

Ecology, Capital, and Resilience: Socioeconomic Transformation and Public Policy Restructuring of the Shui Ethnic Group's Horse-Tail Embroidery

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Abstract

"Shui Horse-Tail Embroidery," a national-level intangible cultural heritage, serves not only as a "wordless history book" of Shui cultural identity and totem worship but also as a quintessential "eco-cultural" synergy system that has emerged from the fragile karst and desertified ecosystem of Southwest China. Under the impact of modernization and urbanization, Horse-Tail Embroidery faces dual challenges: high labor opportunity costs and substitution by modern industrial products. Based on field visits and surveys conducted by our research team during winter and summer breaks from 2024 to 2026 to the homes and workshops of Horse-Tail Embroidery artisans in Sandu Shui Autonomous County, Guizhou Province—and drawing on literature such as Research on Shui Culture in China and the Economic and Social Survey Report on China's Ethnic Regions—this paper systematically analyzes the dynamic evolution of Horse-Tail Embroidery amid ecological resource constraints, market-oriented transformation, and institutional protection from the interdisciplinary perspectives of environmental economics, cultural sociology, and public policy. The study finds that through the low-carbon, circular utilization of natural resources, the regeneration of women's social capital, and micro-scale innovations in cultural and creative products—such as embroidery combined with silver—Horse-Tail Embroidery has successfully charted a transformation path that balances ecological sustainability with community economic resilience. Finally, this paper evaluates the effectiveness of current "productive conservation" public policies and proposes a modern public policy restructuring plan to promote the sustainable development of Horse-Tail Embroidery from the perspectives of environmental property rights protection, cultural compensation mechanisms, and social governance.

Keywords: Shui Horse-Tail Embroidery, socioeconomic transformation, environmental economics, community resilience, productive conservation, public policy restructuring

1 Introduction

In Sandu Shui Autonomous County, Guizhou Province—an area characterized by typical southwestern karst topography—limited arable land and a fragile ecological barrier have long imposed external constraints on the development of the local agricultural economy. Against a backdrop of relatively scarce natural capital, the ancient Shui people created a rich and profound intangible cultural heritage, among which “Shui Script” and “Shui Horse-Tail Embroidery” stand out most prominently. As a unique writing system and body of knowledge of the Shui people, Shui Script records their ecological ethic of “harmony between heaven and humanity”; Horse-Tail Embroidery, meanwhile, showcases the artisans’ ingenious skill in combining horsehair with plant dyes and silk threads.

Traditional economic models often view cultural heritage as a static, consumable public good, overlooking its productive function as “renewable cultural capital” in enhancing rural communities’ resilience to risks. With the deepening of the market economy and the acceleration of urbanization, Horse-Tail Embroidery has faced the impact of modern industrial civilization. To explore the contemporary survival landscape of this traditional craft, our team conducted in-depth field research and follow-up interviews with several representative inheritors of Horse-Tail Embroidery and their families in Sandu Shui Autonomous County, Guizhou, during the winter and summer breaks from 2024 to 2026. At the same time, we incorporated analytical frameworks from economics—specifically “opportunity cost” and “market failure”—along with sociological perspectives on “gender and community resilience” and public policy evaluation mechanisms to explore how Horse-Tail Embroidery can be reshaped from a “self-sufficient folk tradition” into a “modern cultural product that bridges ecology and the market.”

2 Resource Constraints and Ecological Wisdom: The Material Culture and Sociological Implications of Horse-Tail Embroidery

According to research on the cultural history of the Shui people, their ancestors’ origins are inextricably linked to water, and their social life retains a strong tradition of nature worship and totem beliefs (Guizhou Shui Culture Research Association, 2018a). This deep-rooted cultural heritage has been stitched into Horse-Tail Embroidery, stitch by stitch, by Shui women.

A. Low-Carbon Recycling and Ecological Inclusivity of Raw Materials

Horse-Tail Embroidery is known as the “soft gold” of embroidery. Its core technique involves wrapping a core of 3–5 strands of horsehair with colored silk thread to create “horsehair thread,” which is then used to outline three-dimensional, relief-like patterns on fabric. From the perspective of resource utilization, horsehair is a byproduct of agricultural civilization—either naturally shed by horses or discarded after labor—which artisans transform into high-value-added works of art, embodying early communities’ commitment to zero waste and efficient recycling of biological resources (Guizhou Shui Culture Research Association, 2018a).

B. “A History Book Without Words” and Women’s Social Capital

From a sociological perspective, Horse-Tail Embroidery is far more than mere decoration. An ancient Shui saying goes: “Horse-tail embroidery is a history book worn on the body.” Throughout the long history marked by the absence of a systematic and widespread written language, Shui women used Horse-Tail Embroidery patterns—such as “Two Phoenixes Facing the Sun,” fish motifs, and butterfly motifs—to encode cultural meanings, thereby passing down the Shui people’s simple philosophy regarding the proliferation of life and the origin of the universe (Guizhou Shui Culture Research Association, 2018b). For example, the “fish” totem, which frequently appears in Horse-Tail Embroidery, attests to the Shui people’s deep-rooted belief that they are the “descendants of fish” and reflects their subsistence pattern of “rice and fish” (Pan & Wei, 2004).

3 The Impact of Modernization and the Dilemma of Microeconomics

Although Horse-Tail Embroidery embodies immense cultural and ecological value, its preservation faces serious economic barriers in contemporary society. A study by the Local Chronicles Compilation Committee of Sandu Shui Autonomous County, Guizhou Province (2015) points out that since the beginning of the 21st century, the processes of urbanization and industrialization in Sandu County have accelerated significantly, leading to the migration of a large number of surplus rural workers to developed coastal regions and urban areas.

A. The Sharp Rise in the Opportunity Cost of Labor

The crisis facing the transmission of Horse-Tail Embroidery is, at its core, “a contradiction between high opportunity costs and low market premiums.” It takes a skilled embroiderer months or even years to produce a traditional horse-tail embroidered baby carrier. In the modern labor market, the average daily earnings of migrant workers far exceed the meager income earned by sitting at an embroidery frame. When the economic returns of traditional handicrafts fail to cover the opportunity cost of labor, artisans inevitably choose to exit the trade, directly leading to a generational gap in the transmission of Horse-Tail Embroidery.

B. Industrial Substitution and the “Lemons Market” Effect

With the influx of machine-embroidered and nylon-thread imitations, the market has become flooded with low-cost counterfeit horse-tail embroidery. These industrial substitutes have taken market share away from pure handmade Horse-Tail Embroidery at extremely low prices, leading to a “lemons market” effect—consumers, due to information asymmetry, are unwilling to pay the high price for authentic handmade pieces, leaving embroiderers who adhere to tradition in financial distress.

4 Dynamic Changes and Field Observations

Since Horse-Tail Embroidery was included in the first batch of the National

Intangible Cultural Heritage List in 2006, the Sandu County government has implemented a series of policies for intangible cultural heritage-based poverty alleviation and industrial transformation through a “cooperative + embroiderers + enterprise” model (Local Chronicles Compilation Committee of Sandu Shui Autonomous County, Guizhou Province, 2015). However, in reality, traditional Horse-Tail Embroidery once faced the dilemma of “having products but no market” due to its complex processes, long production cycles, high prices for large items, and reduced practicality.

During field surveys conducted by our team during the winter and summer breaks of 2024–2026, which involved in-depth visits to artisans’ homes and workshops in Sandu County, we discovered that over the past three years, the Horse-Tail Embroidery industry has exhibited significant new trends toward “micro-scale production,” “diversified application scenarios,” and “cross-sectoral restructuring.”

In the homes of master artisans, calligraphy in “Shuishu” — a national-level intangible cultural heritage (such as the phrase “Heaven rewards diligence”) — complements the Mawei embroidery environment. As the Shui people’s unique pictographic writing system, Shuishu provides an endless source of visual symbols and cultural endorsement for Mawei embroidery-inspired creative products (Fig.1).

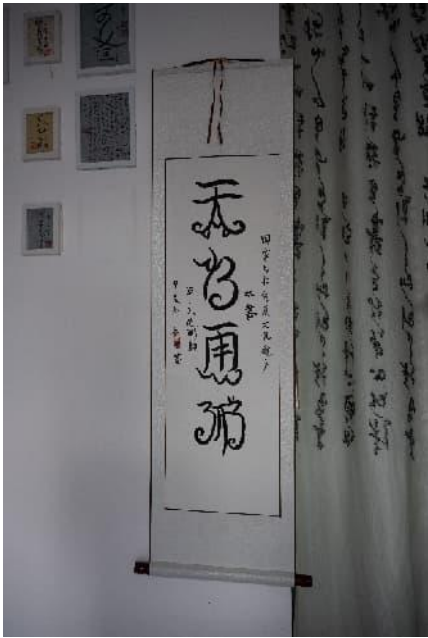


Fig.1 Shuishu and Cultural Endorsement

This image displays a “hairpin” that combines Mawei embroidery with traditional metal forging. In terms of structural design, artisans have broken free from the traditional limitation of using Mawei embroidery solely on large fabric surfaces such as shoulder straps and shoe uppers. Instead, they have scaled down the embroidery to a miniature circular patch at the top of the hairpin, pairing it with a hammered metal conical pendant below. From a microeconomic perspective, this shift toward “material crossover (embroidery + silver jewelry)” and “miniaturization” is crucial: it drastically reduces the production time required—from the hundreds of labor-hours needed to make

a single pair of suspenders to just a few hours for a miniature embroidered patch. This not only significantly lowers the marginal labor cost of the product but also successfully integrates traditional embroidery into the daily accessory consumption habits of modern women (Fig.2).



Fig.2 Miniaturization and Innovation in Embroidery and Silverwork

This is a set of intangible cultural heritage necklaces combining metal chain clasps with rectangular horsehair embroidery patches. The embroidery patches feature a navy blue fabric background and use gold silk thread to wrap horsehair, embroidering auspicious characters from the Shu script with a distinctly modern geometric aesthetic. This product moves away from the intricate and heavy forms of traditional folk embroidery, embracing a minimalist design that aligns with modern “Guochao” aesthetics. This effort to transform traditional craftsmanship into everyday jewelry with high turnover rates and high added value has objectively greatly enhanced the price elasticity of handicrafts and improved the efficiency of capital turnover in the market (Fig.3).



Fig.3 Fashionable, Affordable Luxury Cultural and Creative Products

This illustrates the delicate stitching and three-dimensional outlining techniques of horsehair embroidery on fabric. The exquisite butterfly and floral motifs reflect the Shui women’s keen observation of the natural world and their totemic beliefs. Even amid modern cultural and creative innovations, this

distinctive, bold relief effect—achieved by using horsehair as a core wrapped in silk thread—has been fully preserved, forming an irreplaceable core technical barrier for intangible cultural heritage products. (Fig.4)



•Fig.4 Details of Traditional Stitching Techniques and Patterns

Photographs taken during field visits at inheritors’ workshops and home embroidery corners. The images depict the embroidery hoops, needles, thread, and other tools used by embroiderers in their daily work, as well as works in progress. This “front-shop, back-workshop” or “home-based embroidery” production model vividly illustrates how horsehair embroidery transforms rural women’s fragmented time into economic income, demonstrating the role of distributed production in ensuring flexible employment opportunities within rural communities (Fig.5).



Fig.5 Production Scenes and Spaces for Living Heritage Transmission

This figure showcases diverse attempts to integrate Mawei embroidery into practical modern-life scenarios (such as combinations of earrings, pendants, and cultural and creative bag clasps). By deconstructing traditional Mawei embroidery—originally confined to ceremonial garments such as back-strap dresses and wedding gowns—and integrating it into modern, high-frequency consumer goods, the barrier to purchasing individual items has been significantly lowered. This has successfully facilitated the transition of intangible cultural heritage from “museum-style static preservation” to

“everyday, dynamic consumption” (Fig.6).



Fig.6 Diverse Media and Cross-Boundary Integration into Daily Consumption

5 Theoretical Expansion: “Community Resilience” from the Perspectives of Environmental Economics and Public Policy

The preservation, transmission, and development of Sandu Horse-Tail Embroidery is not merely a matter of industrial transformation and upgrading; it is a systemic issue of social governance involving rural community resilience, the restructuring of gender capital, and the governance of the commons.

A. Gender, the Reconstruction of Social Capital, and Community Resilience

According to the Local Chronicles Compilation Committee of Sandu Shui Autonomous County, Guizhou Province (2015), in the karst desertification regions of Southwest China, the rapid urbanization process has led to a large-scale migration of young and able-bodied rural workers to the eastern coastal regions, leaving rural societies facing serious risks of depopulation and the marginalization of left-behind populations. Our team’s field research in Sandu County indicates that the Horse-Tail Embroidery industry has established a crucial social safety net for left-behind women in rural areas through “flexible home-based employment” and “distributed production” models.

- **Women’s Economic Autonomy and Micro-level Household Empowerment**

Embroiderers use fragmented time during breaks from farm work to create embroidery pieces, thereby generating stable cash income. As Zhang Xiaojun (2021) noted in his study of ethnic minority handicrafts in Southwest China, this microeconomic income not only breaks left-behind women’s economic dependence on a single source of agricultural income or remittances from migrant workers, but also significantly enhances their say in household budget allocation and decisions regarding their children’s education.

- **Reconstruction of Social Capital and Community Resilience**

According to records from the Guizhou Shui Culture Research Association (2018b), the traditional production of Horse-Tail Embroidery has always

carried strong social attributes specific to women. During the transition to modernization, new women's mutual-aid networks—linked through cooperatives and intangible cultural heritage transmission centers—have successfully transformed into powerful social capital. These community networks, grounded in mutual trust and cultural identity, have greatly enhanced the social resilience of rural communities in the face of external economic and environmental shocks, such as fluctuations in agricultural market prices and natural disasters.

B. Addressing “Market Failure”: Modern Policy Reconstruction Based on Property Rights and Externalities

The marketization dilemma of traditional Horse-Tail Embroidery essentially stems from the inability to monetize positive externalities (where ecological and cultural values are not factored into market prices) and the “lemons market” effect caused by information asymmetry. As David Throsby (2001) argued in the field of cultural economics, when the non-market value of cultural heritage cannot be captured by price mechanisms, public policy intervention becomes inevitable. Drawing on micro-level innovations documented during fieldwork—such as Shui Script-inspired cultural and creative products, embroidered silver hairpins, and bracelets—modern public policy should be precisely restructured along the following four dimensions:

- Establish a “Cultural and Ecological Service Payment (PES) Mechanism”

According to the Shui ethnic group's ecological wisdom as described by the Guizhou Shui Culture Research Association (2018a), the natural plant dyeing (indigo) and horsehair recycling used in Horse-Tail Embroidery objectively reduce the carbon footprint and protect the fragile aquatic ecosystems of karst landscapes. Drawing on the valuation logic of ecosystem services proposed by Costanza et al. (1997), public finances should establish an “Authentic Cultural and Ecological Conservation Fund” to provide direct, targeted payments (PES) to artisans who adhere to traditional, low-carbon techniques, thereby compensating them for the opportunity costs incurred by forgoing low-cost industrial substitutes.

- Promote Property Rights Demarcation and Digital Traceability

According to Elinor Ostrom's (1990) theory of commons governance, the effective management of public resources must be based on clearly defined boundaries and property rights. Local governments should take the lead in promoting the digital copyright registration of the “Sandu Shui Ethnic Group Horse-Tail Embroidery” national geographical indication and the visual symbols of Shui Script. Furthermore, cooperatives should be encouraged to adopt QR code or blockchain traceability technologies to establish a “unique digital identity” for each handcrafted item—one code per item—thereby fundamentally resolving the trust crisis caused by Gresham's Law (“bad money driving out good”).

- Optimize Cooperative Governance to Reduce Transaction Costs

Although policies for poverty alleviation through intangible cultural heritage have played a positive role, the Local Chronicles Compilation Committee of Sandu Shui Autonomous County, Guizhou Province (2015) pointed out that the current “cooperative + farmer” model still suffers from excessive reliance on government support and weak market-driven self-sustainability. Policies should shift from “mandatory procurement” to “market-driven incubation.” By introducing professional managers and transparent

profit-sharing mechanisms, cooperatives should be encouraged to establish industry-academia-research partnerships with university design teams to lower internal transaction costs and enhance autonomous operational capabilities.

- Drive the Integration of Tertiary Industries (“Ecology-Culture-Tourism”)

Building on Zhang Xiaojun’s (2021) study on the capitalization of ethnic minority handicraft culture, the preservation of Horse-Tail Embroidery should be fully integrated into Sandu County’s macro-regional economic planning. Leveraging unique local folk resources such as the Shui Ethnic Group’s Duan Festival and Mao Festival, a closed-loop industrial chain should be established encompassing “raw material cultivation (indigo) — rural workshop embroidery — educational tours and cultural and creative product sales.” Through the integration of these three sectors, both the price elasticity of demand and the cultural added value of handicrafts can be significantly enhanced.

6 Conclusion

Based on field surveys and literature reviews conducted from 2024 to 2026, the Shui ethnic group’s Horse-Tail Embroidery in Sandu, Guizhou, is not only a time-honored folk craft that has stood the test of time, but also a cultural crystallization of the harmonious coexistence between humans and nature within a fragile karst ecosystem. Guided by the dual strategies of rural revitalization and ecological civilization construction, Horse-Tail Embroidery has successfully established a pathway for transforming natural capital into cultural and financial capital through the symbolic integration of “Shui Script and Horse-Tail Embroidery” and innovative designs combining traditional craftsmanship with modern accessories.

In the future, public policy formulation for this region should continue to deepen the “ecology-culture-economy” trinity support framework. Through institutional innovation, the rights and interests of embroiderers must be safeguarded, enabling Shui Horse-Tail Embroidery to forge a new path of sustainable development and mutually beneficial community coexistence while preserving its ecological foundation and cultural authenticity.

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