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Sustaining Tradition:

Rajasthani Leather Craft Reimagined through Biodegradable Materials

Rajasthan's leather craft traditions reflect a deep relationship between material, environment, and cultural expression, shaped by generations of artisanal knowledge and regional identity. Historically, leather products from the region were created using naturally treated materials and processes that respected ecological cycles while allowing rich surface ornamentation through embroidery and hand-finishing. As environmental concerns grow and the availability of traditional resources declines, the future of these crafts depends on thoughtful innovation that can sustain both cultural integrity and environmental responsibility.

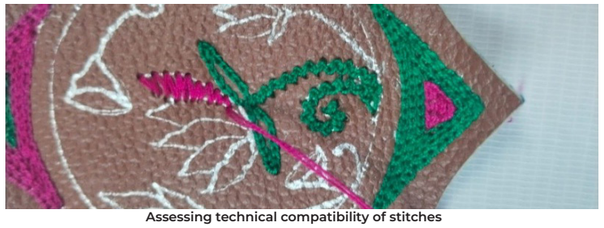
In this context, the development of biodegradable, plant-based leather through the collaborative efforts of the Indian Council of Agricultural Research (ICAR) and the Footwear Design and Development Institute (FDDI) marks a significant step toward sustainable craft practices. Combining agricultural research with footwear and leather product expertise, this collaboration has resulted in a material designed to replicate the flexibility, strength, surface finish, and tactile qualities of conventional leather while remaining biodegradable and environmentally benign. The material offers artisans a viable alternative that aligns with traditional working methods rather than replacing them.

Biodegradable material

Traditional Embroidery

Finished Product

Biodegradable leather developed by the ICAR when developed into products by FDDI Kolkata CoE, is found to be compatible with established craft techniques such as cutting, stitching, folding, and hand-finishing, allowing artisans to continue working within familiar frameworks. Its edges respond effectively to colour absorption, edge coloring, and dense embroidery, ensuring that the visual depth and tactile richness associated with Rajasthani leather products are preserved. This compatibility is essential for maintaining the cultural authenticity of embroidered leather goods while transitioning toward sustainable materials.



Assessing technical compatibility of stitches

True sustainability in leather products extends beyond the outer surface to include internal reinforcements and linings. Natural interfacings made from cotton, jute, flax, banana fibre, and recycled cellulosic textiles provide structural stability while remaining breathable and biodegradable.

These materials help distribute embroidery tension evenly, reducing stress on the biodegradable leather and enhancing durability. Wool-based cushioning, traditionally abundant in Rajasthan, is reintroduced as a natural padding material, offering shock absorption, moisture regulation, and long-term comfort without the environmental cost of synthetic foams.

Plant-derived and natural linings such as organic cotton, handloom fabrics, bamboo-based textiles, and plant-fibre nonwovens replace synthetic alternatives, improving wearability and supporting traditional dyeing and printing practices. Eco-friendly adhesives, including water-based binders, natural resins, and starch-derived formulations, ensure effective bonding without toxic residues. Cotton tapes and plant-fibre cords are used for bindings and edge reinforcement, maintaining flexibility, repairability, and biodegradability throughout the product.

Development of products that exemplify a model for sustainable heritage craft-based innovation.

Rajasthani embroidery remains central to the identity and performance of these leather products. Techniques such as Taanka, Zardozi, Kantha, Herbeja, Salwali, and chain stitch adapt well to biodegradable leather surfaces, maintaining stitch precision, thread tension, and surface integrity.

Embroidery continues to serve both aesthetic and structural functions, while metallic embellishments and fittings are used thoughtfully for their durability and recyclability. Traditional finishing techniques such as hand-stitching, folding, burnishing, and natural wax polishing further reinforce a handcrafted aesthetic while reducing reliance on synthetic coatings.

By integrating biodegradable leather developed through the ICAR–FDDI collaboration with natural reinforcements, linings, and traditional embroidery, leather products can evolve into near-complete biodegradable systems. At the end of their usable life, these products can safely decompose or be repaired and reused, aligning with circular design principles that emphasise longevity, ecological regeneration, and reduced waste.

This collaborative approach demonstrates how scientific research and design education can work alongside artisanal traditions to create sustainable pathways for the future. By bridging innovation with heritage, biodegradable leather products enriched with Rajasthani embroidery emerge as ethical, culturally grounded, and future-ready expressions of India's living craft traditions.

Biodegradable Leather Board

Biodegradable Wool & Threads

Biodegradable Wool Padding

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Ms. Basumitra Ghosh Mukherjee, Senior Faculty (Grade 1) and Head of the Centre of Excellence (CoE) - FDDI Kolkata is a senior academic and technical professional with extensive experience across industry, research, and institutional development in the leather and lifestyle products sector.

A Master's graduate in Leather Apparel Design and Technology from NIFT, she began her career in the leather goods export industry in 2002 and spent nearly a decade working with leading global brands including ZARA, MANGO, NEXT, Debenhams, Clarks, and Samsonite, culminating in a vice-presidential–level leadership role.

At the CoE, her work focuses on product development, manufacturing excellence, sustainability, and market relevance, with contributions to national and international initiatives including craft cluster upgradation in Shantiniketan, SADC region market studies, and leather sector capacity building in Tanzania, reflecting a strong industry-informed and implementation-driven approach to research and education.