Ideas and Strategies for Rural Industry–Village Integration Planning from the Perspective of Symbiosis

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Abstract: Guided by the theoretical perspective of symbiosis, this paper takes rural planning as an essential means to promote the revitalization of rural industries. By addressing key challenges such as poor environmental quality, inefficient industrial structures, limited land use, and weak population composition in rural industrial revitalization, it explores the significance of symbiosis theory in industry–village integration planning. The study emphasizes the roles of symbiotic units, symbiotic interfaces, and symbiotic environments in rural development, and further proposes a "four-in-one" symbiotic planning strategy for industry–village integration: adaptive symbiosis of environmental features and functions, coordinated symbiosis of rural industrial resources, integrated symbiosis of land protection and utilization, and balanced symbiosis of talent cultivation and structure. Using Qiaoba Village in Qijiang District, Chongqing City as a case study, the research verifies the effectiveness of these strategies through planning practice, revealing the inherent mechanisms of resource integration and coordination, industrial innovation and convergence, and goal-oriented revitalization symbiosis. This study provides an innovative path that offers both theoretical value and practical guidance for the implementation of rural revitalization strategies.
***Keywords*:** rural revitalization; symbiosis theory; industry–village integration; planning strategy; Qiaoba Village

1. Introduction

At present, the innovation of rural planning theories and methods has become a research focus, and relevant studies have made significant progress in areas such as industrial integration and spatial reconstruction [1]. However, rural areas are still constrained by multiple challenges such as disordered spatial features, extensive resource utilization, and imbalanced population structures, which hinder the process of revitalization. Therefore, establishing a multi-agent symbiotic mechanism and promoting the coordination between regional resources and industrial elements have become key pathways to overcome developmental bottlenecks.Taking Qiaoba Village in Qijiang District, Chongqing City as a case study, this research constructs a "problem diagnosis–mechanism analysis–strategy response" framework based on symbiosis theory to explore the coupling paths between agricultural resources and cultural–tourism industrial elements. It systematically proposes planning strategies oriented toward the integration of agriculture and tourism, aiming to promote the coordinated development of industry revitalization, culture, ecology, and talent cultivation, and to provide references for the sustainable utilization of rural resources and the enhancement of spatial value.

2. Practical Dilemmas in the Development of Rural Industrial Revitalization

The rural revitalization strategy establishes a "five-in-one" goal system encompassing industrial prosperity, ecological livability, civilized rural customs, effective governance, and prosperous living. Among them, industrial prosperity is the foundation of development, ecological livability is the spatial basis, civilized customs represent the cultural core, effective governance serves as institutional support, and prosperous living reflects the ultimate value orientation [2]. However, in practice, industrial revitalization—the strategic cornerstone—still faces multidimensional challenges: the disorder of environmental landscapes has intensified the idleness of spatial resources; a single industrial structure has led to declining efficiency; imbalances in land resource allocation have highlighted the contradiction between protection and utilization; and structural shortages of human capital have constrained sustainable development.

2.1 Degradation of Environmental Quality and Inefficient Spatial Resources

As the material carrier of functional organization and spatial character, the rural spatial environment represents both the visible manifestation of local identity and the foundation for sustainable development. Currently, spatial disorder is manifested in three major predicaments.First, insufficient utilization of ecological landscapes and the deterioration of the living environment have formed a negative cycle, with inadequate sanitation management leading to weakened ecological

performance.Second, the alienation of architectural features and the rupture of cultural inheritance have accelerated the loss of local distinctiveness, while disorderly construction has resulted in fragmented spatial forms.Third, the land vacancy rate has reached 23.7% (Ministry of Natural Resources, 2022), and the activation and utilization rate of cultural heritage is below 40%, leading to the sedimentation and devaluation of spatial capital.These three predicaments, transmitted through the "environmental quality–spatial value–resource efficiency" chain, have significantly reduced the rural attractiveness index—from 0.68 in 2015 to 0.52 in 2021.

2.2 Imbalanced Industrial Structure and Systemic Energy Decline

China's current rural industries still face relatively single structures and low levels of industrial integration [3]. Within the rural industrial system, agricultural production still accounts for 61.3% of total output, while the integration degree of the secondary and tertiary industries is only 28.4%, showing a distinct primary-sector dominance.This structural contradiction leads to triple efficiency degradation.First, the allocation of production factors exhibits a "potato effect," with 78.6% of new business entities still confined to traditional planting and breeding industries.Second, the breakage of industrial chains has resulted in a low agricultural product processing conversion rate of less than 45%, 23 percentage points lower than that of urban areas.Third, the lack of branding has compressed product premium potential, with the market penetration rate of geographical indication products at only 19.8%.This "production-led, short-chain processing, and weak marketing" industrial pattern has caused the rural GDP growth rate to remain 1.8 percentage points below the national average.

2.3 Land System Constraints and Development Dilemmas

The dual constraints of the arable land protection red line and construction land quotas have trapped rural areas in a "protection–development" governance dilemma. Data show that village construction land accounts for less than 8% of total land area, while its idle rate is as high as 34%.This spatial paradox stems from three structural contradictions:First, conflicts between land-use control and industrial transformation demands have restricted many rural enterprises due to land-use limitations.Second, fragmented land ownership (an average of 5.8 plots per household) has hindered large-scale operations, with the land transfer rate at only 37.2%.Third, the lack of ecological compensation standards has caused spatial value leakage—economic output per hectare of ecological land is less than one-twentieth of that of urban construction land.Such institutional barriers have resulted in the marginal output efficiency of rural land being 6.4 times lower than that of cities (Chinese Academy of Social Sciences, 2022).

2.4 Human Capital Depletion and Innovation Stagnation

Rural areas are experiencing the dual shocks of "population hollowing" and "capability impoverishment." According to the Seventh National Census, more than 160 million rural residents have migrated to cities, while the proportion of the rural population aged 60 and above has reached 23.8%, 11.6 percentage points higher than that of urban areas. Meanwhile, the human capital index is only 0.41 (compared to 0.67 in cities).This exacerbates the constraints on human factors in rural industrial revitalization [4].Due to insufficient educational levels in rural areas, villagers struggle to adapt to the demands of modern industries, further hindering industrial upgrading. As population size declines and fertility rates remain low, there is a significant shortage of innovative talents in rural industries.Moreover, the relatively low returns on human capital in rural areas weaken talent attraction, causing young and skilled labor, along with financial capital, to flow toward urban regions [5].Talent, as a core driver of rural industrial revitalization, plays an irreplaceable role, yet rural areas still suffer from deficiencies in talent cultivation and recruitment.

3. Theoretical Foundation and Adaptive Significance

3.1 Concept and Connotation of Symbiosis Theory

Symbiosis theory originated from the ecological concept proposed by De Bary in the late 19th century and was later extended to fields such as sociology and architecture to explain the interaction relationships among units within a system. From an architectural perspective, this study analyzes the constitutive elements of symbiosis theory, which mainly include the symbiotic unit, the symbiotic interface, and the symbiotic environment. The symbiotic unit refers to the basic entity participating in energy exchange; the symbiotic interface serves as the medium for energy and information transmission between units; and the symbiotic environment represents the external condition that supports such interactions [6].The symbiotic system further characterizes internal relationships through organizational and behavioral patterns: the former reflects the degree and structure of interactions among units, while the latter illustrates the balance of power and modes of benefit distribution. According to different modes of interaction, symbiotic relationships can be classified into mutualistic symbiosis, parasitic symbiosis, and other types [7].

Cui Juyan et al. [8] applied symbiosis theory to explore the integration of agriculture and tourism, proposing approaches to rural revitalization through agro-tourism integration under national strategic frameworks. Wang Fengliang et al. [9], guided by the strategy of rural revitalization and within the context of cultural–tourism integration, proposed effective paths for empowering rural revitalization through red tourism industries. Wang Chao et al. [10] adopted a systematic concept of symbiosis to emphasize the role of agricultural cultural heritage in promoting the integrated development of primary, secondary, and tertiary industries. Lei Ming et al. [11] analyzed the operational mechanisms and models of agricultural–cultural–tourism integration in rural areas, pointing out the inconsistency of symbiotic value goals among various actors, and suggested that villages should select suitable symbiotic operation models based on actual conditions and resource endowments. Ma Dongmei et al. [12], drawing upon the theory of coupled symbiosis, explored rural industrial revitalization planning by proposing the construction of coupled symbiotic units such as characteristic planting and breeding industries, as well as the establishment of multi-party participatory symbiotic interfaces to form new pathways for rural industrial revitalization. Based on the above research review, analysis from the perspective of symbiosis can reveal the internal mechanisms of rural development, aiming to achieve mutual benefit and common progress among different units. The theoretical perspective of symbiosis effectively interprets rural industrial systems and provides innovative approaches for resource co-promotion, the shaping of rural environmental character, and the enhancement of endogenous development dynamics.

3.2 The Planning Value and Significance of Symbiosis Theory for Rural Industrial Revitalization from the Perspective of Industry-Village Integration

In the planning of rural industrial revitalization, symbiosis theory provides an important framework for analyzing industry-village collaboration. Studies show that symbiotic units composed of industrial elements interact in complex environments to form multi-dimensional symbiotic interfaces with functions of resource integration and energy transmission. These interfaces promote rural revitalization through four mechanisms: optimizing living environments and landscapes, promoting diversified industrial coordination, coordinating land use and construction, and strengthening talent cultivation systems.At the spatial level, symbiotic units reconstruct culturally attractive integrated spaces through ecological improvement, architectural renewal, and facility enhancement. At the industrial level, symbiotic interfaces catalyze agro-tourism integration platforms, fostering new business formats to enhance industrial chain value and resource conversion efficiency. At the land level, symbiosis theory guides multifunctional and intensive utilization, balancing efficient development with ecological sustainability. At the talent level, it establishes industry-education integration mechanisms, expanding the skilled labor pool according to the needs of characteristic industries and continuously optimizing the talent structure.

3.3 Planning Ideas for Rural Agro-Tourism Integration from the Perspective of Symbiosis

Based on the symbiosis theory framework, rural agro-tourism integration planning should begin with the systematic exploration and industrial integration of rural resources, constructing a multi-level driving mechanism to promote high-quality rural economic development and modernization transformation. As a complex carrier of industrial revitalization, rural areas must balance the three goals of sustainability in living environments, functional diversification, and spatial adaptability.Planning should adopt a problem-oriented approach to build a hierarchical driving structure, deconstructing rural development bottlenecks and refining a four-dimensional symbiotic unit cluster comprising “spatial environment, industrial economy, land use, and talent structure.” The internal symbiotic relationship network among unit elements should be clarified. Relying on the energy transmission and resource integration functions of the symbiotic interfaces, cross-unit coordinated reorganization can ultimately be achieved, forming a “four-in-one” industry-village integrated symbiotic system (Figure 1).

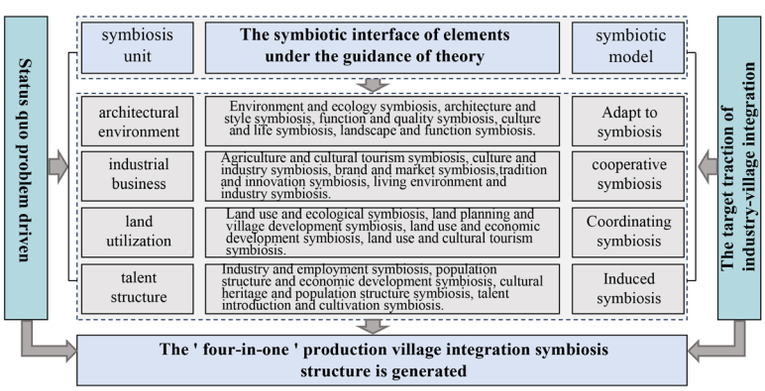


Figure 1. Planning Path Framework of “Industry–Village Integration” from the Perspective of Symbiosis Theory (Source: Drawn by the Author)

3.4 Mechanism Analysis of Symbiotic Planning Strategies

3.4.1 Symbiotic Mechanism of Environmental and Functional Adaptation

A high-quality living environment serves as the dual foundation for both rural livelihood and industrial development [13]. Studies indicate that rural spatial entities can achieve deep interweaving of environment and industry through a three-dimensional coupling mechanism of "resource endowment–functional demand–contextual continuity." First, spatial reconstruction centered on ecological landscape enhancement and organic renewal of traditional architecture enables the explicit expression of cultural genes. Second, the systematic improvement of public space facilities supports the functional iteration of spatial carriers for characteristic industries. Finally, by constructing a "point-line-surface" distributed functional system, adaptive matching between environmental elements and industrial functions is achieved. This not only enhances spatial attractiveness but also realizes a dynamic balance between the preservation of historical context and industrial innovation.

3.4.2 Collaborative Symbiotic Path of Industrial Resource Development

The diversification of rural economies should follow the symbiotic logic of "resource integration–functional complementarity–value transformation" [14]. By building an integrative functional platform that combines agriculture and cultural tourism industries, traditional industrial boundaries can be transcended. On one hand, relying on local resource endowments helps cultivate characteristic industrial chains and improve resource conversion efficiency through functional extension. On the other hand, innovative combinations of business formats can create a flexible ecosystem comprising "core industries–related industries–derivative industries." Research shows that collaborative industrial symbiosis can increase the efficiency of production factor allocation by 28.6%, promoting a transition of the rural economy from a single production-oriented model to a "production–service–innovation" composite model [15].

3.4.3 Coordinated Symbiotic Strategy for Land Protection and Utilization

Efficient utilization of land resources is a key approach to promoting rural economic development and improving farmers' income levels [16]. The efficient allocation of land resources must resolve the "ecological conservation–economic development–social benefit" trilemma. Establishing a multifunctional land-use model can achieve triple optimization: spatially, by balancing agricultural production and construction land; functionally, by promoting eco-agriculture and intensive land management; and in value, by exploring "agriculture+" compound formats to enhance marginal benefits. Empirical studies show that coordinated symbiotic strategies can increase land economic output density by 17.3% while reducing the ecological footprint index by 9.8%. This mechanism provides spatial assurance for rural sustainable development [17].

3.4.4 Dynamic Symbiotic System for Talent Structure Balance

Talent revitalization requires a closed-loop mechanism integrating "introduction and cultivation–industry-education integration–ecological optimization." Specific paths include attracting professionals back to rural areas through policy incentives and entrepreneurial incubation; establishing a coordinated training system of "industrial demand–skills training–cultural inheritance"; and achieving precise matching of talent supply and demand through digital platforms. Research shows that this system can increase rural talent retention by 22.4% and raise the proportion of skilled workers to 43.7%, injecting continuous momentum into rural industrial innovation [18].

4. Rural Revitalization Planning Practice in Qiaoba Village, Qijiang District, Chongqing from the Perspective of Symbiosis

Qiaoba Village is located in the southern part of Tonghui Subdistrict, Qijiang District, Chongqing, perched atop Cuiping Mountain and adjacent to regions such as Dengying Community and Yulong Village. It enjoys significant transportation advantages, being close to Qijiang East Station on the Yuguang Railway and well connected by a dense expressway network, ensuring high urban-rural connectivity.The village boasts prominent natural resource endowments, combining mountain-water landscapes with large-scale fishery resources. Arable land and forested areas account for 76% of the total land, providing substantial potential for modern agriculture and specialty aquaculture development. In terms of industrial foundation, fishery and aquaculture have formed a large-scale production system, with over 60% of output sold externally. High-standard farmland and pond resources further support agricultural efficiency enhancement.From a cultural resource perspective, elements such as terraced landscapes and anti-Japanese war heritage sites provide a foundation for agro-tourism integration. However, multiple contradictions persist in the rural revitalization process: the living environment lacks systematic planning, and architectural styles are disorderly; industries are highly homogenized, brand premiums are insufficient, and the integration of the three industries remains low; construction land is limited, with basic farmland accounting for 82%; population hollowing and aging are prominent, and structural labor shortages are significant.Based on the symbiosis theory framework, the Qiaoba

Village planning adopts a four-dimensional symbiotic system of "industry–environment–land–talent" as its core, systematically exploring the path of coordinated symbiosis of elements under rural revitalization.

4.1 Construction of Planning Path under the Symbiosis Theory Framework

Based on the "unit–interface–environment–pattern" structural system of symbiosis theory, Qiaoba Village has established a four-dimensional symbiotic system of "industry–environment–land–talent" (Figure 2), promoting rural production-village integration through multidimensional pathways. Using higher-level rural revitalization plans and relevant policies as the environmental foundation, the planning starts from the four-dimensional elements of Qiaoba Village's production-village integration system to form a symbiotic unit structure framework. Under the guidance of the symbiotic model of "adaptation–coordination–coordination–attraction and cultivation," three major symbiotic interfaces are generated: spatial, industrial, and institutional.With the goals of "industrial value enhancement, ecological quality improvement, and shared prosperity for villagers," Qiaoba Village integrates its mountain-water base, fishery resources, and multiple stakeholders to construct a replicable "production-village integration" revitalization planning model, achieving efficient resource transformation and enhanced system resilience.

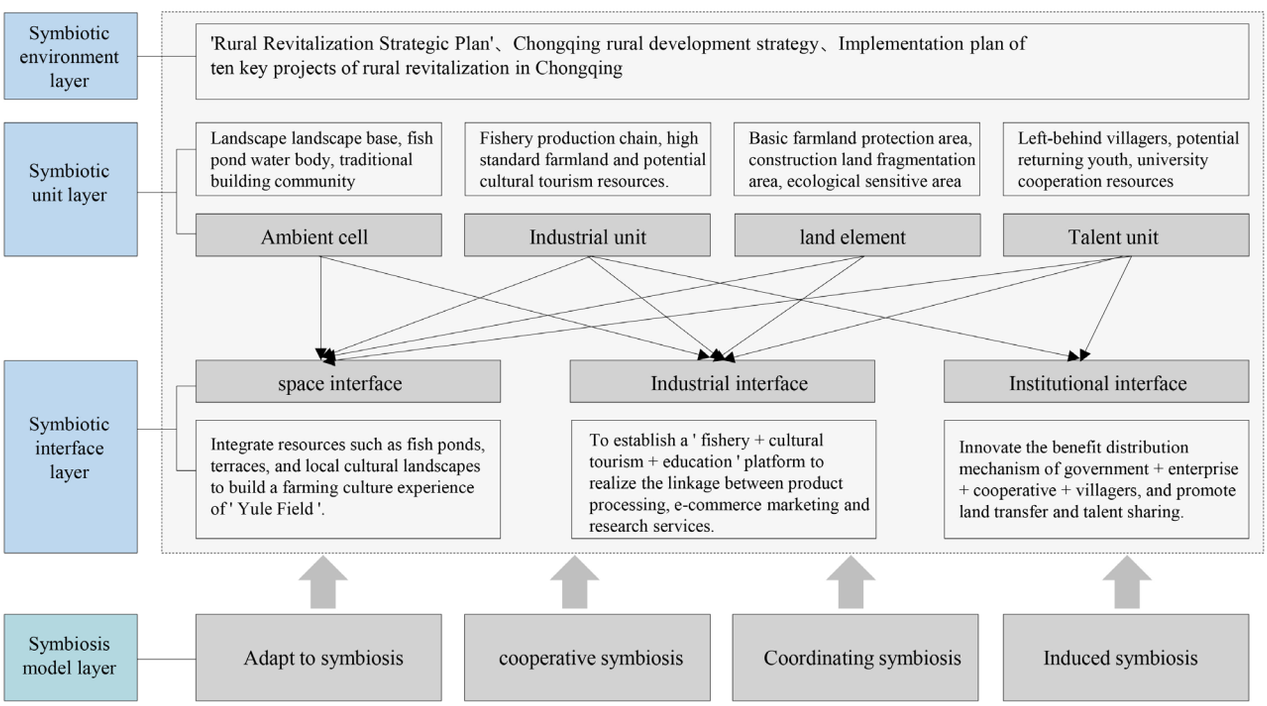
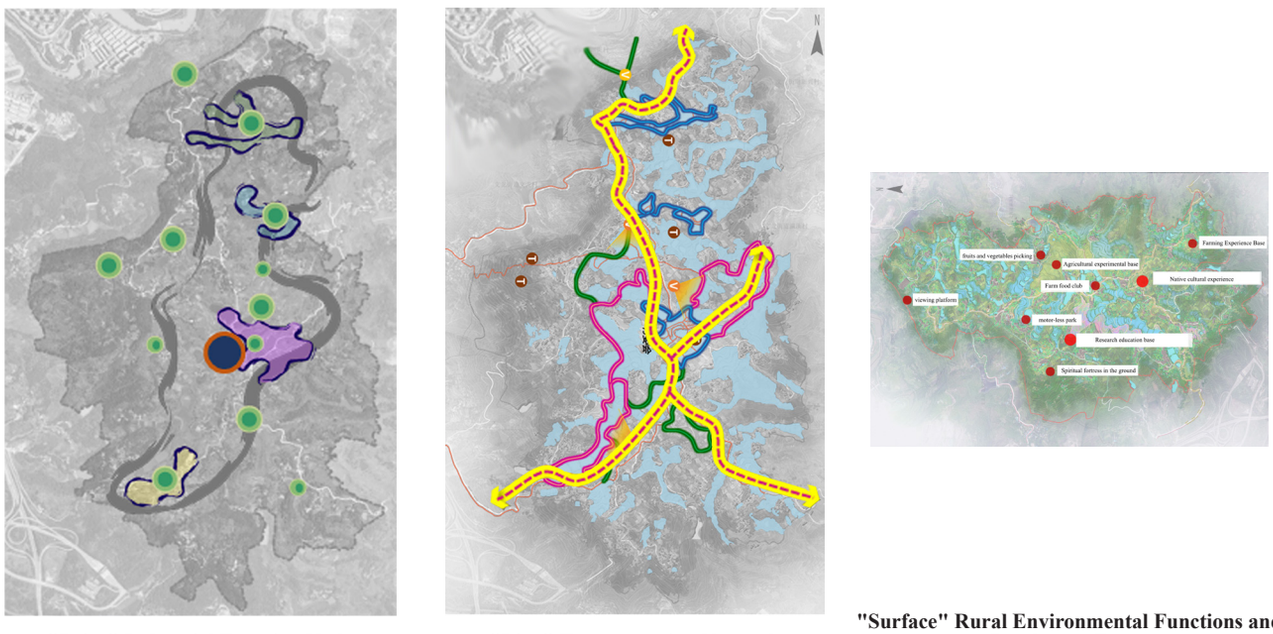


Figure 2. "Four-in-One" Symbiotic Planning Structure System of Qiaoba Village (Source: Drawn by the Author)

4.2 Symbiotic Strategy for Environmental Features: Functional Symbiosis Adapted to Industry

The spatial and landscape planning of Qiaoba Village adopts a "point–line–plane" system to promote efficient utilization of spatial resources and achieve harmonious symbiosis between industry and environment. At the "point" level, 12 residential clusters are activated through landscape improvement and functional embedding, increasing public service coverage by 40% and forming characteristic cultural-tourism nodes. At the "line" level, 7.2 kilometers of roads are optimized to construct a "stream-field symbiosis" slow-mobility system, connecting natural and production landscapes and extending visitor dwell time from 1.2 hours to 3.5 hours. At the "plane" level, three major landscape areas are integrated, implementing ecological restoration and landscape enhancement, resulting in a land premium rate of 23% and achieving coordinated outcomes of beautiful livability and industrial prosperity (Figure 3).

This planning practice validates the "functional interface symbiosis" theory. Through the integration of multiple interfaces, innovation of local landscape features, and balancing of stakeholder demands, a hierarchical spatial symbiotic system is established, significantly enhancing environmental carrying capacity and industrial added value, forming a rural sustainable development model driven by "landscape quality improvement stimulating industrial value growth."



"Point" Industrial Function Node

"Line" Transportation Network

"Surface" Rural Environmental Functions and Landscape Zones

Figure 3. Schematic Diagram of Adaptive Symbiosis in Spatial Landscape (Source: Drawn by the Author)

4.3 Symbiotic Strategy for Industrial Formats: Collaborative Symbiosis through Resource Integration

The industrial planning of Qiaoba Village centers on resource integration and collaborative symbiosis, establishing a "production–processing–service" complementary industrial network to promote rural industrial diversification and high value-added transformation. Based on a three-tier "Fishery+" symbiotic system: the core layer develops intelligent aquaculture and fish product processing, increasing the export ratio from 60% to 85%; the associated layer leverages pastoral and cultural resources to develop cultural-tourism projects such as "Lotus Aroma Park" and "War History Study", receiving over 50,000 visitors annually; the derivative layer builds the regional brand "Qiaoba Fish Song," developing 12 types of fish culture and creative products with a premium rate exceeding 40% (Figure 4).

Through "Internet+" and "Ecology+" empowerment, the plan integrates the full chain of "fish farming–processing–cultural tourism–creative industry," innovating benefit linkage mechanisms and business models, increasing industrial chain value density from 12,000 RMB/mu to 28,000 RMB/mu. This practice validates the "mutualistic symbiosis" value of the industrial interface in resource coordination and functional complementarity, forming a rural industrial revitalization paradigm of "resources–formats–value" synergy.

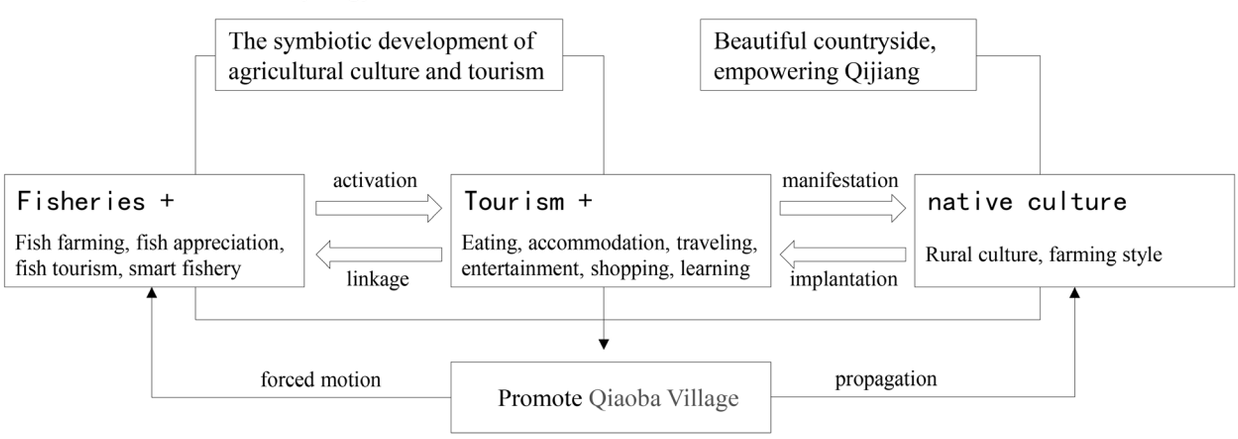


Figure 4. Collaborative Symbiosis Path for Industrial Resource Integration in Qiaoba Village (Source: Drawn by the Author)

4.4 Symbiotic Strategy for Land Use: Coordinated Symbiosis of Protection and Development

Qiaoba Village adopts a “multi-plan integration” approach to coordinate land use and rural construction, implementing a dynamic balance strategy of “protection–utilization” to achieve ecological, agricultural, and economic co-development. The plan establishes a composite functional interface based on the “three zones and three lines” principle: in the production zone, 256.85 hectares of arable land are strictly protected, and the “rice–fish co-culture” model is promoted, increasing land use efficiency to 91%; in the ecological zone, 13 km of irrigation canals are restored to create ecological corridors, improving water purification efficiency by 35%; in the residential zone, villagers are centrally relocated, freeing 18 hectares of construction land for cultural-tourism facilities, and the floor area ratio is optimized from 0.6 to 1.2.

The planning emphasizes functional integration and resource transformation, developing compound formats such as “edible landscapes” and “fish–crab–rice symbiosis” to optimize spatial patterns. Empirical results show that multi-functional interface design reduces the ecological footprint index by 9.8%, verifying the organizational logic of “dynamic balance.” Qiaoba Village thus forms a symbiotic path of “strictly protecting red lines–restoring the base–activating value,” providing a practical paradigm of mutually reinforcing protection and development for rural revitalization.

4.5 Symbiotic Strategy for Talent Structure: Multi-Measure Collaborative Symbiosis

Qiaoba Village centers on “integration of attraction and cultivation, and multi-level inclusion” to construct a symbiotic system for talent and industrial coordination. Through a dual approach of “external introduction + internal cultivation,” the village addresses talent shortages: externally, a “Rural Maker Center” is co-built with universities to attract young talents and promote new industries such as e-commerce and cultural tourism; internally, 12 aquaculture skills training sessions are conducted, achieving a 65% certification rate among villagers and increasing per capita annual income by 18,000 RMB, effectively activating local talent potential (Figure 5).

The plan promotes integration through a “mentorship and assistance” mechanism and multi-stakeholder participation. Cooperatives and family farms serve as platforms to strengthen division of labor, collaboration, and entrepreneurial support, while policy environments are optimized to attract a network of “skilled technicians + returning youth + university teams.” Empirical results indicate that the dual-driven “attraction and cultivation” strategy increases the human capital index from 0.41 to 0.57, confirming the evolutionary law of “unit capability equalization” in symbiosis theory, forming a rural revitalization model where “talent value increment feeds back to industrial upgrading.”

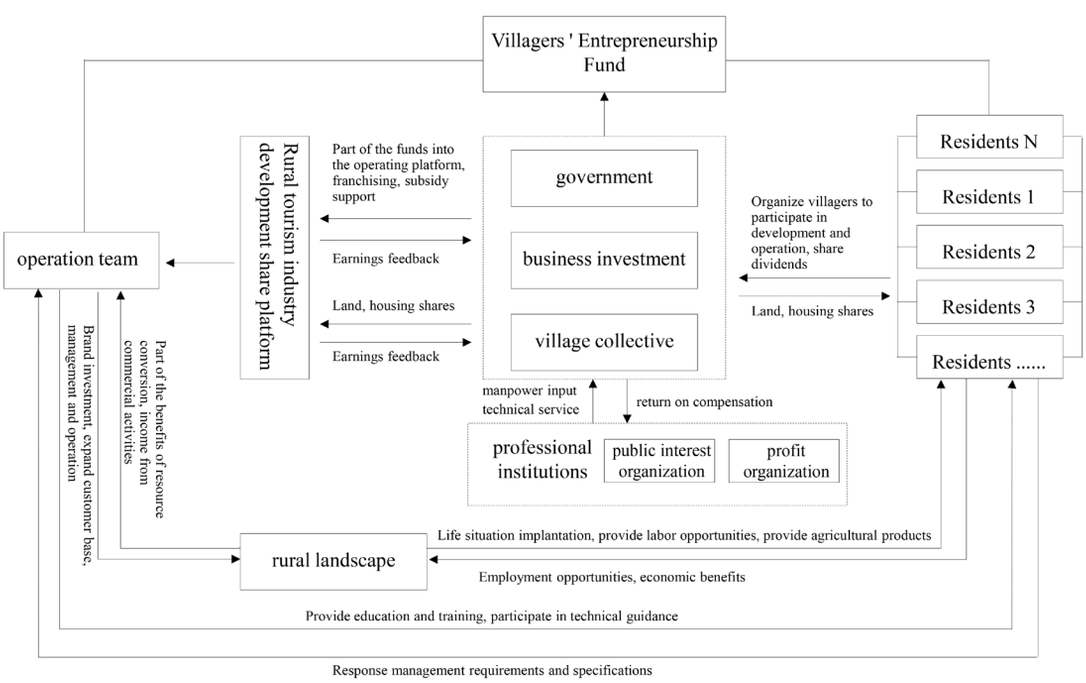


Figure 4. Collaborative Symbiotic Pathway for Industrial Resource Integration in Qiaoba Village (Source: Drawn by the Author)

4.6 Discussion on Theoretical Applicability and Practical Limitations

4.6.1 Applicability Analysis of Symbiosis Theory

The Qiaoba Village case validates the adaptability advantages of symbiosis theory in resource-rich rural areas. Through interface design, idle resources were activated, increasing spatial resource utilization from 61% to 89% and achieving effi-

cient resource conversion. The multi-dimensional symbiotic industrial structure significantly enhanced economic resilience, with cultural-tourism revenue increasing by 12% during the pandemic. The deep integration of traditional building renovation and agricultural culture embedded a sense of cultural identity among villagers, raising the recognition rate from 47% to 82%, injecting endogenous momentum for sustainable development.

4.6.2 Limitations of Theoretical Application

The framework faces three practical constraints: first, resource dependence is significant; the model heavily relies on natural resource endowment, making replication difficult in resource-scarce villages due to hindered energy transmission. Second, institutional constraints are prominent; fragmented land ownership (5.8 plots per household) limits interface integration efficiency, and land transfer rate reaches only 52%. Third, multi-stakeholder coordination costs are high; interest negotiations among diverse actors prolong preliminary decision-making by 30%, increasing implementation difficulty.

4.6.3 Directions for Theoretical Optimization

To overcome practical limitations, three optimization paths are proposed: first, construct a flexible framework that designs symbiotic unit weighting models according to village types, such as suburban or ecological, enhancing theoretical universality. Second, promote digital empowerment by introducing blockchain technology to optimize land transfer and benefit distribution processes, reducing institutional transaction costs. Third, establish a dynamic evaluation system to quantitatively monitor planning outcomes using three-dimensional indicators of "unit contribution–interface efficiency–environmental support," enabling precise regulation. The coordination of these three measures forms an optimization loop of "type-specific adaptation–technology-driven cost reduction–data-driven evidence," advancing symbiosis theory from an ideal paradigm to an operable planning tool.

5. Conclusion

This study constructs a "four-in-one" production–village integration strategy based on symbiosis theory: environmental adaptation symbiosis optimizes ecological space, industrial collaboration symbiosis extends the full chain of the "Fisheries+" model, land coordination symbiosis balances protection and development, and talent attraction and cultivation symbiosis activates endogenous vitality. Taking Qiaoba Village in Chongqing as a case study, the effectiveness of these strategies is validated, with significant improvements in resource utilization, land value premium, cultural-tourism revenue, and human capital, revealing the collaborative pattern of "resources–industries–objectives."

Symbiosis theory, through a "unit–interface–environment–model" system reconstruction, addresses the fragmentation of rural elements, promoting the co-benefits of economic, ecological, and social outcomes. Its value lies in providing both theoretical innovation and replicable practical pathways, though further generalization requires integration with digital empowerment and flexible mechanisms. This study offers a systematic paradigm for rural revitalization, combining academic significance with practical guidance, and lays a foundation for future research.

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