

# Relationship between Rural Industry Revitalization and Land Resource Utilization and Its Practice in Ganning Town, Wanzhou District of Chongqing

Jinrong YANG, Linlin CAO\*, Zisheng YANG

Institute of Land & Resources and Sustainable Development, Yunnan University of Finance and Economics, Kunming 650221, China

**Abstract** [Objectives] To explore the relationship between rural industry revitalization and land resource utilization. [Methods] Starting from the connotation of rural industry revitalization and land resource utilization, this study explores the relationship between rural industry revitalization and land resource utilization, Taking Ganning Town with typical mountain industry as the research area, this paper analyzed the relationship between rural industry revitalization and land resource utilization through a combination of field research and literature analysis, found out the existing problems and came up with pertinent recommendations. [Results] (i) Rural industry revitalization is both mutually reinforcing and mutually restrictive. (ii) In this study, the land use types of Ganning Town were divided into nine categories, including farmland, garden land, forest land and grassland, and their industrial functions and development models were identified, and the corresponding framework of land resource utilization and rural industry revitalization in Ganning Town was constructed. (iii) In view of the problems existing in Ganning Town, this paper proposed to change the ideological concept and enhance understanding, improve the utilization rate of idle land and promote rural industry revitalization, and accelerate land consolidation and restoration, and promote sustainable development. [Conclusions] It is necessary to correctly understand the two-way role and dynamic change relationship between rural industry revitalization and land resource utilization, solve the problem from the perspective of development, adopt development strategies according to local conditions, and take the road of sustainable development.

**Key words** Rural industry revitalization, Land resource utilization, Relationship, Ganning Town in Chongqing

## 1 Introduction

The No.1 central document in 2023 stated that the most arduous and onerous task in building a modern socialist country in all respects is still in the rural areas<sup>[1]</sup>. Industrial prosperity is the priority work in rural revitalization<sup>[2]</sup>, and land is the foundation of rural development. Studying the relationship between the two is of great significance for promoting agricultural production increase, increasing farmers' income, narrowing the urban-rural gap<sup>[3]</sup>, and promoting the agricultural and rural modernization. The key to rural revitalization is industrial revitalization. From the research of China's industry-driven rural development, it can be mainly divided into two stages: the first stage is the stage of industrial poverty alleviation, and the second stage is the stage of industrial revitalization<sup>[4]</sup>. Promoting industrial development in the new stage is the key to realizing rural industry revitalization, identifying regional characteristic resources, guided by market demand, developing characteristic industries, and making economic benefits for farmers in a more and better way<sup>[5]</sup>. For rural industry

revitalization, land is the carrier<sup>[6–8]</sup>, and in the context of the new era of focusing on the pursuit of high-quality development, it is of great significance to clarify the relationship between rural industry revitalization and land resource utilization<sup>[9]</sup>, and many experts and scholars have also made extensive studies on this issue.

Taking rural industry revitalization, land resources and land use as the core words, we searched and analyzed the relevant literature at home and abroad, and found 12 500 articles related to "rural industry revitalization" and 53 100 articles related to "land resources". Domestic research on the concepts of "rural industry revitalization" and "land resource utilization" usually takes the following two aspects as the starting point: (i) to comprehensively promote rural revitalization, we must promote the modernization and development of the rural industrial system<sup>[10]</sup>, combine factors such as population, land, and industry, rely on the advantages of rural location, develop regional characteristic industries according to local conditions, and promote the integration of rural industries; (ii) in the critical stage of comprehensively promoting the rural revitalization strategy, it is necessary to start with land consolidation, deepen the reform of the land system<sup>[11]</sup>, improve the efficiency of land resource utilization, promote the transformation of land use methods, ensure the balance between supply and demand of rural land use functions, so as to help rural industry revitalization<sup>[12–14]</sup>. However, there are few studies placing "rural industry revitalization" and "land resource use" at the same research level to study their relationship<sup>[4]</sup>.

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Jinrong YANG, master candidate, research fields: land resources and land use, urban and rural development and rural revitalization.

\* Corresponding author. Linlin CAO, master candidate, research fields: land resources and land use, urban and rural development and regional sustainable development.

Starting from the two key elements of rural industry revitalization and land resource utilization, we explored their relationship, and used Ganning Town, Wanzhou District, Chongqing as the research area to demonstrate the relationship between them. Ganning Town is located in a mountainous area, with serious surface rock desertification and inherent ecological vulnerability<sup>[15]</sup>. In such areas, the contradiction between population-resources-environment and economy is usually very prominent<sup>[16]</sup>, but the advantageous industries in this area are prominent, the overall industrial development is good, and the industrial synergy is strong, so it is typical as a research area. In addition, we analyzed the shortcomings between the current land resource utilization and rural industry revitalization, and came up with some recommendations, in order to provide a certain reference for the research on rural industry revitalization and land resource utilization in China, and provide a certain reference for the planning and layout of the same type of area.

## 2 Connotation of rural industry revitalization and land resource utilization

**2.1 Rural industry revitalization** The key to rural revitalization is industrial revitalization. Rural industry relies on agricultural and rural resources and takes integrated development as the path, and has significant regional characteristics. Rural industry revitalization is not only an important means to increase farmers' income<sup>[17]</sup>, but also a key element to ensure stable social and economic development<sup>[22]</sup>. At present, there is no clear definition of rural industry revitalization, it is generally believed that rural industry revitalization is the common revitalization of all industries involved in rural development, so as to promote rural economic development and increase the income of villagers. According to the relevant elaboration of rural industry revitalization in the *Strategic Planning for Revitalization of Rural Areas* (2018 – 2022) issued by the Central Committee of the Communist Party of China and the State Council<sup>[19]</sup> and the No. 1 central document<sup>[1]</sup> in 2023, it can be considered that rural industry revitalization is to pursue the maximization of farmers' value-added income and strengthen innovation in systems, technologies and models, promote the integrated development of rural industries, promote the high-quality development of the industrial economy, and achieve "industrial prosperity". The key to achieving rural industry revitalization lies in the following aspects.

**2.1.1 Integrated development of industries** is a key path for rural industry revitalization. The integrated development of rural primary, secondary and tertiary industries can significantly increase the income level of farmers<sup>[20]</sup>, which is the key path to effectively promote the masses to increase income and become rich<sup>[21]</sup>. It is of great significance to promote rural industry revitalization, boost rural agricultural restructuring, high-quality development of rural economy, and coordinated development of urban and rural economy. To promote the integrated development of rural industries, it is necessary to rely on regional resource advantages, take industry

as the core, develop a new rural collective economy with high economic returns and strong radiation driving ability, and consolidate the foundation for industrial integration and development.

**2.1.2 Industrial innovation and development empowers rural industry revitalization.** Rural industry revitalization is to optimize and upgrade the local industrial structure, coordinate the allocation of labor, capital, resources and other factors, so as to greatly improve the scale and economic benefits of rural industries and achieve sustainable development of rural industries. In recent years, China's new rural industries and new models have developed rapidly, and the rural industrial system has become increasingly perfect, which attracts many industrial and commercial enterprises to invest in the rural areas and cultivating new momentum for the development of the new rural collective economy.

**2.1.3 The development of agricultural industrialization** is the only way for rural industry revitalization. At present, China's economy has entered a stage of high-quality development, and agricultural production must also meet the needs of economic development and realize the transformation from quantity to quality. Agriculture is the basic industry and the most important industry in rural areas, and the development of agricultural industrialization is a powerful measure to drive farmers to increase income. For rural industry revitalization, the top priority is to carry out agricultural transformation and upgrading, promote agricultural quality and efficiency, cultivate and expand characteristic industries, extend the industrial chain, and realize agricultural and rural modernization.

## 2.2 Connotation of land resource utilization

**2.2.1 Connotation of land resource.** Land resources refer to all land that is useful to human beings<sup>[22]</sup>, there is no absolutely useless land<sup>[23]</sup>, only land that has not yet been exploited. Therefore, from this point of view, land itself is a resource<sup>[22]</sup> and it has both "quality" and "quantity" aspects. Now, China is in a new stage of comprehensively promoting rural revitalization, land resource endowment is the fundamental factor of rural industry revitalization development, rational utilization of land resources is the source of support and guarantee the healthy and sustainable development of agriculture and rural areas, and has a far-reaching impact on promoting the high-quality development of rural economy.

**2.2.2 Connotation of land resource utilization.** Land resource utilization refers to the use, protection and transformation of land resources by human beings for economic and social development. The ways of land resource utilization are diverse, from the perspective of large-scale agricultural utilization, including tillage utilization, forestry, animal husbandry utilization, fishery utilization, etc.<sup>[22]</sup>. Limit is one of the characteristics of land resources, which requires people to extensive, full, scientific and rational use of land resources. To this end, it is necessary to establish the concept that all land can be used and that every piece of land must function as much as possible<sup>[22]</sup>. With the development of social economy and science and technology, land resource use has shown diversified characteristics. Therefore, it is necessary to study the use of land resources from a long-term and development perspec-

tive in order to achieve the sustainable use of land resources.

### 3 Discussion on the relationship between rural industry revitalization and land resource utilization

Land is a key element for industrial prosperity<sup>[24]</sup>. Rural industry revitalization and land resource utilization are both mutually promoting and restrictive. The efficiency of land resource allocation is an important indicator to measure the level of regional economic development<sup>[25–26]</sup>. Scientific, rational and effective use of land resources can promote rural industry revitalization. Besides, rural industry revitalization will also have a certain positive feedback effect on land resource utilization, and the economic benefits brought by industrial development will promote the upgrading of rural land resource structure and the optimization of spatial layout. It is necessary to accelerate the development of rural industries, break through the bottleneck of industrial land constraints, deepen land use security, improve land supply capacity, save and intensive use of land<sup>[10]</sup>, and finally achieve sustainable land use. From this perspective, it can be said that rural industry revitalization and land resource use are mutually promoting. However, it cannot be ignored that once misuse or abuse of land occurs, it will greatly restrict the development of rural industries; the slow development of rural industries will also force rural residents to blindly pursue industrial development and economic benefits, thus ignoring the rational use of land resources. Therefore, both are mutually restrictive.

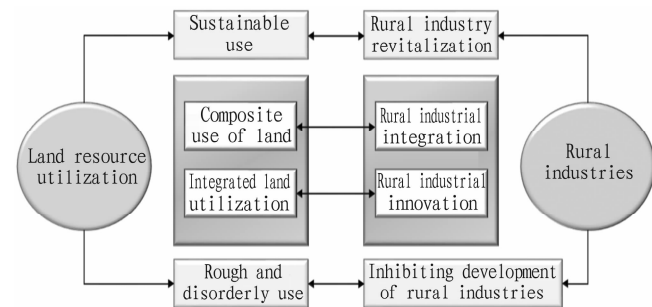


Fig. 1 Relationship between rural industry revitalization and land resource utilization

#### 3.1 Rural industry revitalization and land resource utilization promoting each other

**3.1.1 Simultaneous development of rural industrial integration and composite land utilization.** At present, the forms of rural industrial integration in China are gradually diversified, and the degree of integration is also deepening, from the integrated development between primary industries such as rice-fish symbiosis and understorey aquaculture to the integrated development of multiple industries including agriculture, cultural tourism, research and learning, and health care. The deep integration of rural industries has broken the conventional classification of land use, and the use of land resources has also shifted from single to complex. Many agricultural land and construction land have superimposed tourism and ornamental functions on the basis of maintaining their original land use functions, making land use more diverse.

**3.1.2 Rural industrial innovation and layout optimization and overall land utilization promote each other.** Rural industry is a functional complementary or similar industrial aggregate with spatial aggregation characteristics. It is necessary to develop rural industries according to local conditions, invest in scientific and technological elements, and create industrial innovation. When optimizing the spatial layout of rural industries, we should pay attention to the systematization and comprehensiveness, not only corresponding to the rural industry in terms of content, but also matching with rural life and ecological space. When formulating rural spatial planning, it is necessary to focus on the two needs of all-factor territorial spatial planning control and rural development space utilization<sup>[27]</sup>. To realize the rational layout of rural industrial space, it is necessary to scientifically coordinate regional land resources, take the "three areas and three lines" management and control system as the guide, scientifically prepare plans, improve land use efficiency, promote the development of new industries and new formats in rural areas<sup>[28]</sup>, and promote the overall utilization of rural land resources and the continuous extension of the industrial chain.

**3.2 Rural industry revitalization and land resource utilization mutually restrictive** Land is the spatial carrier of human social life, labor and generating economic income<sup>[29]</sup>, rural industry development relies on the rational development and utilization of land resources, rural industry is based on agricultural resources, has distinct regional characteristics, can effectively promote increase of farmers' income. However, factors such as limited land resources, misuse of land, and unreasonable spatial layout will restrict rural industry revitalization. In addition, if the development of rural industries is slow, it cannot bring economic benefits, and in the process of pursuing economic development, rural areas may not have time to take into account the rational use of land resources, resulting in the abuse and destruction of land resources, the loss of land fertility, and the unreasonable spatial layout, ultimately failing to realize sustainable development. Therefore, it is necessary to fully understand the connotation of rural industry revitalization and land resource utilization, put them on the same status, pay the same attention, coordinate the relationship between them, and realize the resonance of rural industry revitalization and sustainable use of land resources simultaneously.

### 4 Practice of the relationship between rural industry revitalization and land resource use in Ganning Town

#### 4.1 General situation of the study area

**4.1.1 Geographical location.** Ganning Town is located on the north bank of the Yangtze River, 25 km away from Wanzhou City, bordered by Gaofeng Town to the east, Yangtze River to the south, Longsha Town to the west, and Zhushan Township to the north. It is 12 km away from the railway station and highway, 25 km away from the deep-water wharf, 40 km away from Wuqiao Airport, and the G348 national highway and provincial highway 103 cross the town, with highways extending in all directions. According to the Statistical Yearbook of Chongqing Wanzhou District in 2022<sup>[30]</sup>, by the end of 2021, the jurisdiction area was 104.81 km<sup>2</sup>, with 28

villages (residences) under its jurisdiction, the rural permanent population was 52 000, and the per capita disposable income of rural residents was 20 859 yuan.

**4.1.2 Geomorphological conditions.** Ganning Town is located in the eastern section of Fangdou Mountain Range, belongs to a typical karst landform, surrounded by mountains, the terrain is mainly gentle hilly landform, is high in the middle and low in the periphery, the slope of farmland above 15 degrees is relatively low, the terrain is less undulating, the highest peak in the territory Huangxingzhai is in the territory of Gaoqiao Village, 847 m above sea level, and the lowest point, Yanghe Creek, is located in Jiangjia Village. The special mountainous and hilly landforms have given birth to 2 district-level rivers, 3 town-level rivers and 12 reservoirs, as well as the well-known wetland landscape Wanzhou Waterfall. Ganning Town is called by the people of Wanzhou as a "treasure town" far away from the hustle and bustle of the city and breathing freely.

**4.1.3 Resource conditions.** As to the climatic conditions, the climate of Ganning Town belongs to the warm and humid central subtropical southeast monsoon climate, mild climate, sufficient sunshine, four distinct seasons, annual average temperature of 18.1 °C, annual average rainfall of 1 293.3 mm, annual average sunshine of 1 204.5 h, annual average absolute humidity of 17.6 mm, relative humidity of 81%, frost-free period of 260–283 d. The quality of air, soil and water resources is high. From the perspective of land resources, the types of land in Ganning Town mainly include forest land, farmland, collective construction land, rural residential land, transportation and water conservancy land, etc. Farmland area is 4 500 ha, an effective irrigation area of 1 900 ha, and a crop sown area of 5 600 ha. Farmland is mainly used for rice cultivation, fish pond farming, vegetable and fruit cultivation, etc. In terms of landscape ecological resources, Ganning Town is located in the central boundary of 4A forest park, with a forest area of 3 920 m<sup>2</sup>, a forest coverage rate of 50.19%, rich forest resources, and 99 families, 255 genera and 506 species of trees. The air in Ganning Town contains a large number of negative oxygen ions, the air quality is high, and the air is fresh and pollution-free.

**4.1.4 Industry overview of Ganning Town.** For the primary industry, agriculture is based on the cultivation of rice, maize, beans and potatoes, it produces high quality fruits such as citrus, cinnamon, pear, plum, loquat and tribute peach. Ganning rice is moist and fragrant, and is quite famous in Chongqing and is well received by the public. Swine, waterfowl and fishery have formed industrialized production bases, and rice fish farming, Chinese medicinal materials, Japanese meat rabbits, straw amination cattle breeding, etc. have been listed as key development projects for efficient agriculture. Ganning Town has built a modern agricultural industrial system with late-ripening citrus and vegetables as the backbone, supplemented by efficient grain and oil, characteristic flowers and famous aquatic products, and agricultural industrialization has become an important model of its rural economic development. Tongxin Vegetable Grand View Garden, which represents the highest level of agriculture in the west, has become a display window for Wanzhou agriculture. The Ganning Sericulture Base of

Chongqing Three Gorges Academy of Agricultural Sciences, the Rare Fish Breeding Base in the upper reaches of the Yangtze River of Wanzhou District Fisheries Research Institute, and the Experimental Base of Wanzhou District Rose Orange Research Institute have also taken shape. In terms of secondary and tertiary industries, a large number of high-quality agricultural products have become an effective industrial support for promoting the economic development of Ganning Town. Ganning Town uses policy support and investment to develop the agricultural product processing industry, build a local agricultural product processing extension to various planting bases and parks, move the processing of agricultural products to the field, and realize the integration of "characteristic planting and preliminary processing". Supermarkets for agricultural products and handicrafts have been built to drive villagers to carry out handicraft culture and creativity and sell special agricultural products. Ganning Town has also formed an economic development pattern with silk, carpet, construction, building materials and other enterprises as the backbone. Silk, carpet and other products are exported to Japan, the United States, Canada and Western Europe. In addition, social undertakings in Ganning Town have developed by leaps and bounds. Cultural and entertainment facilities are complete, optical fiber encrypted TV villages are connected, medical facilities are advanced, education is booming, and finance, insurance and postal services are more and more prosperous. Relying on the characteristics of local resources and the rapid development of local folk customs, Ganning Town will create a modern agriculture integrating sightseeing, leisure, picking and ecology with folk culture tours, ecological agricultural tours and farm style tours, integrate unique, rich, diversified and three-dimensional tourism resources, and comprehensively set up an ecological leisure tourism base that radiates the surrounding areas. At present, starting from local resource endowments, Ganning Town is focusing on promoting the landscaping of agricultural parks and the modernization of agricultural industries. Ganning Town is actively establishing a national agricultural science and technology park, an industrial strong town and a rural revitalization demonstration town, accelerated the creation of a municipal agricultural characteristic town, and strived to build Ganning into a rural meeting room in Wanzhou at the end of the 14<sup>th</sup> Five-Year Plan.

## **4.2 Relationship and practice between rural industry revitalization and land resource utilization in Ganning Town**

The rural industry revitalization of Ganning Town is closely related to land resource utilization, adhering to the concept of innovation and development, exploring different industrial functions and supporting industrial development models according to different land use types, so that the rural industrial development and land resource utilization in the area form a benign interaction. Based on the *Current Land Use Classification* (GB/T21010–2017)<sup>[31]</sup>, this study divided the land use types into nine categories: farmland, garden land, forest land, grassland, residential land, commercial land, land for public management and service, land for waters and water conservancy facilities, and land for industrial and mining warehousing. The industrial functions and development models of these nine types of land were identified, and the corresponding frame-

work of land resource utilization and rural industry revitalization in Ganning Town was constructed (Table 1).

**Table 1** Corresponding framework of land resource use and rural industry revitalization in Ganning Town

Land use type	Industrial functions	Industrial development model
Farmland	Rice-fish symbiosis	Agricultural sightseeing (farming experience)
Garden land	Orchard	Sightseeing and picking
Forest land	Forest	Natural ecology
Grassland	Green space	Recreational farm
Residential land	Buildings	Fine B&B
Commercial land	Catering and farm stays	Specialty catering
Land for public management and service	Parks and shared farms	Scenic sightseeing
Land for waters and water conservancy facilities	Lotus ponds, water wheels	Landscape agriculture
Land for industrial and mining warehousing	Warehousing	Logistics industry

**4.2.1** Composite use of land to create a new model of agricultural industry such as rice-fish symbiosis. Relying on the endowment of land resources, Ganning Town actively tried and promoted compound planting and breeding, and promoted the "rice + " industrial model through production systems such as "rice oil crops" drought and water rotations, rice-fish symbiosis, rice and economic rotation, and rice-poultry collaboration, which improved land use efficiency, increased the output value per unit area of agricultural land, and mobilized farmers' enthusiasm for growing grain. In agricultural production, Ganning Town adheres to the comprehensive management of field, soil, water, roads and forests, promotes irrigation, drainage, transportation, infrastructure construction and agricultural mechanization, and promotes the development of new agricultural formats, to help rural industry revitalization. In view of the good economic and ecological benefits of the rice and fish breeding model, Ganning Town has now built 66.67 ha of rice and fish breeding, and Ganning Town has continuously opened up ditches and strengthened infrastructure construction, and the high-quality rice produced by rice and fish comprehensive cultivation and breeding can reach 8 250 kg per hectare, and more than 1 500 kg/ha of rice fish in paddy fields, increasing the economic benefits of 75 000 yuan/ha, truly realizing the good ecological benefits of rice-fish symbiosis, mutual use of waste and space sharing. In 2022, 53.33 ha of rice and fish bases were added in Ganning Village, Yongsheng Village, Shimiao Village and other villages, and the large grain farmers in the jurisdiction will be gradually guided to explore multi-form three-dimensional circular ecological breeding models.

**4.2.2** Using land according to local conditions and developing late-ripening citrus land. Ganning Town is located in the Ganning River and Tongping River Basin, and most of the area under its jurisdiction is relatively flat, with fertile soil and low altitude. Its climate is "high effective accumulated temperature, rapid recovery of ground temperature in early spring", and rare extreme climate in winter, with an annual frost-free period of 299 – 320 d, belong to a unique flat dam small basin climate. According to authoritative experts, Ganning Town is the most suitable area for the growth of late-ripening citrus in China and even the world, and is known as "the treasure land for the development of late-ripening citrus". Ganning Town adheres to the principle of "planting according to local conditions"<sup>[32]</sup> to develop rural characteristic industries and

promote rural revitalization. In 2004, Ganning Town began to test the cultivation of rose oranges, adopting the business model of "village party branch + cooperative + enterprise + base + farmer", innovating the land management model, and emphasizing the rationality of the layout of farmland planting and the concentration and contiguity of agricultural land. Ganning Town mobilized farmers to buy shares through land, so that farmers can share the value-added benefits of the industry. Relying on the domesticated varieties passed down for thousands of years, as well as the unique natural conditions and land resources, Ganning Town made rose orange harvest that year. Ganning Town also generated jobs for the masses by transferring land and absorbing labor, and also strengthened the collective economy, laying a solid foundation for its industrial revitalization. Ganning Town, which enjoyed the success, quickly expanded its planting area, relying on high-quality products and continuous guaranteed supply, Ganning Town quickly developed the market and occupied a certain share. It has now become one of the largest rose orange supply bases in the Three Gorges Reservoir Area, and is also the source of rose orange in Shanghai, Nanjing, Shenzhen and other places, and even Ganning Town exports rose orange to the Philippines and other countries<sup>[33]</sup>. Ganning Town has always practiced the "two" path of "ecological industrialization and industrial ecology", with its own resource endowment and scientific ecological planting mode, developed tens of thousands of acres of rose orange on a large scale, and built 40 ecological and green standardized orchards, with an annual output of more than 10 000 t. There are 5 020 farmers engaged in the cultivation of rose oranges in the town, and the annual output value of rose oranges is 465.95 million yuan, accounting for 51.51% of the total agricultural production value of the town.

**4.2.3** Integrating land and other resources to promote industrial integration and development. As the "back garden" of Wanzhou District, the hinterland of the Three Gorges Reservoir Area, Ganning Town is backed by beautiful pastoral scenery and relies on modern agricultural facilities to actively explore a new form of "agriculture + culture + tourism" integration of agriculture, culture and tourism. Ganning Town combines land resources such as vacant homesteads with cultural and landscape resources, and closely accelerates the construction of the core area of the National Agricultural Park around the Wanzhou Waterfall Scenic Area, with the goal of "dining, living, traveling, traveling, shopping, and enter-

tainment", and initially built a tourist area featuring folk culture tours, health vacations, ecological landscapes, picking experiences, leisure and recreation science education, etc., attracting a large number of tourists and increasing economic benefits. Ganning Town mainly relies on the tourism industry, drives the development of other industries, explores the development model of multi-industry integration, and gradually forms an industrial pattern of "promoting tourism with agriculture and culture, leading agriculture with cultural tourism, and integrating agriculture, culture and tourism". At present, the town has completed the greening of passages, the construction of village passage roads, and the construction of tourist channels, and realized the integration of water, electricity and network into villages and households<sup>[34]</sup>. In the first half of 2022 alone, Ganning Town received 320 000 tourists, the tertiary industry increased its income year-on-year, and farmers' "money bags" also bulged.

**4.2.4** Implementing land consolidation and planning to promote industrial innovation and development. Ganning Town carried out a thorough inventory of construction land, prepared village plans according to village characteristics, planned and led village construction, and carried out village construction land consolidation. It combines urbanization construction with homestead management, promotes the development and construction of central villages, boosts the innovative development of advantageous industries in rural areas, improves the level of intensive land utilization and the modernization of agriculture and rural areas, and improves economic, social and ecological benefits in an all-round manner. Ganning Town also established the Ganning Town Innovation and Entrepreneurship Park, led by the town party committee and government, Nanqiao Village is collectively responsible for operation and management, introduced preferential policies, supported foreign enterprises and local villagers to establish economic entities, and built agricultural products supermarkets, handicraft supermarkets, B&B hotels. At the same time, it provided rural women training in "handmade tie-dyeing", flower arrangement art, and traditional embroidery skills, driving villagers to carry out handicraft cultural creativity, develop catering B&B, and sell special agricultural products, so as to promote Ganning's characteristic agricultural cultural tourism products to go to the market. In addition, it actively promotes the integration of production and scenery in Nanqiao Village, Yongsheng Village, Heima Village and Ganning Village, vigorously develop the courtyard economy and B&B, and actively builds a digital tourism cooperation service platform. Through cooperation with technology enterprises, Ganning Town promotes the integrated development of online and offline tourist attractions in the jurisdiction; through model projects such as "Internet + Tourism", it takes advantage of big data to promote the transformation and upgrading of rural characteristic industries.

## 4.3 Problems

**4.3.1** Insufficient social publicity and understanding of the relationship between rural industry revitalization and land resource utilization. Land resources are limited and non-renewable, and the development of industry must rely on land resources, so it is necessary to strengthen the understanding of both. The use of land resources is extensive, and its specific application is professional and

complex. Due to the lack of implementation of policies and publicity by relevant departments, some rural residents in Ganning Town did not have a deep understanding of them, resulting in a large amount of idle land and limiting the intensive use of land resources. For example, rural residents with weak awareness of farmland protection are more based on short-term interests, and it is difficult to recognize the long-term benefits arising from the rational use of land resources. Many farmers do not have enough understanding of the current land circulation policy, and their willingness to transfer is weak, resulting in a large number of idle rural homesteads and more and more "hollow villages", and land cannot be used rationally and effectively, which affects the development of rural industries.

**4.3.2** It is difficult to convert idle homesteads into industrial land, and the land use efficiency is low. In the 25 administrative villages of Ganning Township, the phenomenon of multiple homesteads per family is very common, and the phenomenon of illegal overtime occupation of homesteads is also common. Due to the increase in the income level of farmers due to migrant work, some farmers have chosen relatively well-located homesteads for the reconstruction of new houses, but they have not demolished old houses. Some poverty alleviation households do not have a comprehensive understanding of the "one family, one house" policy, believing that after the new house is built, the right to build a house on the old homestead can still be retained. As a result, they are unwilling to deal with the old homestead, and more and more old houses are idle. On the one hand, there will be potential safety hazards due to the disrepair of old houses and inadequate management. On the other hand, a large amount of idle land causes a waste of land resources, and a large number of old houses will affect the rural landscape, making the spatial scope of the development industry small, which is not conducive to promoting rural industry revitalization.

**4.3.3** The development and utilization of resources is irrational, and it is difficult to achieve the sustainable development of rural industries and land resources. For relatively backward areas, abundant natural resources are essential to improve the living standards of local residents, but large-scale exploitation of resources also causes harm to the local natural environment<sup>[35]</sup>. For example, in the process of land cultivation, the long-term use of chemical fertilizers and pesticides in order to maximize yield has led to poor rural land and eutrophication of water bodies; unreasonable felling of trees and interference in rural construction activities will cause disasters such as mudslides and landslides, seriously threatening the continuous supply of rural ecological products<sup>[36]</sup>. These actions also undermine the soil's ability to self-rehabilitate, resulting in a decrease in the output value per unit area of land. The concept of "development first, then governance" and the blind pursuit of economic benefits have also caused the ecological environment to be neglected. Excessive pursuit of economic development and neglect of ecological environment protection, environmental pollution and ecological damage in rural areas are becoming increasingly serious<sup>[37]</sup>. The industrial wastewater and waste gas generated in the production of enterprises are arbitrarily discharged without treatment, which destroys the land ecosystem

and ecological environment of Ganning Town, and hinders the pace of rural industry revitalization to a certain extent.

#### 4.4 Recommendations

**4.4.1 Transforming thinking and enhancing understanding.** It is necessary to transform ideas and innovative ways of thinking so as to better promote the rational, orderly and effective use of land resources. Therefore, relevant departments should strengthen science popularization and education, guide the public to fully understand the importance of rational use of land resources, and create a good atmosphere for the development and utilization of land resources<sup>[38]</sup>. It is recommended to strengthen publicity on policies and regulations related to land contracting, transfer, and confirmation of rights, strengthen the farmers' concept of the rule of law, and raise the awareness of villagers in using and managing land in accordance with laws and regulations, encourage the masses to consciously protect natural resources and intensively economize on land use. We should firmly remember that clear waters and green mountains are as good as mountains of gold and silver, to realize the promotion of rural industry revitalization through the rational use of land.

**4.4.2 Improving the utilization rate of idle land and promoting rural industry revitalization.** Reforming the homestead system is an important means to promote the utilization of rural land resources. (i) It is proposed to take back the idle homestead for a fee on the premise of ensuring the living conditions of the farmers, and when the area used by the homestead exceeds the specified area, the farmers need to pay the relevant fees and change the unpaid use to paid use; comprehensively assess idle homesteads, increase capital investment to purchase idle homesteads, and improve the villagers' compensation system. (ii) It is recommended to reform the system of permanent use of homesteads, implement an automatic recovery system for the situation where one family occupies multiple houses, and the village collective will uniformly reclaim the idle homestead and report it to the land department for cancellation, and apply again when necessary, so as to reduce the waste of resources. (iii) It is recommended to improve the homestead opening system, redevelop vacant homesteads, transform them into B&Bs, and develop rural tourism; vacant homesteads can also be leased to investors to attract investment and improve the level of rural economic development. In the process of homestead opening, it is necessary to abide by relevant laws and regulations, carry out circulation in a scientific and reasonable manner, and avoid the use of homesteads to arbitrarily build houses or clubs for private use.

**4.4.3 Accelerating land consolidation and rehabilitation to promote sustainable development.** First, it is necessary to widely publicize ecological environmental protection, build up green villages, and make good ecology a support point for rural revitalization<sup>[39]</sup>. It is necessary to strengthen publicity on environmental protection, call on foreign tourists and residents to protect the ecological environment, and enhance their ideological awareness of environmental protection. In addition, it is necessary to promote the construction of garbage treatment plants and sewage treatment plants in the village. In the cultivation process of green agricultural products, it is necessary to reduce the use of chemical fertilizers, increase the use of organic fertilizers, increase the content of organic matter in the

soil, and encourage farmers to plant green plants, increase vegetation coverage, and improve the quality of the ecological environment. Second, it is necessary to take the concept that mountains, rivers, forests, farmlands, lakes, and grasslands are a life community as the guidance, emphasize ecological priority, take global planning and all-factor management as the starting point, coordinate and promote the comprehensive improvement of agricultural land, the improvement of construction land, and the restoration of ecological environment such as river basin management; regulate and control the main ecological factors causing land impoverishment, salinization and soil erosion, and carry out afforestation, soil improvement and farmland capital construction according to local conditions<sup>[40]</sup>.

## 5 Conclusions and discussion

**5.1 Conclusions** Based on the connotation of rural industry revitalization and land resource utilization, we discussed the relationship between them, studied their practice in Ganning Town, found out the existing problems and came up with corresponding recommendations. We reached the following conclusions.

(i) There is a positive correlation between rural industry revitalization and land resource utilization, they are both mutually promoting and restrictive. The rational development and utilization of land will promote rural industry revitalization, and industrial prosperity will become a favorable support for the sustainable development of land. On the contrary, if the land is used extensively and disorderly, it will not be able to provide space and resources that match the development of industry, and hinder the pace of industrial development; the lagging in development of rural industries will also cause problems such as unreasonable land layout and soil damage. (ii) We divided the land use types of Ganning Town into nine categories: farmland, garden land, woodland, grassland, residential land, commercial land, land for public management and service, land for water and water conservancy facilities, and land for industrial and mining warehousing, and identified their industrial functions and development models. Besides, we constructed the corresponding framework of land resource utilization and rural industry revitalization in Ganning Town. (iii) In view of the insufficient social publicity of rural industry revitalization and land resource utilization in Ganning Town, the difficulty of converting idle homesteads into industrial land, and the unreasonable development and utilization of resources, we came up with three recommendations: transforming ideological concepts and enhancing ideological understanding; improving the utilization rate of idle land and promote rural industry revitalization; accelerating land consolidation and restoration to promote sustainable development.

**5.2 Discussion** (i) Rural industry revitalization and land resource utilization are two-way and dynamic, rather than static. For example, the composite use and integrated use of land can promote the integration and innovation of rural industries, thereby promoting rural industry revitalization. If relevant departments and farmers pay attention to the integrated development of primary, secondary and tertiary industries and focus on promoting industrial innovation, it will bring huge economic benefits to rural development, promote the rational planning and utilization of rural land re-

sources, and make rural industry revitalization and sustainable use of land resources develop in synergy and take the road of high-quality development. Conversely, if villagers use land in an extensive and disorderly manner, it may cause the decline of land "quality" and the emergence of fragmented forms of land space, which is not conducive to the construction of agglomeration industrial space, thereby hindering the development of rural industry. In addition, if the development of rural industries is slow or stagnant, the economic benefits of rural areas will be reduced, the importance of land resources will also decline, and the possibility of extensive and disorderly use of land resources will increase, causing them to fall into a vicious circle. Therefore, we must put rural industry revitalization on an equal footing with land resource utilization, and promote their coordinated development.

(ii) It is necessary to look at the relationship between rural industry revitalization and land use from the perspective of development. China is in a new stage of development in building socialist modernization, and how to start from the limited land resource endowment, give full play to its social, economic and ecological role, and promote rural industry revitalization is a problem that needs to be paid attention to at present and in the future. Land resources are a fundamental element to boost rural industry revitalization. How to plan and develop rural industries according to local conditions, build a scientific and reasonable industrial revitalization mechanism, improve the overall utilization level of land resources and improve the output value of rural industries is also a key research direction. Therefore, when formulating the overall land use plan, it is necessary to consider the future development goals of the future rural industry, scientifically predict the future industrial scale, and do a good job in the planning of reserved industrial space. Similarly, when the relevant departments prepare the rural industry revitalization plan, they should fully consider the local resource endowment, and if necessary, they can evaluate the suitability of local land use, find out the most suitable industrial development direction, and truly achieve the goal of industrial prosperity.

(iii) Rural industry revitalization and sustainable use of land resources require the adoption of multi-dimensional land use strategies to create industrial advantages. Ganning Town is a typical mountainous area, and the surface rocky desertification is serious, and it has endogenous ecological vulnerability, which may hinder the development of local industry to some extent. However, its unique small basin climate and other conditions make it the most suitable area for the growth of late-ripening citrus in China and even in the world, and has become a "treasure land for the development of late-ripening citrus". The rose orange industry has also become an important part of the implementation of the rural revitalization strategy in Ganning Town. In addition to the use of land resources according to local conditions, we can also pay attention to the complexity of land functions, the integration of land and other resources, land consolidation and planning, etc. These strategies can promote the innovation and integration of rural industries, promote rural industry revitalization, and take the road of sustainable development.

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