PAKISTAN LEATHER SECTOR:
TRACEABILITY, CLEANER PRODUCTION AND CIRCULARITY

ADVANCING CIRCULARITY THROUGH WASTE VALORISATION

SMEP | UN trade & development | UK International Development — Partnership | Progress | Prosperity | WWF

Overview

Pakistan's leather sector is the country's third largest export industry, contributing approximately four per cent of GDP, yet it operates under growing pressure to meet international sustainability standards. It is a major economic driver that contributes heavily to domestic employment while maximising resource efficiency through utilisation of the by-products of the meat industry. However, the sector's sustainability story remains incomplete.
Leather production generates substantial volumes of solid waste, particularly wet blue shavings, and trimmings.

These materials retain significant residual value but are commonly disposed of in open dumping sites or landfills. Once deposited, chromium-laden organic waste may undergo anaerobic decomposition, releasing methane and carbon dioxide into the atmosphere and contributing to the sector's environmental footprint. With improved recovery and reuse pathways, these waste streams could be transformed into valuable resources rather than remaining a source of environmental, regulatory, and reputational concern.

Insights

With the global shift towards circular economic models and low carbon manufacturing, international buyers and compliance frameworks are raising the bar. Businesses that continue to treat valuable waste as a disposal problem risk losing market access, while those who transform it into a resource stand to gain both competitive advantage and a credible sustainability narrative. For Pakistan's leather industry, the question is no longer whether to act, it is how quickly the sector can redirect what flows into the waste stream back into the value chain.

Leather manufacturing is a water- and chemical-intensive process that generates waste at different stages of production. Tanned waste, particularly wet blue shavings, can account for 10 to 25 per cent of total waste generated and contain collagen protein, which has potential industrial value. This presents an opportunity to explore improved reuse so that wet blue shavings can be treated not only as a disposal challenge, but also as a potential resource within a more circular leather value chain.

Drivers

Growing demand for sustainable production

Achieving sustainability standards

Environmental impact of solid waste from leather manufacturing

Resource efficiency and cost saving

Need for circular economy solutions

What we have delivered under the project

Under the SMEP Programme, WWF-Pakistan partnered with the Pakistan Council of Scientific and Industrial Research (PCSIR) to pilot an innovative circularity solution by developing a biodegradable, protein-based surfactant for reuse in leather processing.

Wet blue shavings were identified as a viable secondary raw material because of their high collagen content. This characteristic makes them suitable for value recovery and provides an opportunity to reduce reliance on conventional disposal pathways. Collagen-based proteins were extracted from waste through a controlled alkaline hydrolysis process and then modified using lauric acid, and supporting processing agents to produce a biodegradable surfactant that could serve as an alternative to synthetic, petrochemical-based surfactants.

The pilot generated measurable results:

- 296 kg wet blue shavings processed
- 167 kg biodegradable surfactant produced
- 181 kg waste diverted from disposal pathways
- Approximately 600 kg CO_2 emissions potentially mitigated

Importantly, the surfactant was also evaluated for practical application. Quality performance and stability assessments showed that leather produced using the pilot surfactant achieved results comparable to commercially available synthetic alternatives. This indicates that the solution has potential for industry applications beyond laboratory testing. Overall, the pilot demonstrated a practical closed-loop approach, where waste generated within the leather production process can be recovered and reused as a functional industrial input. This provides a replicable model for improving resource efficiency, reducing disposal pressures, and supporting circularity within the leather sector.

Significance

This project shows that leather industry waste can be successfully converted into useful inputs without affecting product quality, proving the viability of a closed-loop system. It reduces waste disposal impacts and lowers the sector's environmental footprint through resource recovery. Overall, it offers a scalable pathway for a more efficient and sustainable leather industry in Pakistan.

Approximately 600 kg CO_2 emissions could potentially be avoided through the diversion of 181 kg of waste from conventional disposal pathways.

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