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Research on Rural Ecological Revitalization Path Based on Citespace Theory of Ecosystem

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Abstract

In alignment with China's national rural revitalization strategy and ecological civilization development requirements, this study employs an ecosystem theory framework to analyze core challenges in rural ecological revitalization and propose actionable solutions. As a pivotal component of the "Five Revitalizations" initiative, ecological revitalization serves as the foundation for achieving agricultural powerhouse status, ensuring ecological security, and enhancing public welfare. Research identifies several critical challenges in current practices, including inefficient capital flow and integration barriers, governance failures due to fragmented responsibilities among stakeholders, ecological overburden and landscape fragmentation threatening system stability, as well as weak environmental awareness and outdated living conditions. To address these issues, the paper proposes targeted strategies focusing on resource recycling, collaborative governance, ecological restoration, and the cultivation of ecological culture.

Keywords

Ecosystem theory; rural ecological revitalization; rural revitalization strategy; ecological restoration; collaborative governance; sustainable development.

1. Research Status of Rural Ecological Revitalization

1.1. Research Background and Significance

The 19th National Congress of the Communist Party of China proposed the Rural Revitalization Strategy, designating it as the overarching approach for "agriculture, rural areas, and farmers" (the "three rurals") work in the new era. The five revitalization dimensions—organizational, ecological, cultural, industrial, and talent development—are mutually reinforcing, not only concerning agricultural and rural modernization but also holding significant implications for China's comprehensive building of a modern socialist country[1].

The 19th National Congress of the Communist Party of China made a significant strategic decision on rural revitalization, explicitly stating that ecological revitalization is an indispensable component of rural development. A healthy rural ecological environment not only represents the most inclusive public welfare but also serves as a goldmine for rural prosperity. Only by effectively protecting rural ecological resources and improving environmental conditions—making mountains greener, waters clearer, ecosystems more livable, and environments more conducive to business—can we achieve ecological benefits that truly benefit the people, enrich communities, and enhance livelihoods. This is the essential meaning of rural ecological revitalization[2].

1.2. Research Hotspots and Trends

This study took "rural ecological revitalization" as the theme term and "ecology" as the key section, with a time frame of 2019–2024 and a limitation on journals to core journals such as SCI journals, Peking University Core journals, and CSCCI journals. A combined search was

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conducted on the China National Knowledge Infrastructure (CNKI) advanced search page, yielding 909 journal articles. To enhance the accuracy and representativeness of the literature sample, some journals with low relevance to rural ecological revitalization were manually excluded, resulting in a final selection of 553 journal articles. The collected papers were imported into CiteSpace software for analysis and relevant Excel tables were generated.

Analysis shows that China's annual publication volume on rural ecological revitalization research has maintained a steady growth trend over the past five years. This trajectory can be divided into three phases: The first phase was a brief decline period (2019-2020). While research on rural ecological revitalization remained abundant around 2019, a downward trend emerged in 2020. The second phase marked a stable growth period (2021-2023). Following the 19th National Congress of the Communist Party of China in 2020, which prioritized addressing critical shortcomings in the "agriculture, rural areas, and farmers" sector to achieve comprehensive poverty alleviation, domestic research on rural revitalization surged. Studies related to rural ecological revitalization also increased significantly. The release of the Central Document No.1 in 2023, outlining key tasks for advancing rural revitalization, further propelled research in this field to its peak in 2023. The third phase represents the current development stage (2024-present). Post-2023, research on rural revitalization has shown relative decline. With the nationwide victory in poverty eradication and subsequent policy guidance in 2023, studies in this field have adopted more comprehensive perspectives. However, since 2025, the introduction of the Rural Comprehensive Revitalization Plan (2024-2027) is expected to drive renewed growth in research on rural ecological revitalization[3-7].

Over the past five years, research on rural ecological revitalization in China has exhibited a distinct trend: these studies are closely linked to the context of the new era and the enactment of relevant policies. With the successful completion of the goal to build a moderately prosperous society in all respects, as well as the introduction of initiatives and policies such as "Rural Revitalization," research perspectives aligned with these developments have become a focal point in contemporary academic discourse.

In this study, all retrieved journal articles (a total of 553 papers) were imported into CiteSpace for keyword extraction. The generated keyword clustering map can assist in tracking cutting-edge research hotspots within a specific field.

Cluster keywords #2 (Ecological Livability), #3 (Ecological Civilization), #5 (Ecological Environment), #6 (Ecological Revitalization), and #8 (Three-Sphere Space) focus on discussions of internal ecological issues, primarily addressing solutions to problems within the ecological system. Cluster keywords #0 (Rural Revitalization), #1 (Green Development), #4 (Ecological Agriculture), and #7 (Common Prosperity) represent the intersection between ecological and economic development. Papers in this category emphasize not only resolving internal ecological challenges but also exploring solutions for cross-sectoral issues, with particular emphasis on enhancing economic dimensions.

The aforementioned analysis reveals two prominent trends in China's research on rural ecological revitalization: First, exploring future development possibilities from the perspective of ecological environments themselves, including land use, water resources, and territorial structures. Second, integrating ecology with economic development by adopting innovative agricultural industry models to replace traditional development approaches.

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2. Analysis of Rural Ecological Revitalization under the Theory of Ecological Systems

2.1. Capital Coordination and Flow: Inefficient Allocation and Barriers to Coordination

From the perspective of "energy flow" in ecosystems, rural ecological revitalization funds function similarly to "energy input" within ecosystems, yet current practices exhibit significant allocation inefficiencies and circulation barriers. On one hand, multi-tiered fiscal fund transfers (from central to village-level governments) suffer substantial losses, plagued by delayed disbursements, fund misappropriation, and poor performance outcomes—mirroring the gradual energy depletion in ecosystems. Ineffective fund allocation hinders project implementation, while the predominantly "project-based" one-way funding model limits social capital participation, lacks diversified closed-loop mechanisms, and weakens risk resilience. On the other hand, cross-departmental fund management suffers from "metabolic stagnation" (e.g., inconsistent standards and information silos between housing construction and environmental protection departments) and spatiotemporal misallocation (seasonal/regional distribution imbalances), resulting in fragmented resource distribution patterns.

2.2. Multi-agent Collaboration: Responsibility Ambiguity and Functional Distortion

Within the "interaction" dimension of ecosystems, key stakeholders including governments, enterprises, and farmers have deviated from theoretical ecological niches, exhibiting functional distortions. Governments have transformed from institutional providers into direct implementers, with unclear interdepartmental responsibilities and frequent buck-passing. Enterprises prioritize profit over ecological preservation, reducing resource allocation to short-term behaviors. Farmers, constrained by weak environmental awareness and low education levels, have shifted from active participants to passive recipients, even exacerbating pollution for economic gains, thereby disrupting the classic producer-consumer-decomposer structure. Furthermore, the "information entropy increase" during policy transmission causes grassroots implementation to deviate from policy objectives, rendering negative feedback mechanisms ineffective.

2.3. Ecological Condition Damage: Overloading Capacity and Inadequate Restoration

Rural ecosystems face dual crises regarding stability and resilience. Firstly, excessive cultivation and disorderly development have pushed land use intensity beyond ecological thresholds (e.g., farmland fragmentation>0.35, vegetation coverage <45%), triggering chain reactions such as soil erosion and drastic biodiversity loss. Secondly, overuse of chemical fertilizers and pesticides disrupts soil microbial communities, impedes nitrogen-phosphorus metabolic pathways, leading to fertility depletion and ecological chain disruption. Thirdly, road/waterway construction fragments ecological corridors, while landscape fragmentation extends natural restoration cycles by 3-5 times, resulting in diminished flood regulation capacity and reduced biodiversity functions within ecosystems.

2.4. Environmental Awareness and Human Settlements: Cognitive Deficiencies and Governance Lag

Some rural residents lack environmental awareness, resulting in prominent issues of "dirty, chaotic, and poor conditions" and frequent uncivilized behaviors. Farmers have limited understanding of ecological conservation, excessively using pesticides and fertilizers to boost yields, which exacerbates environmental pollution. Meanwhile, the rural living environment falls far short of modern standards, and negative feedback from human activities has not been

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effectively transformed into driving forces for ecological improvement. This hinders the implementation of the "Two Mountains" philosophy and the progress toward harmonious coexistence between humans and nature.

3. Solutions to Rural Ecological Revitalization Issues

3.1. Optimizing Capital Allocation: Establishing a Multi-stakeholder Collaborative Investment Mechanism

To address the issues of "fragmented funding" and "inefficiency" in rural ecological revitalization, it is essential to establish a diversified investment system featuring "government guidance, market supplementation, and social participation." On one hand, the Public-Private Partnership (PPP) model should be promoted. Through policy tools such as special funds, tax incentives, and fiscal subsidies, enterprises and financial institutions can be encouraged to participate, thereby alleviating government fiscal pressure. On the other hand, fiscal fund management mechanisms need optimization. Simplifying the fund allocation process from central to village-level governments and implementing a "direct fund distribution" system will reduce losses during multi-tiered transfers across provincial, municipal, county, and township levels. Concurrently, ecological project oversight agencies should be established to conduct comprehensive audits throughout fund utilization, ensuring dedicated use of funds. This approach enhances cross-departmental fund coordination efficiency, activates capital circulation effectiveness in ecological conservation and industrial development, and provides stable support for systemic energy-matter flows.

3.2. Promoting Ecological Protection and Restoration: Enhancing System Resilience and Self-healing Capacity

Guided by dual objectives of ecosystem stability and resilience, we implement a "disturbance resistance + restoration promotion" collaborative strategy. On the disturbance resistance front, we strictly delineate ecological protection redlines and enforce rigid controls over key areas including water sources, forests, and wetlands. We optimize land use structures by promoting crop rotation and fallow systems to mitigate ecological damage from overdevelopment. Supporting infrastructure such as sewage treatment facilities and waste management systems is constructed alongside dynamic monitoring networks for critical indicators like air quality, water quality, and soil conditions to enable early risk detection. For ecosystem restoration, we employ integrated approaches including afforestation, soil remediation, and river dredging for degraded ecosystems. Natural recovery is advanced through native tree species cultivation and minimal human intervention, supplemented by artificial measures like soil remediation and vegetation reconstruction. Concurrently, we establish ecological management teams and routine inspection mechanisms, clarifying post-restoration management responsibilities. Institutional safeguards ensure sustainable ecological restoration outcomes, gradually restoring ecosystems' self-regulation and recovery capabilities.

3.3. Strengthening Multi-stakeholder Collaboration: Improving Responsibility Allocation and Co-governance Mechanisms

To address the misalignment of roles among governments, enterprises, and rural communities, a collaborative governance framework integrating institutional constraints, interest alignment, and awareness enhancement must be established. As policymakers and regulatory bodies, governments should prioritize top-level design, dismantle departmental silos through cross-agency coordination mechanisms, incorporate rural ecological revitalization outcomes into functional performance evaluations, and reinforce territorial accountability responsibilities. Enterprises, as market participants, must proactively embrace green development social responsibilities by embedding environmental protection requirements throughout production

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processes and adopting policy incentives to drive eco-friendly transformations. Villagers, as direct beneficiaries of ecological initiatives, require enhanced environmental consciousness through regular education programs and participatory governance. By promoting green technologies like organic fertilizer substitution and biological pest control alternatives to chemical pesticides, they can translate environmental responsibilities into practical actions that "preserve ecosystems while boosting incomes." This ultimately establishes a co-governance model characterized by "government-guided direction, enterprise-driven technological empowerment, and community-led participation."

3.4. Enhancing Environmental Education and Public Awareness: Promoting Endogenous Green Lifestyle

To address villagers 'weak environmental awareness and outdated living conditions, we must drive conceptual transformation through a "cognition-behavior-culture" approach. At the governmental level, ecological conservation should be integrated into rural revitalization evaluation systems, focusing not only on hard indicators like environmental quality but also soft metrics such as villagers' sense of fulfillment. Policy guidance should convey the value proposition that "ecological protection equals productivity development." Socially, a multi-dimensional publicity network combining schools, communities, and media should be established: schools offer eco-practice courses, communities organize waste sorting competitions and upcycling workshops, while new media platforms showcase "eco-friendly success stories" to foster a "green lifestyle for all" ethos. Practically, agricultural experts should be deployed to villages to promote practical technologies like soil testing-based fertilization and eco-friendly pest control. Through comparative demonstrations in model fields, villagers can directly observe income growth effects from environmental actions, gradually transforming external mandates into intrinsic motivation for "green living." This ultimately cultivates a new rural lifestyle prioritizing ecological sustainability and resource efficiency.

4. Conclusion

From the proposal of "Implementing the Rural Revitalization Strategy" in the report to the 19th National Congress of the Communist Party of China to its subsequent endorsement at the Fifth Plenary Session of the 19th CPC Central Committee, this marks a pivotal shift from initial implementation to comprehensive advancement in rural revitalization. It represents a historic realignment of priorities in agricultural, rural, and farmer-related work following the complete victory in the poverty alleviation campaign. As a cornerstone of the rural revitalization strategy, ecological revitalization in rural areas transcends being merely an isolated environmental project. It serves as a critical nexus integrating ecological security, livelihood protection, economic transformation, and cultural upgrading. This initiative not only establishes an ecological barrier safeguarding the sustainable development of the Chinese nation but also functions as a green engine for agricultural and rural modernization. More importantly, it embodies the essence of Chinese-style modernization characterized by "harmonious coexistence between humanity and nature." As exemplified by the Changsha-Zhuzhou-Xiangtan Green Heart initiative: When rural areas regain their pristine landscapes, revitalization gains an enduring source of vitality.

The revitalization of rural ecosystems requires deep adherence to principles of ecosystem integrity, dynamic equilibrium, and co-evolution, establishing an integrated "theory-practice" framework: (1) Functional cycle optimization: Addressing bottlenecks in capital and resource flows by creating efficient direct mechanisms and cross-departmental integration platforms to attract social capital for green industry development, thereby enhancing systemic energy-matter cycle efficiency. (2) Collaborative symbiosis among stakeholders: Defining ecological niche roles for governments, enterprises, and villagers, while strengthening interaction

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effectiveness through digital monitoring and accountability mechanisms. (3) System resilience enhancement: Strictly enforcing ecological redlines to control development intensity, restoring landscape corridor connectivity, and promoting adaptive technologies (e.g., sponge facilities, crop rotation and fallow systems) to improve disturbance resistance and self-recovery capacity. (4) Guidance of humanistic behaviors: Cultivating ecological cultural genes, transforming environmental awareness into sustainable production and lifestyle practices, and driving value-added ecological resources for public welfare.

The future development direction of rural ecological revitalization has seen new expansions, including: Smart empowerment – establishing ecological threshold early warning systems to enable real-time regulation of carrying capacity and biodiversity; Institutional innovation – exploring cross-regional ecological compensation mechanisms and specialized legislation to solidify collaborative governance models; Value elevation – deepening the "Two Mountains" conversion mechanism to create eco-communities that are livable, business-friendly, and tourist-friendly.

Based on ecosystem theory as the cornerstone, a sustainable development paradigm that promotes mutual reinforcement between ecological conservation and rural revitalization can be constructed through four-dimensional synergy: functional optimization, collaborative governance, resilient restoration, and human-driven approaches. The Changsha-Zhuzhou-Xiangtan Green Heart initiative demonstrates that strictly adhering to ecological fundamentals and innovating institutional designs are key to activating rural green momentum, providing a replicable China model for global urban-rural integration.

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