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Cultural Ecosystem Services and Sustainable Livelihoods: The Role of Ethnic Traditional Sports in Rural Revitalization in Yunnan, China

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Abstract: Traditional sports are seldom counted as cultural ecosystem services, but in the rural communities we studied in Yunnan they supply a range of non-material benefits that households clearly rely on. This paper asks how ethnic traditional sports function as cultural ecosystem services within the sustainable livelihoods framework, and what they add to human, social, natural, physical, and financial capital. We draw on household surveys (n = 412), participatory rural appraisal workshops, and in-depth interviews (n = 68) conducted in Nujiang Lisu Autonomous Prefecture, Honghe Hani and Yi Autonomous Prefecture, and Dehong Dai and Jingpo Autonomous Prefecture. Survey and modeling results point to five service categories — identity affirmation, social cohesion, knowledge transmission, recreation and tourism, and spiritual wellbeing — with the strongest measured contributions to social capital (mean 4.32/5.00) and human capital (mean 4.18/5.00). Structural equation modeling shows a significant positive effect of sports-mediated cultural ecosystem services on livelihood outcomes ($\beta = 0.437$, $p < 0.001$), routed largely through community social networks and cultural identity. Three livelihood trajectories — cultural entrepreneurship, community-based tourism, and agro-sport integration — carry these services into tangible income and security. The same processes that create value, however, also expose the practices to cultural erosion and elite capture, and we close by considering governance arrangements that could keep the services community-embedded.

Keywords: Cultural Ecosystem Services; Sustainable Livelihoods Framework; Ethnic Traditional Sports; Rural Revitalization; Yunnan; Community Resilience; Intangible Cultural Heritage.

1. Introduction

The cultural ecosystem services (CES) framework was developed to capture the non-material benefits people draw from ecosystems — aesthetic, spiritual, educational, recreational, identity-related[1]. It has moved our understanding of landscape values forward considerably. Yet for all its reach, the literature has mostly treated culture as something ecosystems provide to people. Human cultural practice itself — embodied, place-based traditions such as ethnic traditional sports — has rarely been examined as a source of ecosystem services[2,3]. This matters most in rural development, where cultural practices are often the core resources on which livelihoods are built.

Rural China is a useful place to press this point. Since the Rural Revitalization Strategy launched in 2017, policymakers have searched for development paths that improve livelihoods, preserve heritage, and protect the environment at the same time[4]. The "Sports+" (Tiyu+) initiative has become prominent in this search, but the way it is usually discussed is narrow: infrastructure spending and tourism revenue, with little attention to what traditional sports actually do for the cultural-ecological fabric of a village[5].

Nowhere is the question sharper than Yunnan. The province is home to 25 of China's 56 recognized ethnic minorities, and its traditional sports are deeply woven into local cultural-ecological systems[6]: Lisu crossbow competitions and rope-bridge challenges in the Nujiang Gorge; Hani long-table banquets and ceremonial wrestling among the terraced rice fields of Honghe; Dai peacock-dance martial arts in the tropical borderlands of Dehong; Jingpo munao zongge group dances. These practices encode ecological knowledge, social norms, and cosmological understandings accumulated over centuries[7]. They are not cultural leftovers. They actively produce and reproduce the social-ecological systems in which rural livelihoods are made.

Despite growing recognition of the rural development potential of ethnic traditional sports, significant knowledge gaps persist regarding their specific contributions to household and community livelihoods. Existing research has primarily employed either cultural heritage preservation frameworks, which tend to emphasize static conservation over dynamic livelihood generation, or sports economics approaches, which reduce cultural practices to commodified entertainment products[8,9]. Neither approach adequately captures the multifaceted ways in which traditional sports services contribute to the formation and maintenance of livelihood capitals in rural communities.

We approach these gaps with the Sustainable Livelihoods Framework (SLF) developed by the UK Department for International Development, treating ethnic traditional sports as cultural ecosystem services and asking how they feed the five livelihood capitals[10]. Four questions organize the research: What categories of CES do traditional sports generate in rural Yunnan? How do these services contribute to human, social, natural, physical, and financial capital? Which livelihood trajectories emerge when sports-based CES are mobilized? And what governance challenges follow?

The study contributes on several fronts. For CES scholarship, it shows that services can originate in embodied cultural practice, not only in landscapes and biodiversity. For livelihoods research, it documents concrete mechanisms linking cultural practice to capital formation — a relationship the SLF usually treats only in passing. For policy debate, it offers evidence from one of China's most diverse regions, with comparative value for other multi-ethnic settings. And

for practitioners, it translates the framework into recommendations that can actually be tested in revitalization programs.

2. Literature Review and Theoretical Framework

2.1. Cultural Ecosystem Services: Conceptual Foundations

The ecosystem services framework, formalized by the Millennium Ecosystem Assessment in 2005, divides the benefits ecosystems provide into provisioning, regulating, supporting, and cultural services[11]. Cultural services have always been the hardest of the four to pin down, precisely because they are subjective and place-dependent. The MA defined them as "the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences," and later work has widened the definition to include sense of place, cultural identity, social cohesion, and educational value[12].

More recent CES research has pushed the field toward process: cultural services, on this view, are not handed over by ecosystems but co-produced through human practices, meanings, and relationships with place[13]. Fish, Church, and Winter made this argument influentially, contending that CES are actively created rather than simply provided[14]. If that is right, then human cultural practices — sports, rituals, festivals — belong in the analysis as constitutive elements of CES, not just as beneficiaries.

Operationalizing CES for policy has mostly meant landscape indicators, visitor counts, and stated-preference valuation[15]. These tools have their uses, but they miss what is embodied and performative about cultural services[16]. Traditional sports, which involve direct physical engagement with specific places and social settings, make the gap hard to ignore.

2.2. The Sustainable Livelihoods Framework

The Sustainable Livelihoods Framework, developed by DFID in the late 1990s and refined since, offers an analytical structure for how households build livelihoods inside complex social-ecological systems[10,17]. Its five capital assets are familiar: human (skills, knowledge, health, labor), social (networks, trust, institutional membership), natural (land, water, biodiversity), physical (infrastructure, equipment), and financial (income, savings, credit, remittances). Livelihood outcomes, on this account, emerge from the interaction of these capitals with mediating institutions and vulnerability contexts — shocks, trends, seasonality.

The SLF has traveled well and been applied to rural settings across many regions[18]. Its weakness, for our purposes, is cultural thinness. The five capitals gesture at culture — indigenous knowledge sits inside human capital, ritual networks inside social capital — but the framework never theorizes how cultural practices, symbols, and meanings actually enter livelihood construction[19]. In indigenous and ethnic minority contexts, that silence is costly, because cultural practices such as traditional sports are themselves central livelihood resources.

Scholars have responded in different ways. Soini's work on livelihood capital in highland Kenya argued for cultural capital as a category in its own right, alongside the conventional five[20]. Research on indigenous livelihoods in Latin America has likewise shown how traditional practices sustain the social-ecological relationships on which livelihoods depend[21]. We take a different route here: rather than adding a sixth capital, we treat ethnic traditional sports as generators of cultural ecosystem services that feed into and strengthen the five existing capitals. Cultural economics offers a complementary account of how cultural value, though generated differently from economic value, feeds back into the assets on which livelihoods depend[30].

2.3. Ethnic Traditional Sports: Between Heritage and Livelihood

Three properties of these practices matter for a CES analysis. They are place-based, having evolved in specific ecological settings that supply the material and symbolic resources their performance requires. They are social: putting one on takes collective organization and community participation. And they are transmitted intergenerationally through apprenticeship, so that technical skill, cultural knowledge, and social values travel together[22].

Different disciplines have approached the sports-livelihood connection from their own angles. Sports management research has quantified tourism potential — spending, employment, multipliers[5,23]. Anthropology has documented what these practices do socially: holding communities together, marking seasons and life transitions, managing relations between villages[24]. Heritage studies has concentrated on preservation under outmigration, homogenization, and generational drift[25]. Each of these lenses illuminates something real, but none of them engages the livelihood-ecosystem nexus directly, which is where this study sits.

2.4. Conceptual Framework

We therefore combine the CES and SLF frameworks into one model (Figure 1): ethnic traditional sports generate five categories of cultural ecosystem services, which contribute unevenly to the five livelihood capitals, which in turn produce livelihood outcomes — all of it mediated by vulnerability contexts and institutional processes.

Table 1. Conceptual Framework: Ethnic Traditional Sports as Cultural Ecosystem Services within the Sustainable Livelihoods Framework

CES Category	Description	Primary Livelihood Capital
Identity-affirming	Reinforcement of ethnic identity, pride, belonging, cultural distinctiveness	Human, Social
Social-cohesion	Community building, trust formation, collective action, conflict resolution	Social
Knowledge-transmission	Intergenerational transfer of ecological knowledge, skills, cultural values	Human, Natural
Recreation-tourism	Leisure, entertainment, income generation through visitor attraction	Financial, Physical
Spiritual-wellbeing	Mental health, life satisfaction, spiritual fulfillment	Human, Social

We derived the five CES categories inductively from preliminary fieldwork, then refined them against existing CES taxonomies. Identity-affirming services cover what

traditional sports contribute to individual and collective ethnic identity — pride, belonging, distinctiveness. Social-cohesion services cover their community-building functions: trust, collective action, conflict resolution. Knowledge-transmission services are the intergenerational transfer of embodied ecological knowledge, technical skill, and cultural values through practice and apprenticeship. Recreation-tourism services are the leisure, entertainment, and income functions, for locals and visitors alike. Spiritual-wellbeing services are the contributions to mental health, life satisfaction, and spiritual fulfillment that come from physically engaging with a culturally meaningful activity.

3. Methodology

3.1. Study Area and Case Selection

We used a multiple-case embedded design and selected three ethnic minority autonomous prefectures in Yunnan that differ in ecology, culture, and development: Nujiang, Honghe, and Dehong. Selection was purposive, aiming for maximum variation in ethnic composition, dominant sports forms, tourism intensity, and accessibility.

Table 2. Characteristics of Study Sites

Site	Ethnic Groups	Key Traditional Sports	Ecological Context	HH Survey (n)
Nujiang Lisu AP	Lisu, Nu, Tibetan	Crossbow shooting, rope climbing, river crossing	Alpine gorge, subtropical to alpine	138
Honghe Hani AP	Hani, Yi, Dai	Mud wrestling, dragon bone whip, horse racing	Rice terraces, humid subtropical	142
Dehong Dai AP	Dai, Jingpo, De'ang	Peacock dance, knife dance (Nongxian), cross-border racing	Tropical lowland, border region	132

The three sites contrast sharply. Nujiang, in the Nu River gorge of northwestern Yunnan, is a highland, relatively remote area where Lisu, Nu, and Tibetan communities keep up crossbow shooting, rope climbing, and river-crossing competitions. Honghe, in the southeast, contains the Honghe Hani Rice Terraces World Heritage landscape, where Hani, Yi, and Dai communities practice mud wrestling, fire rituals, and dragon bone whip performances tied to the terrace system. Dehong, on the western border with Myanmar, is tropical lowland; its Dai, Jingpo, and De'ang communities maintain Buddhist-influenced peacock dances, Jingpo knife dances (Nongxian), and sports exchanges across the border.

3.2. Data Collection

Fieldwork ran from June 2024 to May 2025. Four methods were combined:

Household survey (n = 412). We administered a structured questionnaire to randomly selected households in 18 villages, six per prefecture, covering demographics, livelihood activities, sports participation, perceived contributions of traditional sports to each livelihood capital (5-point Likert scales), income from sports-related work, and subjective wellbeing. The response rate was 89.3% (412 of 461 contacted households).

Participatory Rural Appraisal (PRA) workshops (n = 12). Each study village hosted facilitated group exercises: community mapping of sports spaces, seasonal calendars linking sports to agricultural and ecological cycles, wealth ranking, and trend analysis of sports participation and livelihood change over two decades. Groups of 8–15 participants were chosen to span age, gender, and socioeconomic position.

In-depth interviews (n = 68). We interviewed traditional sports practitioners, village elders, government officials, tourism operators, school teachers, and heritage administrators about how the sports have evolved, what they mean for livelihoods today, the threats and opportunities practitioners perceive, and what they think of current policy.

Secondary data analysis. We reviewed policy documents, statistical yearbooks, tourism development plans, intangible cultural heritage registration materials, and the academic literature, to situate the primary data within regional and national trends.

3.3. Data Analysis

Quantitative analysis used SPSS 26.0 and AMOS 24.0. Descriptive statistics characterized the sample and participation patterns; exploratory factor analysis tested the five-category CES typology; structural equation modeling tested the pathways from sports-mediated CES through livelihood capitals to outcomes. Qualitative material from workshops and interviews was transcribed, coded, and thematically analyzed in NVivo 14, following Braun and Clarke's six-phase procedure[26]. Integration of the two strands happened at interpretation: qualitative findings were used to explain what the quantitative results could not.

4. Results

4.1. Cultural Ecosystem Services from Ethnic Traditional Sports

Exploratory factor analysis returned five factors matching the hypothesized CES categories, together explaining 71.4% of total variance (KMO = 0.867; Bartlett's test $p < 0.001$). Table 3 reports loadings, reliabilities, and descriptive statistics.

Table 3. Cultural Ecosystem Services from Ethnic Traditional Sports: Factor Analysis Results

CES Category	Factor Loading Range	Cronbach's Alpha	Mean Score	Std. Deviation
Social-cohesion services	0.72 - 0.88	0.91	4.32	0.71
Human capital services	0.69 - 0.85	0.89	4.18	0.68
Identity-affirming services	0.65 - 0.82	0.87	3.89	0.82
Spiritual-wellbeing services	0.61 - 0.79	0.84	3.71	0.79
Recreation-tourism services	0.58 - 0.76	0.82	3.56	0.91

Social cohesion scored highest (M = 4.32, SD = 0.71), which matches what respondents told us: sports events are when the community actually assembles. A Hani village elder in Honghe put it this way: "When we hold the Kuzhazha festival with the dragon bone whip dance, the whole village

comes together. Decisions about the terraces, about water allocation, about school repairs — these are all discussed at the sports ground[27]."

Human capital followed (M = 4.18, SD = 0.68), especially for physical health, self-confidence, and youth development. Identity-affirming services averaged lower (M = 3.89, SD = 0.82) but varied most across age groups and migration statuses. Recreation-tourism (M = 3.56, SD = 0.91) and spiritual-wellbeing (M = 3.71, SD = 0.79) sat in the middle, with considerable site-level differences.

4.2. Contributions to Livelihood Capitals

Looking across the five capitals (Figure 2), social capital received the strongest overall contribution (composite 4.32), then human (4.18), natural (3.67), physical (3.45), and financial (3.21). The ordering held across sites, but the mix shifted: Nujiang scored higher on natural capital, reflecting the close tie between its sports and forest-ecosystem knowledge, while Dehong scored higher on financial capital, where cross-border sports tourism is more developed.

Table 4. Contributions of Traditional Sports CES to Livelihood Capitals by Study Site

Livelihood Capital	Nujiang	Honghe	Dehong	Overall	F-value
Social capital	4.28	4.35	4.31	4.32	2.14
Human capital	4.22	4.15	4.19	4.18	1.87
Natural capital	3.89	3.52	3.61	3.67	8.42**
Physical capital	3.38	3.51	3.46	3.45	1.23
Financial capital	2.98	3.32	3.35	3.21	6.75**

Social capital, we found, accumulates through several channels at once. Sports associations and festival committees are the most inclusive village-level organizations on offer, open across gender, age, and wealth. Events double as arenas for reputation — performing well earns standing, and standing creates incentives for pro-social behavior. And cross-village competitions build inter-community networks through which resources are shared, disputes mediated, and common causes advanced.

The human capital effects were strongest for young people. Adolescents in sports training reported better school attendance, stronger ethnic language proficiency, and less early outmigration than non-participants. Parents in Honghe credited the apprenticeship structure: "When my son trains in mud wrestling with the old masters, he learns not just wrestling but patience, respect, and how to work with others. These are the skills he needs for life [27]."

4.3. Structural Equation Modeling Results

The measurement model fit acceptably ($\chi^2/df = 2.34$; CFI = 0.94; RMSEA = 0.057; SRMR = 0.048). Table 5 gives the structural results.

The total effect of sports-mediated CES on livelihood outcomes was positive and significant ($\beta = 0.437$, $p < 0.001$), and about 62% of it ran through the livelihood capitals — indirect pathways. Social capital was the single strongest mediator (indirect effect $\beta = 0.156$, $p < 0.001$), followed by human capital ($\beta = 0.089$, $p < 0.01$). The remaining direct effect ($\beta = 0.166$, $p < 0.01$) suggests that traditional sports contribute to livelihoods through channels the five-capital framework does not capture — plausibly cultural resilience, adaptive capacity, and subjective wellbeing.

Table 5. Structural Equation Model Results: Direct and Indirect Effects

Pathway	Direct Effect	Indirect Effect	Total Effect	p-value
CES -> Social capital -> Outcomes	--	0.156	--	<0.001
CES -> Human capital -> Outcomes	--	0.089	--	<0.01
CES -> Natural capital -> Outcomes	--	0.042	--	<0.05
CES -> Physical capital -> Outcomes	--	0.031	--	0.08
CES -> Financial capital -> Outcomes	--	0.027	--	0.12
CES -> Outcomes (direct)	0.166	--	--	<0.01
CES -> Outcomes (total effect)	--	--	0.437	<0.001

4.4. Livelihood Trajectories

Qualitative analysis identified three distinctive livelihood trajectories through which traditional sports CES translate into tangible livelihood improvements:

Cultural entrepreneurship trajectory. Skilled practitioners monetize their expertise — teaching fees, performance contracts, sales of handmade equipment and costumes, social media content. This was most common in Dehong, where cross-border tourism pays for authentic Dai and Jingpo performances. Successful entrepreneurs reported 30,000–80,000 RMB a year from sports-related work, often more than farming yields. But the path is narrow: it favors younger, male, better-educated practitioners with the social capital and digital literacy to find market openings.

Community-based tourism trajectory. Here the community organizes events and experiences for visitors and shares the revenue — village-run wrestling competitions in Nujiang, terrace-festival packages in Honghe, Dai New Year water-sports events in Dehong. Distribution is more equitable than in entrepreneurship, though per-capita returns are lower. Governance is the weak point: free-riding, elite capture of leadership, and friction between authentic practice and tourist expectations.

Agro-sport integration trajectory. A third route folds traditional sports into agricultural production and marketing, adding cultural value to farm products and diversifying household income. The most common form is the harvest-season sports festival that brings urban consumers to buy directly from farmers. In Honghe's Hani communities, the "terraced sports and harvest festival" pairs mud wrestling with rice-tasting, earning ticket revenue and premium prices for terrace rice sold as a culturally authentic product. This trajectory matters disproportionately for women, who dominate agricultural production while men tend to monopolize the performance-oriented entrepreneurship.

5. Discussion

5.1. Theoretical Implications

The findings push the CES framework past its habitual terrain. That ethnic traditional sports generate five distinct service categories, and that these can be measured against livelihood capitals, extends CES analysis from landscapes and biodiversity to embodied cultural practice[2,3]. The theoretical move is to treat these practices as co-producers of cultural-ecological value rather than merely its recipients[14].

The livelihoods side of the argument gains specificity too. Where most SLF applications gesture at "cultural dimensions" in general terms, our data identify concrete pathways: sports associations building social capital, apprenticeship sustaining human capital, place-based knowledge supporting natural capital, venue investment adding physical capital, and tourism revenue supplying financial capital[10,18]. Analysts can use these pathways; so can intervention designers.

The modeling carries one caveat worth repeating. Social and human capital do most of the work: direct effects account for less than 40% of the total. Cultural ecosystem services, it seems, operate through social relationships rather than as individually consumed goods — evidence that favors collective, community-based governance arrangements[13].

5.2. Governance Challenges

Sustainable benefit from sports-mediated CES is possible, but not automatic, and three governance problems stand out. The first is the commodification dilemma. Once traditional sports acquire market value, pressure builds toward standardization, simplification, and spectacle — exactly the qualities that hollow out the cultural depth that made them valuable[28]. Several informants described tourism-oriented performances as "empty shells": visually impressive, culturally thin.

The second problem is capture. Cultural entrepreneurship pays best, and it pays the young, male, and better-educated — those positioned to exploit market openings. Women and elders, who often hold the deepest traditional knowledge, are pushed to the margins of market-oriented development. Community-based tourism distributes benefits more evenly but earns less and governs with difficulty.

The third problem is generational. For all the positive findings, youth participation in traditional sports is falling across all three prefectures — outmigration, digital entertainment, and parental preference for schooling over sport. Left alone, this trend threatens the supply side of the entire CES system. Informants in Nujiang noted that crossbow-making, once central to Lisu masculine identity, is now practiced by fewer than twenty people in the whole prefecture[27].

5.3. Policy Implications

Policy has so far valued traditional sports mainly as tourism assets. The evidence here supports a broader valuation — one that credits their contributions to social cohesion, identity, knowledge transmission, and spiritual wellbeing — and rural development assessment should move past narrow tourism-centric metrics toward multidimensional wellbeing indicators[4,5].

On governance, community-level institutions look more promising than the commodification of individual skills. Village sports associations, inter-community networks, and participatory management mechanisms distributed benefits broadly where they functioned. Honghe's terrace-festival model — collective cultural performance tied to agricultural marketing — is the clearest template we saw.

Education is a second lever. Bringing traditional sports into school curricula serves human capital development and intergenerational transmission at once. The associations we observed — better attendance, stronger ethnic language proficiency, less early outmigration — suggest that well-designed sports-education integration can serve several revitalization goals simultaneously [22].

Heritage policy, finally, must hold two imperatives at once: documentation and preservation, and living practice with room for adaptive innovation. ICH registration brings recognition and resources, but it can freeze practices into standardized forms that drift away from what communities actually need. Policy should protect core techniques and meanings while leaving space for contemporary adaptation[29].

6. Conclusion

This study set out to examine how ethnic traditional sports in Yunnan work as cultural ecosystem services within the sustainable livelihoods framework. The answer, in brief: they generate five categories of CES — identity affirmation, social cohesion, knowledge transmission, recreation and tourism, spiritual wellbeing — that feed the five livelihood capitals unevenly, with social and human capital benefiting most. Structural equation modeling confirms a significant positive effect on livelihood outcomes, mediated largely through those two capitals.

Three trajectories carry these services into livelihood improvement — cultural entrepreneurship, community-based tourism, and agro-sport integration — each with its own distribution of benefits, governance demands, and sustainability risks. Behind the positive headline findings stand three governance problems that will not solve themselves: commodification pressure, elite capture, and generational discontinuity.

Combining the CES and SLF frameworks, we offer a theoretically grounded and empirically tested way to read the livelihood significance of embodied cultural practices. As rural China pursues the multiple objectives of the Rural Revitalization Strategy, ethnic traditional sports look like an undervalued resource — one that can serve economic development, cultural preservation, social cohesion, and ecological sustainability together, provided governance keeps them community-embedded and co-produced.

6.1. Limitations

The design limits causal inference: cross-sectional data cannot settle whether sports participation improves livelihoods or the reverse, so longitudinal work is needed. Three prefectures in one province constrain generalization. Self-reported measures of CES and livelihood capitals may carry response bias, though the mixed-methods design offers some triangulation. And the structural model, however informative, flattens relationships the qualitative data show to be non-linear and context-dependent.

6.2. Future Research

Comparative work in other multi-ethnic regions of China and Southeast Asia would test whether the five-category typology travels, and where it needs revision. Panel studies

would show how sports-based livelihoods evolve and how durable the three trajectories prove. Gender-disaggregated analysis is needed to establish who actually captures the benefits of sports-mediated CES. And experimental or quasi-experimental evaluations of policy interventions would generate evidence about which strategies work, rather than assuming they do.

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