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Analysis on the Transition of Resource-based Rural Land Use in the Context of Rural Revitalization: A Case Study of Taolingou Village, Yangquan City, Shanxi Province

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Abstract The key to the transformation of resource-based rural economy lies in the land use transition, which has important theoretical and practical significance for the reconstruction of rural values and the promotion of rural revitalization. Taking Taolingou Village in Yangquan City, Shanxi Province as an example, on the basis of expounding the concept and connotation of land use transition, this paper analyzes the evolution trend of resource-based rural land use transition, explores the driving force of resource-based rural land use transition and clearly puts forward the measures to strengthen the transformation of resource-based rural land use in the context of rural revitalization. The analysis shows that the land use of Taolingou Village is transforming towards the trend of sustainability, putting people first and multi-function, which is consistent with the strategic goal of rural revitalization. The driving force of land use transition in Taolingou Village includes four aspects, namely, industrial structure, economic factors, development policy and contradiction between human and land. Adjusting and optimizing the industrial structure, protecting the ecological environment, perfecting relevant policies and regulations, and controlling the overall population are the effective measures for Taolingou Village to realize the land use transition. This case study is expected to provide a useful reference for the land use transition in other resource-based rural areas.

Key words Resource-based rural areas, Land use transition, Taolingou Village

1 Introduction

Land resources are the most basic natural resources for human survival, and any human production and life are inseparable from land. The limitation of land resources requires that people must ensure that every piece of land is widely, fully and reasonably used^[1]. Therefore, the research on land use has been paid much attention by various countries and experts and scholars since ancient times, and land use transition, as one of the new forms of land use/cover change (LUCC) research, has also received extensive attention in the field of international land change research in recent years. With the introduction of this research into China, a large number of research results have emerged in China, mainly related to land use transition and eco-environmental response^[2-9], coupling analysis of transformation and rural transformation development^[10-11], characteristics and driving forces of land use transition^[12-15] and regional land use transition^[16-20]. Therefore, it is necessary to strengthen the analysis of the land use transition so as to lay a solid foundation for the sustainable use of land and the social and economic development of the countryside.

China has a vast territory, and different stages of social and economic development in different regions correspond to different

processes of land use transition, so it is necessary to conduct an in-depth study on specific regional issues. Taking Taolingou Village, Yangquan City, Shanxi Province as an example, on the basis of expounding the concept and connotation of land use transition, this paper analyzes the evolution trend of resource-based rural land use transition, explores the driving force of resource-based rural land use transition and clearly puts forward the measures to strengthen the transformation of resource-based rural land use in the context of rural revitalization.

2 Concept and connotation of land use transition

In 1987, Walker first used the term "land use transition" when analyzing the phenomenon of deforestation in underdeveloped countries; at this time, land use transition refers to the process of felling land being reclaimed into agricultural land by farmers after being abandoned^[21]. In 1995, Grainger, a geographer at the University of Leeds in England, put forward the concept of "land use transition" from the perspective of "national land use morphology"^[22]; at this time, land use transition refers to the transformation of national land use form. Researcher Long Hualou introduced the land use transition as a new way of LUCC research into China at the beginning of the 21st century, and it gradually entered the international academic field of vision^[23].

Land use transition is the change of land use form in time sequence, which usually corresponds to the transformation of economic and social development stage^[23]. The form of land use initially refers to the structure of the main land use types corresponding to the stage of economic and social development of a country/

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region in a certain period of time, that is, a specific stage of economic and social development corresponds to a certain land use structure of a country/region^[22]. Land use forms are generally divided into dominant and recessive forms. Dominant form is a land use form composed of the main land use types in a certain period of time in a region, which exists on the surface and is easy to be detected; recessive form, the form of land use, which can only be obtained through analysis, experiment, measurement and investigation, is attached to the dominant form and is not easy to detect^[23].

Therefore, Long Hualou^[24] put forward the land use transition, that is, the process of the transformation of one land use form (dominant form and recessive form) to another in a certain area within a period of time, which usually coincides with the transformation of the stage of economic and social development.

3 A brief introduction to Taolingou Village, Yangquan City, Shanxi Province

Taolingou Village, Yangquan City, Shanxi Province is a typical resource-based rural area. Resource-based rural areas refer to the rural areas with rich mineral resources, hydraulic resources, and other natural resources or electric power, manpower and other resources^[25], and its development has a strong resource direction. It is characterized by simple industrial structure, over-reliance on resources and inefficient land use^[26]. Relying on the advantages of resources, the village has actively developed the coal industry, and now it has carried out the land use transition according to local conditions, and has developed into a new countryside for ecotourism, and has been included in the second batch of key villages of rural tourism on August 26, 2020. Therefore, the case study of Taolingou Village can provide experience for the land use transition in resource-based rural areas.

Taolingou Village, Yangquan City, Shanxi Province is located on the outskirts of the city, with a land area of 1.86 km², cultivated land area of 0.7 km² and an agricultural population of 746. The accumulated coal resources in Taolingou Village accounts for about 16.7% of the total coal resources in Yangquan City, Shanxi Province, with an average production capacity of more than 300 000 t per pit. The automation level of mining machinery has reached 95%, and the mining rate of coal mine has reached 80%. In the 1980s, Taolingou Village, with a per capita annual income of only 400 yuan and a per capita debt of 14 000 yuan, is a well-known poor mountain village in the country. Until 1996, Taolingou Village built a new mine with an annual output of 80 000 t by using a small piece of land resources on the edge of the village. After years of hard work and practice, the economic income of Taolingou Village exceeded 14.7 million yuan at the beginning of the 21st century, of which the collective economic income was 4.5 million yuan and the annual per capita net income of farmers was 2 050 yuan. For more than 20 years, coal mining is not only the dominant industry of the village's economic development, but also the key way of employment for the masses.

With the continuous rise of coal market prices, modern coal mines have become an important pillar of the collective economy in Taolingou Village. Until 2005, under the specific guidance of the rural revitalization and development strategy and the integration of coal resources in Shanxi Province, several coal mines in Taolingou Village were shut down to deal with the lack of the core economic and industrial chain, and the daily life and employment of the masses encountered great challenges. Subsequently, with the help of the original capital accumulation of coal, Taolingou Village achieved the strategic goal of land use transition and rural revitalization by adjusting and optimizing the industrial structure, protecting the ecological environment, improving relevant policies and regulations, and controlling the overall population, and successively won the titles of "National Ecological Civilization Village", "Top Ten Charming New Countryside of Shanxi Province" and so on.

4 The evolution trend of land use transition in resource-based rural areas

4.1 Transformation from intermittent land use to sustainable land use

Taolingou Village is rich in coal resources, and the whole village is mainly dominated by the coal mining industry, but with the gradual depletion of coal resources, coupled with the joint influence of the strategy of rural revitalization and the integration of coal resources by the Shanxi provincial government, Taolingou Villagers began to attach importance to the sustainable use of land, that is, to develop other industries while developing the coal mining industry. In recent years, Taolingou Village, on the premise of ecological and suitable residence and the integrated development of agriculture and tourism, strives to make people live and work in peace and contentment, thus realizing the sustainability of the population; invigorates all kinds of land, further strengthens the land function and space of Taolingou Village, to realize the sustainability of land; optimizes the layout of all kinds of industrial land, determines the guarantee order of industrial development land in Taolingou Village, and balances the needs of industrial development in the village, to achieve the sustainability of the industry. Sustainable land use is systematic and forward-looking, which avoids the blindness and short-term nature caused by intermittent land use, and provides a solid foundation for realizing the strategic goal of rural revitalization.

4.2 Transformation from land-oriented land use to people-oriented land use

The core object of the transformation of resource-based rural land use is land. From this point of view, the concept of resource-based rural land use putting land first is basically feasible, but resource-based rural land use putting land first ignores the symbiotic relationship of rural land, because the rural regional system is a natural and human interaction system with land-use relevance and spatio-temporal dynamics^[27]. In essence, the people-first land use transition is to realize the transfer from the land use object to the land use subject through the optimization and adjustment of the human-land relationship. For example, the

large-scale operation of agriculture in Taolingou Village has liberated more labor forces, and middle-aged people can work in coal mines and brick factories; the elderly can receive the rent of real estate in Yangquan City; women can work in the service industry in this village; young people can work in some technology-intensive enterprises. At the same time, the land use transition to putting people first can increase the income of farmers by four to five times as much as when simply growing food crops. In 2020, the per capita net income of farmers was more than 18 000 yuan, three times that of 2000. The Engel coefficient also dropped from 80% at the beginning of the 1990s in the 20th century to 31% in 2004, and happiness continued to improve. It is necessary to adhere to people-oriented land use, that is, we should take the interests of farmers as the center, proceed from the actual needs of farmers, and meet farmers' pursuit of a happy life through the actual effect of the land use transition in resource-based rural areas.

4.3 Transition from single-function land use to multi-function land use The transition of resource-based rural land use from single function to multi-function can directly promote the functional value and complex function of rural space, which is an important way and means to promote rural revitalization. Taolingou Village has taken a development path of "relying on coal, extending coal, not solely depending on coal, surpassing coal", making full use of the accumulation of coal funds, and rapidly developing non-coal industry. It has built a coal gangue brick plant with an annual output of 90 million, a concrete mixing plant with an annual output of 1 million cubic meters, and a "Golden Phoenix" breeding plant with 400 000 domestic fowls on hand. At the same time, the agricultural production of Taolingou Village is traditionally based on a single planting industry, mainly planting corn and millet. In the context of the rural revitalization strategy, the land has been transformed to multi-functional use, that is, cash crops such as vegetables, medicinal herbs and peach trees have been replanted on most of the farmland, while some fruit trees and flowers have been planted on the mountains, thus greatly improving the comprehensive efficiency of land use. As a result, after the land use transition from single function to multi-function, the income level of farmers and the overall economic benefits of rural areas have been improved, and the living environment has also been improved.

5 Analysis of the driving forces of resource-based rural land use transition

5.1 Industrial structure In recent years, industrial transformation and upgrading have become the focus of attention in resource-based rural areas, and the upgrading of industrial structure is a choice that resource-based rural areas must face under the market economic system^[28]. The development of Taolingou Village is "brought up by coal", and its industrial structure is mainly coal mine. Where there is coal, land expropriation and development has always been the main principle of construction in Taolingou Village, and it is a typical resource-based village. With the trans-

formation and upgrading of industries, the continuous development of emerging industries and the continuous growth of the number of industrial enterprises, the construction of green food processing bases and agricultural eco-tourism parks have promoted the non-grain and non-agricultural use of rural land, and promoted the development of ecological agriculture. The optimization and adjustment of industrial structure drives Taolingou Village to face the important problem of how to effectively use land, not only to develop coal mining, but also to protect the construction of agricultural land.

5.2 Economic factors In fact, the process of economic development is the process of continuous optimization and adjustment of land use structure and continuous improvement of land use intensive degree^[29]. The state's macro control of land use is realized through financial allocation, that is, to stimulate land use units to invest in land, increase land use units' investment in land, and improve the intensive degree of land use, so as to complete the recessive land use transition^[30]. Taolingou Village provides peach picking activities for tourists. Because a large number of tourists are attracted by the picking activities, the income of Taolingou Village has been improved, and the profit obtained has increased by about 25% on the basis of the original direct sales. On the whole, for the land use of Taolingou Village, it is necessary to increase the investment in land from the point of view of utilization efficiency and service function, reduce the extensive land use model, improve the degree of intensive land use, rely on coal resources, adhere to diversified development, and give full play to the location advantages of suburban rural areas, so that land use will be eventually more suitable for rural economic development.

5.3 Development policy One of the ways of social and political macro-control of land use is the policy factor. Policies play a mandatory role in constraining regional land use patterns and their changes, and then improve the overall efficiency of land use. Therefore, they have a significant impact on both dominant and recessive land use transition. In order to fully implement the important task of building beautiful villages proposed in the 18th CPC National Congress, Shanxi Province has accelerated the construction of beautiful and livable demonstration villages, and the suburban district party committee and district government have built new eco-livable city and strong modern suburban area, taking "creating fine tourism" as an important strategic deployment in the future. Specifically, a large amount of cultivated land in Taolingou Village is transformed into sightseeing and leisure land and tourism service land, and the traditional single agricultural production is transformed into compound sightseeing and leisure, which weakens the functions of agricultural production and social security and strengthens the functions of sightseeing, leisure and economic development. All these have created a good regional policy background for the development of Taolingou Village.

5.4 Contradiction between man and land The contradiction of land use with large population and little land has become increasingly prominent, and the scarcity of land resources has be-

come increasingly apparent. With the increase of population, the demand pressure of agricultural output will inevitably be transferred to the cultivated land for grain production. The excessive input and use of land will not only cause agricultural non-point source pollution, but also aggravate the degradation of land. As a result, the recessive form of cultivated land will be changed obviously. In addition, with the substantial increase in population, the demand for residential land, industrial land, service land, public facilities land and other construction land will increase significantly. Over the years, the rapidly increasing population of Taolingou Village has a greater demand for production and living land and behavior space, especially for construction land, including residential land, transportation facilities and public facilities land. Therefore, we must finally change the original land use structure of Taolingou Village to achieve sustainable development, in order to meet the increasing needs of production and life of people.

6 Recommendations

6.1 Adjusting and optimizing the industrial structure and cultivating the new industrial type

The most powerful part of rural reconstruction is the economic reconstruction with optimizing and adjusting industries as the core. Through moderate scale operation of agriculture, rural traditional industries have been transformed and revitalized, and rural new business type has been developed and cultivated by making use of the multi-functional value and modern technological means of rural areas^[31]. Judging from the current land use situation of Taolingou Village, the phenomenon of inefficient land use still exists, the mode of economic growth is slightly extensive, and industrialization has not only brought huge economic profits, but also occupied a lot of land at the same time. It should change the mode of economic growth, adjust, optimize and upgrade the industrial structure. For example, large-scale intensive basic farmland and corresponding agricultural production bases should be built to realize the large-scale operation of agriculture; it is necessary to make the rural industry concentrate to the industrial park, and the rural service industry concentrate to the business area, so as to ensure the steady improvement of the comprehensive production capacity of agriculture, and finally form the rural land use pattern for the comprehensive development of primary, secondary and tertiary industries in resource-based rural areas^[32].

6.2 Protecting the ecological environment and promoting the healthy development of the ecological environment

Land use change is caused by human social and economic activities^[33], and land use change will have a far-reaching impact on the ecological environment, such as air pollution, water pollution and soil pollution. Sustainable land use and the healthy development of the ecological environment system are threatened. The promotion of Taolingou Village's economy is mainly due to the rapid development of coal mining industry, but the rapid development of coal mine has also caused a certain degree of industrial environmental pollution, urban environmental pollution and agricultural environ-

mental pollution in Taolingou Village. Taolingou Village should not only put economic development in the first place, but also strengthen the treatment of ecological environment pollution and pay attention to the problem of sustainable land use. In recent years, Taolingou Village has controlled the source of land pollution, reduced the use of chemical fertilizers and pesticides in agricultural production, and gradually made agricultural production clean, green and pollution-free, and protected the diversity of species habitat and biological resources. At the same time, Taolingou Village must reconstruct the villagers' ideas, let the villagers establish the consciousness of environmental protection, unswervingly take the road of sustainable development, and seek the organic unity of economic, social and ecological benefits of Taolingou Village.

6.3 Changing the concept of decision-making and improving relevant policies and regulations

If we want to achieve the desired results of land use transition, we should change the concept of decision-making, improve relevant policies and regulations, make the management objectives more targeted, and play an important leading role^[34]. All forms of land use activities will exert an impact on the surface natural environment more or less, and the changes of the surface natural environment are usually manifested as the depletion of natural resources and the degradation of ecosystems. When these problems are serious enough to attract the attention of the public and the government, the government and relevant departments can adjust land use through laws, regulations and policies^[35]. In this case, the relevant government departments should pay close attention to the land use transition work, invest enough energy and time to plan the land use transition work, and put forward effective policies and measures. When planning the land use transition, Taolingou Village also needs to fully consider the local population, culture, environmental protection and other factors, implement the principles of fairness, justice and openness, and finally realize the unified development, unified management and unified construction of land use to protect the sustainable development of Taolingou Village.

6.4 Controlling the total population and reducing the pressure on land bearing capacity

Through the analysis of the driving force of the contradiction between human and land, it can be found that population is one of the important factors affecting the land use transition. The growth of the overall population is the fuse that leads to the outbreak of the contradiction between human and land, and the continuous expansion of the population will inevitably cause a certain degree of pressure on the land. Therefore, controlling the total population and growth rate can effectively reduce the pressure of land bearing and improve the efficiency of land use. Taolingou Village should optimize and adjust the land use structure and invest in the development of the tertiary industry to improve the enthusiasm and initiative of farmers to go out to work, strengthen the speed of population flow from rural to urban areas, and control the growth rate of rural population. We should improve the relevant policies of population migration and further broaden the channels and ways of population transfer from rural ar-

eas to cities and towns, so as to effectively alleviate the pressure of land use brought about by population growth. In addition, we should pay attention to the improvement of farmers' quality, actively carry out education and training for farmers, improve their ideological understanding and enhance their ability to make use of modern science and technology.

7 Conclusions

(i) The land use transition, a process of the transformation from one land use form (dominant form and recessive form) to another in a certain area within a period of time, usually coincides with the transformation of the stage of economic and social development. (ii) The resource-based rural land use changes from intermittent to sustainable, that is, to develop other industries through land use, so as to realize the sustainability of population, land and industry. Taking land as the first is changed to putting people first, that is, we need to transfer from the object of land use to the main body of land use service, put the interests of farmers at the center, and proceed from the needs and development of farmers. The single function is changed to multi-function, that is, to promote the functional value and complex function of rural space, so as to increase the comprehensive efficiency of land use. (iii) The driving forces of resource-based rural land use transition include: industrial structure (Taolingou Village can make effective use of land through the optimization and adjustment of industrial structure, and can not only develop coal mining, but also establish agro-ecological tourism park); economic factors (Taolingou Village provides peach picking activities for tourists, which has created considerable economic benefits, and the intensity of land use has been continuously improved); development policy (Shanxi Province regards "creating fine tourism" as an important strategic plan in the future, weakening the functions of agricultural production and social security, strengthening the functions of sightseeing, leisure and economic development, and realizing the dominant and recessive transition of land); contradiction between human and land (with the rapid increase of population in Taolingou Village, Taolingou Village has to change its original land use structure to meet people's growing needs of production and life). (iv) The measures for the land use transition in resource-based rural areas: adjusting and optimizing the industrial structure and cultivating the new business type; protecting the ecological environment and promoting the healthy development of the ecological environment; changing the concept of decision-making and improving relevant policies and regulations; controlling the overall population and reducing the pressure on the carrying capacity of land.

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production and marketing, implement order production, solve the problems of "difficult to buy" and "difficult to sell" in pig breeding, play down the "pig cycle", and maintain the sustained, stable and healthy development of the pig industry.

Pig farming is the basic industry of China's national economy, which is related to people's livelihood and social harmony and peace. The production, supply and marketing of live pigs is a complete industrial chain, which has many closely linked nodes. In order to ensure the stable and healthy development of the pig industry and ensure the effective supply of the market, we must further improve the pig industry system and consolidate the foundation of each node. It is necessary to formulate industrial principles and policies according to the changing situation, bring the pig industry into the rural industrial revitalization plan, and consolidate the industrial foundation. It is necessary to improve its ability of automatic adjustment and the resilience of the industry to ensure the healthy and stable development of the pig industry, the safe and effective supply of the market, and the happiness and well-being of the people.

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