbandry practices, handling during transportation, and suboptimal preservation techniques. Importantly, the paper noted that assessing quality remains a

significant challenge until the removal of air and wool during processing.

Within the tanning subsector, the paper acknowledged the encouraging progress being made in terms of environmental conservation within the leather value chain. It recognized the growing importance of integrating environmental considerations into leather production.

When discussing the industry structure and the value chain, the paper brought attention to the disparity in the economic contributions of key value chain sectors, namely the pre-slaughter, peri-slaughter, and post-slaughter phases. This disparity was a notable issue.

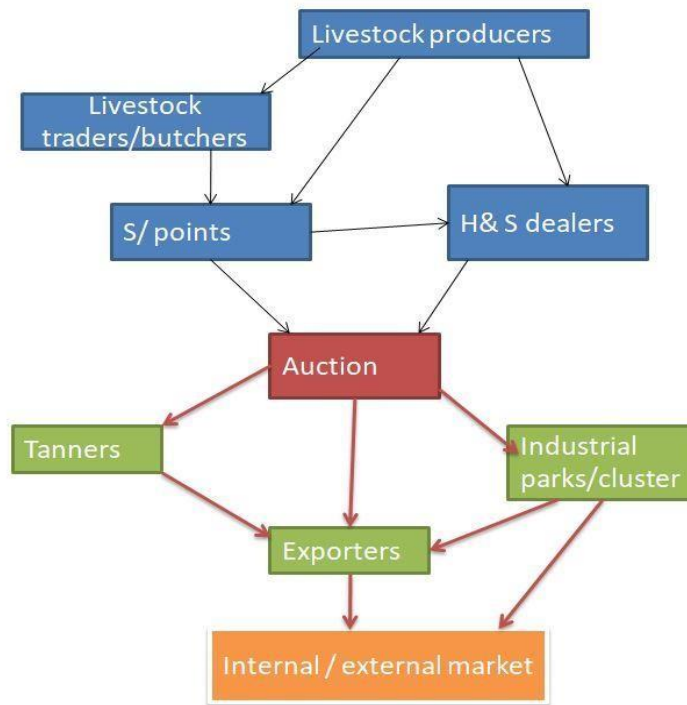
Regarding governance and relationships among the various actors in the leather value chain, the paper highlighted the influence of authority and power dynamics in determining the allocation and flow of financial, material, and human resources. It identified key challenges and issues related to governance within the economic agents of the value chain, spanning pastoralists, livestock traders, butcheries/meat exporters, slaughterhouses, hides and skins traders, national traders/exporters, tanneries, and SMEs involved in footwear and leather goods production.

The paper also delved into the local demand for leather, underscoring the opportunity for increased production of finished leather goods. It summarized strategic intervention areas initially proposed by ALLIPI in 2018 and by Professor Mwinyihija in 2019.

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In conclusion, the paper presented a proposed central auction system for leather, hides, and skins, building upon Professor Mwinyihija's work in 2022. This system was outlined as a key component of

optimizing the leather value chain, offering potential benefits for the leather sector in Kenya and Sudan.



Leather: Planned hides, and skins central auction system after Mwinyihija (2002)

Animal Health and Industry Training Institute (AHITI)-Kabete

During his presentation, Dr. Dennis Nyakundi, the Deputy Principal of Animal Health and Industry Training Institute (AHITI), provided an overview of the institute's mandate, scope, and capabilities. He commenced by offering insights into the institute's background, explaining that AHITI was established over half a century ago with a primary objective of providing training for middle-grade technicians and field extension staff in livestock-related disciplines, encompassing the entire leather value chain, up to leather manufacturing. Notably, leather technology is one of the key disciplines taught at AHITI, and many of Kenya's leather experts have their roots in this institution.

Dr. Nyakundi emphasized AHITI's commitment to capacity building through hands-on training, offering diploma and certificate courses in leather technology as well as programs related to the leather value chain. Moreover, he highlighted AHITI's manufacturing facility, which extends support to Micro, Small, and Medium-sized Enterprises (MSMEs). The facility possesses the capability to process raw hides and skins, taking them through the entire production process to yield finished leather goods.



Drawing inspiration from the Kenya Veterinary Board, the presenter encouraged the leather experts in attendance to work towards self-regulation, fostering professionalism and quality within the sector. Dr. Nyakundi proceeded to elaborate on the technical and practical capacity within AHITI, including the presence of a state-of-the-art workshop for crafting finished leather products, primarily shoes. He outlined the diverse machinery available, along with insights into AHITI's collaborators and a list of courses offered, which can be found on their website.

In the context of shoe manufacturing, some of the machines available at AHITI were highlighted. However, it was noted that there was currently a shortage of moulds for making shoe soles. Collaboration with the Technical University of Kenya (TUK) was suggested to explore the possibility of sourcing machine parts locally. Mr. Moses Kamau, AHITI's leather goods design and manufacture expert, also emphasized the ample sewing capacity with 30 assorted sewing machines.

The session shed light on the challenges faced by AHITI, including the scarcity of certain machines, limitations in human resource capacity, low student enrollment, insufficient practical hours, and issues related to the quality of materials available in the market. Dr. Nyakundi mentioned the government's plan to construct a new leather school and stressed the importance of addressing these challenges in the process.

During the Q&A session following Dr. Nyakundi's presentation, participants expressed their appreciation for AHITI's extensive capacity compared to what is available in the industry, particularly in the informal sector. They sought to understand how the public, especially MSMEs, could benefit from the facility. Several services were discussed:

- AHITI offers training services in leather technology.
- The institute provides a common manufacturing facility for leather production and finished leather goods, accessible to the public.

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- Plans were outlined for adopting the Kenya National Polytechnic framework and Recognition for Prior Learning (RPL) to help artisans acquire formal qualifications that match their knowledge and skills, enhancing their employability and social recognition.
- Mr. Mbogo, the director of leather development in Kenya, mentioned AHITI's Computer-Aided Design/Computer-Aided Manufacture (CAD/CAM) technology, which allows MSMEs to execute design-to-manufacture projects within the facility.
- Participants were informed about plans to enhance the institute's capacity through the construction of a new, larger leather institute, as AHITI currently serves numerous educational establishments in Kenya, including the University of Nairobi.
- While the facility is open to all Kenyans and MSMEs, there are minimal fees involved, and attendees were encouraged to help spread the word about AHITI's resources and services.



Sole moulding machine



Roughing machine



Post bed sewing machine



Sole moulding machine



Toe moulding machine



Heat setting machine



Polishing and brushing machine



Clicking machine



Sole making machine

E. TECHNICAL UNIVERSITY ENGINEERING WORKSHOP VISIT

During the Eco-Tanning Workshop, participants had the opportunity to visit the Mechanical Engineering Department Workshop at the Technical University of Kenya, led by Kenneth Buliva, Senior Technologist. Due to the large number of participants, they were divided into two groups for the tour. The department showcased two significant sections: the Advanced Computer Numerical Control (CNC) Workshop and the Conventional Machine Workshop.

In the Advanced CNC Workshop, participants encountered an impressive array of 21 CNC Milling machines and 20 CNC Lathe machines.

These CNC Milling machines are precision tools capable of crafting intricate components with complex designs, including spare parts, plastic molds for injection and blow molding machines, as well as dies and tools used in production machinery. CNC Lathe machines, on the other hand, are automated devices used for machining intricate 3D details into symmetrical components that find applications in engine parts, machinery, and production equipment like shafts, bolts, and gears. Their advantage lies in their ability to deliver precise and repeatable machining operations, primarily for shaping cylindrical workpieces.



Moving on to the Conventional Machine Workshop, participants encountered a diverse range of equipment, including 10 Universal Conventional Milling machines, 20 Conventional Lathe machines, 10 Shaping machines, 7 Cylindrical Grinding machines, and 3 Surface Grinding machines. Unlike

CNC machines, Universal Conventional Milling machines are non-programmable and are used for shaping workpiece surfaces, producing items such as gears, splines, and interlocking shapes. Their operations are manual and are often used with auxiliary devices like indexing heads.



Conventional Lathe machines, also non-programmable, are used to shape symmetrical components to meet various engineering needs, and their operations are manual as well. Shaping machines play a crucial role in providing slots, grooves, and keyways on flat metal surfaces,

particularly in scenarios where substantial material removal is required within a given time frame. Cylindrical Grinding machines are instrumental in achieving a smooth finish on round surfaces in accordance with specific requirements.



The participants expressed their admiration for the workshop's capabilities and affirmed that the Technical University of Kenya (TUK) possesses the capacity to produce and supply some of the spare parts and machine components they require. Discussions ensued regarding the existing models of engagement for accessing these machines,

including options where they are available for hire at the facility for a daily fee, with clients responsible for procuring materials and possibly having students assist in production. Alternatively, participants can place orders for desired items, and the workshop, following TUK's procurement procedures, will manufacture the requested products.

Workshop Closing Speech

Prof. Paul Shiundu

Acting VICE-CHANCELLOR

THE TECHNICAL UNIVERSITY OF KENYA.

The Principal Secretary, State Department of Livestock Development, Mr.

Jonathan Mueke

The Presidential Advisor on Agriculture, Dr. Dominic Menjo

Chairman, Kenya Tanners Association, Mr. Robert Njoka

United Nations Conference on Trade and Development (UNCTAD) Programme

Officer, Mr. Glen Wilson, - attending virtually

South South North Representative, Ms. Elzette Henshilwood

The Former VC DEKUT, Prof. Eng. Kioni

Dean Faculty of Veterinary Medicine, UoN, Prof. Mande

Principal, AHITI Kabete, Dr. Mugo

The Deputy Vice-Chancellors, TU-K

Executive Deans, TU-K

Professors present

Distinguished Guests and speakers

Members of the Press

Ladies and Gentlemen

Good afternoon.

It is my pleasure to welcome you to The Technical University of Kenya (TU-K) during this official closing ceremony of the 1st International Workshop on sustainable tanning of hides and skins. An old Chinese saying goes that there is no never-ending feast and as such, happy hours are always so short. Indeed, it has been a short two days of brilliant dialogue, a clash of wisdom and a feast of thoughts but that feast has to come to an end, anyway.

Ladies and Gentlemen, I would like to extend the University's highest respect and most sincere gratitude to the joint efforts of all the participants, leaders, experts, guests and representatives. Moreso, it is my most cordial congratulations to you all for the success of this workshop! I believe we all have the same feeling now, that the exchanged ideas on cutting-edge theories and major practices for sustainable leather industry is going to ensure a more efficient, balanced and sustainable tanning of hides and skins in the near future.

Ladies and Gentlemen, indeed, I have no doubt that this workshop has given participants very valuable information from sustainable processes, research findings, sustainable waste recycling and measures aimed at motivating tanners to produce more leather and leather goods for economic development of the sector and the country in general. I am sure, you had an opportunity to visit our state-of-the-art mechanical workshops where you have witnessed our manufacturing capacity. The Technical University of Kenya's Center for Engineering Innovation and Teaching Factor (CEI&TF) is therefore ready to partner with tanneries to manufacture spare parts which are currently imported at very exorbitant prices. Therefore, a sustainable leather industry requires a major sacrifice for investment in inspiring research and enthusiastic innovation.

Ladies and Gentlemen, allow me to express again, on behalf of the Technical University of Kenya and on my own behalf, sincere gratitude to the State Department for Livestock Development (SDL), Tanners Association of Kenya (TAK) and United Nations Conference on Trade and Development (UNCTAD) under the Sustainable Manufacturing and Environmental Pollution (SMEP) programme for the support and trusting us to host this workshop. There is no doubt that this collaboration is the omnibus to success of the leather industry in Kenya.

It is no wonder, that the Government of the Republic of Kenya led by the President, H. E. Dr. William Ruto, holds the leather industry as a key element in the Bottom-Up Transformation Agenda (BETA) of the country. Only recently, the President challenged the leather industry to manufacture 15 million back-to-school shoes per year. The Government's commitment to the realization of the full potential of the hitherto untapped leather industry is evidenced by the participation of senior staff of the State Department of Livestock Development in the Ministry of Agriculture and Livestock Development led by Principal Secretary who graciously opened this workshop yesterday morning.

Ladies and Gentlemen, the main theme of this workshop was to address the challenges faced by the leather value chain players, in particular, pollution control and environmental governance, and aspects which impede their manufacturing processes and trade in leather and leather products whether locally and internationally. In the recent past, National Environment Management Authority has had to close many tanneries due to inefficient practices and failure to modernize manufacturing processes to reduce environmental degradation, which is unacceptable in the 21st Century Kenya.

Therefore, to improve efficiency and sustainability of the leather industry, capacity building for key stakeholders including the regulating authorities and academia on the future direction of the leather industry is paramount. The inclusion of academia in this workshop was therefore, aimed at promoting academia-industry partnership where cutting edge research and innovation by the academia is translated into sustainable processes that improve production efficiency while at the same time reducing environmental degradation.

In conclusion, ladies and gentlemen, allow me to be philosophical and emulate the ancient Greek philosopher Aristotle. Aristotle asserted that people come to cities for better life. Hence, a city is not just a pile of steel and concrete, but a living thing. If a city is a living thing, the economy is its vitality, environment its basis, culture its spirit, and service its crucial point. So, a dream for better city life is the common wish and aspiration of all human beings. However, major cities all around the world are witnessing the most adverse environmental pollution thereby posing threats to people's dream of beautiful life. It is my hope that the leather experts, scientists and engineers here today will come handy in rejuvenating the leather value chain in order to fulfil the dream of all us in the cities and beyond, i.e., to live in an environment that is beautiful.

Ladies and Gentlemen, it is also, my sincere hope that you will, while on the grounds of the Technical University of Kenya explore the unique charm of this university where innovation is our buzz word. I am sure that you will want to experience that by collaborating with us. We, therefore, look forward to meeting you again in the Technical University of Kenya.

Thank you very much and may God bless you all.

Participation Certificate Awards



1st Workshop on Eco-Tanning Processes in Kenya and East African Region



1st Workshop on Eco-Tanning Processes in Kenya and East African Region





Workshop Attendees

Attendees

NAME	DESIGNATION	ORGANISATION
1. Mr. Anuj Parman	Representative	East Africa Tannery Limited, Njiru, Kenya
2. Mr. Augustine Wandera	Secretary	Leather Articles Entrepreneurs' Association (LAEA) - Kenya
3. Mr. Chatlur Lakshmi	Representative	Nairobi Tanners Ltd, Industrial area Nairobi - Kenya
4. Mr. Abdihakim M.	Representative	Sagana Tannery Sagana – Nyeri, Kenya
5. Eng Fredrick O Lamba	Representative	United Tanners Ltd, Dandora Mowlem, Kenya
6. Dr. Dennis Nyakundi	Deputy Principal	AHITI-Kabete – Nairobi, Kenya
7. Mr. Moses K. Kamau	Deputy Head of Leather Department	AHITI-Kabete – Nairobi, Kenya
8. Mr. Denis Obiero	Tutorial Fellow	University of Nairobi - Kenya
9. Prof John N Mande	Dean Faculty of Veterinary Medicine	University of Nairobi - Kenya
10. Prof. P.N. Kioni	Professor	Dedan Kimathi University of Technology – Nyeri, Kenya
11. Dr. Paul Tanui	Head of Chemistry	Dedan Kimathi University of Technology – Nyeri, Kenya
12. Dr, Amos Ichenihi	Lecturer	Technical University of Kenya
13. Mr. Sachan Parmar	Representative	East Africa Tannery Limited, Njiru, Kenya
14. Mr. Martin Mangi	Participant	DVS Kabete – Nairobi, Kenya
15. Mr. Mwebe Emmanuel Zoya	Coordinator/Leather Industry Expert	Uganda Leather and Allied Industries Association - Uganda
16. Mr. Moses Gichana	Director Centre Engineering Innovation	The Technical University of Kenya (TUK) - Kenya
17. Prof Edwin Ataro	Executive Dean, Faculty of Engineering & Built Environment	The Technical University of Kenya (TUK) - Kenya
18. Mr. Gilbert Msafari	Leather Industry Expert	Rwanda
19. Prof. Francis Gatheri	Executive Dean Faculty of Applied Sciences & Technology	The Technical University of Kenya (TUK) - Kenya
20. Mr. Elkana Obeid Malala	Leather Expert Consultant	Bungoma, Trans Nzoia, West Pokot Counties
21. John Ngonjo Kariuki	Chairman	East African Hides and Skins Association - Kenya
22. Mr. Njahira Murimi	Secretary General	East African Hides and Skins Association - Kenya
23. Ms. Serah Lemurt	Representative	Ewaso Nyiro South Development Authority Tannery – Narok, Kenya
24. Mr. Harun Githongo	Representative	Ewaso Nyiro South Development Authority Tannery – Narok, Kenya
25. Mr. Fredrick Langat	Environmentalist	Environmental Institute of Kenya
26. Mr. Erick Kamau	Representative	Horizon Hides and Skins Tannery – Industrial Area, Nairobi
27. Mr. Henry Ochieng	Leather Expert Consultant	Bungoma, Trans Nzoia, West Pokot Counties
28. Mr. Japheth Ogutu	Chief Executive Officer	Kenya National Chambers of Commerce and Industry (KNCCI) – Kajiado, Kenya
29. Mr. Charles Omondi Okoyo	Chairman	Leather Articles Entrepreneurs Association (LAEA)
30. Ms. Virginia Wangigi	Treasurer	Leather Articles Entrepreneurs Association (LAEA)
31. Ms. Rosemary Kaloki	Trainer	KYEOP
32. Mr. Samuel Ofula	Leather Article Trader	Ofula Bags
33. Mr. Jacob Ojwang	Administrator	Msai Import and Export Ltd, Dandora-Mowlem, Kenya

1st Workshop on Eco-Tanning Processes in Kenya and East African Region

NAME	DESIGNATION	ORGANISATION
34. Mr. Abdi Rizak	Representative	Mesai Import and Export Ltd, Dandora-Mowlem, Kenya
35. Ms. Pauline Ogola	CEO	Leather Articles Entrepreneurs Association (LAEA)
36. Ms. Anna Moraa	Leather Goods Trader	Samabora Ltd
37. Mr. Sharif Allawi Salah	Director	United Leather Tanners – Nairobi, Kenya
38. Mr. Sammy Gitau	Student	AHITI - Kabete
39. Mr. Zachary Maina	Student	Dedan Kimathi University of Technology – Nyeri, Kenya
40. Mr. James Kihara	Student	Dedan Kimathi University of Technology – Nyeri, Kenya
41. Ms. Nelly Maina	Student	Dedan Kimathi University of Technology – Nyeri, Kenya
42. Ms. Lucy Akinyi Owiti	Student	Kenyatta University
43. Mr. Seth Omondi	Student	Kenyatta University
44. Ms Nelly Longar	Student	University of Nairobi
45. Mr. Johnson Wenje	Student	The Technical University of Kenya (TUK) - Kenya
46. Ms. Elsie Neville Okinyi	Student	The Technical University of Kenya (TUK) - Kenya
47. Ms. Caroline Nyambura	Student	University of Nairobi
48. Clinton Ngaywa	Student	The Technical University of Kenya (TUK) - Kenya
49. Vivian Awuor	Student	AHITI Kabete

Presenters/Secretariat

NAME OF PARTICIPANT	ORGANISATION	Role
1. Dr. Ahmed Hassan	Kenya Leather Development Council (KLDC)	Presenter
2. Mr Joseph Mbogo	Directorate of Veterinary Service	Presenter
3. Prof Alfred Orina	The Technical University of Kenya (TUK)	Presenter
4. John Otieno Okumu	Kenya Leather Development Council (KLDC)	Presenter
5. Dr. David Ojigo	African Leather and leather product Institute (ALLIPI)	Presenter
6. Dr. George Okwadha	The Technical University of Kenya (TUK)	Presenter/Secretariat
7. Dr. Richard Oruko	Directorate of Veterinary Service	Presenter/Secretariat
8. Dr. Henry J.O. Ogola	Jaramogi Oginga Odinga University of Science & Technology	Presenter/Secretariat
9. Mr. Robert Njoka	Chairman Kenya Tanners Association	Presenter/Secretariat
10. Mr. Stuart Cranfield	Leather Working Group	Presenter
11. Mr. Glen Wilson	UNCTAD Representative	Presenter
12. Dr. Dominic Menjo	State House of Kenya	Presenter
13. Ms. Elzette Henshilwood	SouthSouthNorth Organization – SMEP	Presenter
14. Dr. John Oloo Odiaga	Jaramogi Oginga Odinga University of Science & Technology (JOOUST)	Presenter
15. Dr. Arthur Onyuka	Kenya Industrial Research and Development Institute (KIRDI)	Presenter
16. Mr. Newton Owino	Alisam Products Development and Design – Kisumu	Presenter
17. Dr. Joel Mwondu	University of Nairobi (UON)	Presenter
18. Mr. Moses Nyang'au	The Technical University of Kenya (TUK)	Presenter
19. Ms. Grace Lekasi	Kenya Revenue Authority	Presenter
20. Mr. David Ong'are	National Environmental Management Authority (NEMA)	Presenter
21. Dr. Andrew Muruka	Ministry of Labour and Social	Presenter

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NAME OF PARTICIPANT	ORGANISATION	Role
22. Eng. Stephen Nzioka	Ministry of Energy	Presenter
23. Mr. Denis Osoro	Ministry of East Africa Community	Presenter
24. Ms. Grace Mbugua	Kenya Chamber of Commerce and Industry (KNCCI)	Presenter
25. Mr. Elisha Kogo	Kenya Bureau of Standards	Presenter
26. Mr. Ken Kamau	Kenya Export Promotion and Branding Agency (KEPROBA)	Presenter
27. Dr. Peter Ndangili	The Technical University of Kenya (TUK)	Presenter
28. Miriam C. Bomett	Kenya Association of Manufacturer (KAM)	Presenter
29. Prof. Mwinyikione Mwinyihija	Africa Leather and Leather Products Institute	Presenter
30. 1. Emmanuel Ouko Oginga	ICT Support	Secretariat
31. 2. Jannet Ondulo	Technical University of Kenya	Secretariat
32. 3. Irene Omollo	Technical University of Kenya	Secretariat
33. 4. Benard Nashon Otieno	Technical University of Kenya	Secretariat
34. 5. Tabitha Achieng	GiZ Kenya	Secretariat
35. 6. Jepkosgei Janet	Directorate of Veterinary Services	Secretariat
36. MaryGoretty Chepng'etich	Technical University of Kenya	Secretariat
37. Sarah Mutua	Technical University of Kenya	Secretariat
38. Kimari Waimaitha	Technical University of Kenya	Secretariat
39. Kennedy Njenga	Reddamac Leather Centre	Secretariat
40. Felix Livole	Kenya College of Accountancy	Secretariat

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