



Study on the Path of Comprehensive Land Improvement in the Whole Area of Small Towns in the Context of Rural Revitalization

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Abstract. In the context of comprehensively promoting rural revitalization, the implementation of sustainable rural development and accelerated urban-rural integration cannot be achieved without the important way of comprehensive land management in the whole area. This study takes Xinzhai Town, Yucheng City, Shandong Province, as an example, based on the evaluation of the suitability of land space development, clarifies the degree of suitability of a specific land space for agricultural production, urban construction and other human activities, and puts forward the path remediation response in the three dimensions of field, production and residence.

Keywords: rural revitalization; comprehensive land management of the whole area; evaluation of the suitability of territorial spatial development

1 Introduction

After the reform and opening up, along with the rapid development of China's urbanization, problems such as scattered land structure and rough land use have appeared in rural areas, and land is the core resource for high-quality promotion of the implementation of the rural revitalization strategy, so it is urgent to carry out orderly regulation and governance of space and land resources through the comprehensive improvement of the whole area land ^[1]. According to the Notice on the Pilot Work of Territory-wide Comprehensive Land Improvement issued by the Ministry of Natural Resources, territory-wide comprehensive land improvement takes townships or counties as the main scope, and integrates a number of elements, such as agricultural land improvement and construction land improvement, and carries out systematic improvement of multi-space and multi-factors, in order to achieve the goals of improving the human environment and promoting rural revitalization.

The pilot work of comprehensive land improvement in the whole region of China started earlier in Jiangsu and Zhejiang has achieved initial results, but most of the regions are still in the stage of preparation of the implementation plan. Under the background of rural revitalization, how to make a new space for modern industry and economic development, implement the new will of regional coordination and ecolog-

ical civilization, and safeguard the new needs of the diversified social groups for a secure living still needs to be further explored.

Therefore, based on the above problems, this paper takes Xinzhai Town, Yucheng City, Shandong Province, as the object, analyzes its current predicament in comprehensive land remediation of the whole area, clarifies the suitability of different land spaces in Xinzhai Town for agricultural production, urban construction and other human activities through the evaluation of suitability for land spatial development, and finally focuses on the path remediation response of the three dimensions, namely, field, production, and residence, based on the results of the evaluation.

2 Overview of the Study Area and Data Sources

2.1 Overview of the Study Area

Xinzhai Town is located in the southwestern part of Yucheng City, Shandong Province. 2022 Xinzhai Town has a household population of 44,000, a resident population of 39,000, a total area of 9,346.00 hectares of regional land, a gross domestic product of 1.82 billion yuan, a per capita gross domestic product of 40,100 yuan, and a three-tier industrial structure ratio of 9:38:2. Currently, the town's land improvement is facing a number of dilemmas. Challenges of high resistance to improve the quality and efficiency of arable land and insufficient carrying capacity of industrial space. The industrial land is rough and small, and the current park scale is not enough to support future development. Moreover, for the living space of human beings, in addition to guiding the centralized resettlement of rural residents to realize the intensive and efficient use of construction land, the degree of community integration and sustainable development should also be considered.

2.2 Data Sources

The basic data for this study come from the data of the Third National Land Survey, supplemented by the results of the Geographic National Census, the Geological Environment Survey and the Forest Specialized Natural Resources Survey, and the 2000 National Geodetic Coordinate System and the 1985 National Elevation Datum are uniformly adopted as the basis for spatial positioning.

3 Research Process and Methodology

This part mainly evaluates the suitability of land space development in Xinzhai Town to clarify the suitability of a specific land space for agricultural production, urban construction and other human activities, and serves as the basis for exploring the path of comprehensive land management in the whole region.

3.1 Evaluation of Agricultural Land Suitability

3.1.1 Evaluation Indicator System Construction

By analyzing the data and combining the township characteristics, the suitability of agricultural land is mainly affected by factors such as water resources, land resources and human activities. Based on the principles of data dominance, objectivity and accessibility, and taking into account the agricultural production-oriented suitability evaluation, five evaluation indexes^[2], namely, distance from major water systems, land use status, NDVI, ditch density, and texture of cultivated layer, were selected, and the weights of the different evaluation factors were determined through the hierarchical analysis method and scoring by experts. Based on the degree of influence of each evaluation index on the construction land, it is divided into four grades: the most suitable, suitable, generally suitable, and unsuitable, and 9, 6, 3, and 0 are used to represent the suitability scores of the evaluation indexes, and the higher the scores are, the better the suitability is indicated (Attachment Table 1).

3.1.2 Evaluation Results and Analysis

The vector map containing the five evaluation factors was overlaid using GIS software, and the evaluation results were classified into five categories of high, high, medium, low and unsuitable using the natural breakpoint method to obtain the spatial distribution of agricultural land suitability in the township (Fig. 2, left).

From the evaluation results, it can be seen that the functional orientation of agricultural production in Xinzhai Township is mostly high suitable, higher suitable and medium suitable, and mainly concentrated near rivers. The low-suitable and unsuitable areas are mainly distributed in the central, northwestern or southern edges of the township, which are relatively far away from the water system or are greatly affected by the texture of the cultivated layer.

3.2 Evaluation of the Suitability of Construction Sites

3.2.1 Evaluation Index System Construction

Referring to the "Urban and Rural Land Evaluation Standard (CJJ132-2009)" and the method of indicator selection in related literature, according to the principles of quantifiable, dominant, and appropriateness, it is divided into four main influencing factors: transportation conditions, hydrometeorology, natural ecology, and regional attractiveness, and six evaluation indexes: national highway, county highway, township highway, hydrological and waterway system, woodland, and distance from the settlement, and similarly, through the hierarchical analysis method and expert The weights of different evaluation factors were determined by hierarchical analysis and expert scoring^[3]. According to the degree of influence of each evaluation index on the construction land, it is divided into four levels: most suitable, suitable, generally suitable and unsuitable, and 9, 6, 3 and 0 represent the score of suitability of the evaluation index, and the higher the score means the better the suitability (Attachment 2).

3.2.2 Evaluation Results and Analysis

The scores of single factors were superimposed according to their respective weights, and finally a composite score was obtained. Using the natural breakpoint method, Xinzhai Town was divided into a total of five construction land suitability classes: high, high, medium, low, and unsuitable (Figure 1, right). As can be seen from the land use suitability evaluation map, the construction areas with medium-high suitability and high suitability are concentrated in the town development boundary in the middle of Xinzhai Town, as well as in the east-central, southeastern and south-western areas of the town. Sites with a low suitability rating and below are mainly concentrated in the northern part of Xinzhai Town.

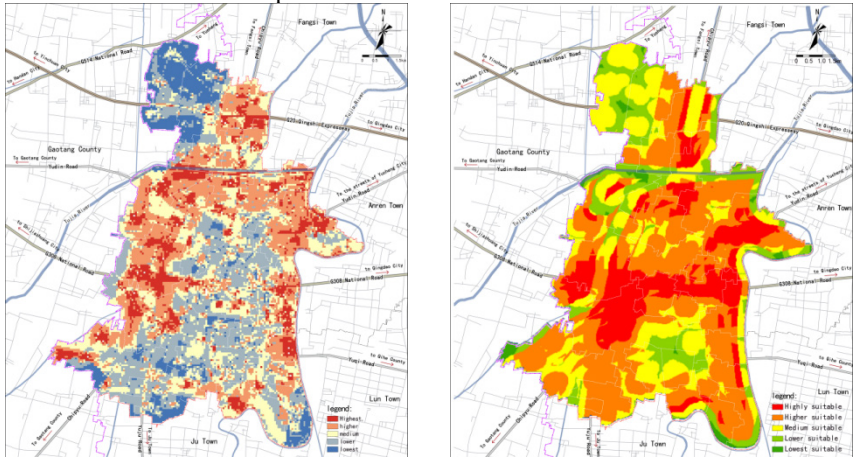


Fig. 1. Agricultural land suitability evaluation of Xinzhai Township (left) Construction land suitability evaluation of Xinzhai Township (right)

4 Pathways to Comprehensive Land Management Throughout the Study Area

4.1 Doing a Good Job with "Fields"

4.1.1 Delineation of Permanent Basic Farmland Reserve Areas and Construction of High-standard Farmland to Build a Solid Base Line for Farmland Construction

With reference to the 0.5%-1% ratio of the task of demarcating permanent basic farmland, according to the evaluation of the suitability of agricultural land, a permanent basic farmland reserve area with an area of about 197 hectares is demarcated in the arable land outside the red line of permanent basic farmland protection and with a higher evaluation of the suitability of agricultural land, which will be used as a replenishment of the land for the occupation of permanent basic farmland by major constructions. By analyzing the quality of farmland through GIS, high standard farmland construction area^[4] is prioritized in the permanent basic farmland and permanent basic farmland reserve area to ensure that the quantity of farmland in the remediation area is increased while the quality is improved, and it is planned that Xinzhai Town

can build about 3,131 hectares of high standard farmland in the next ten years (Fig. 2).

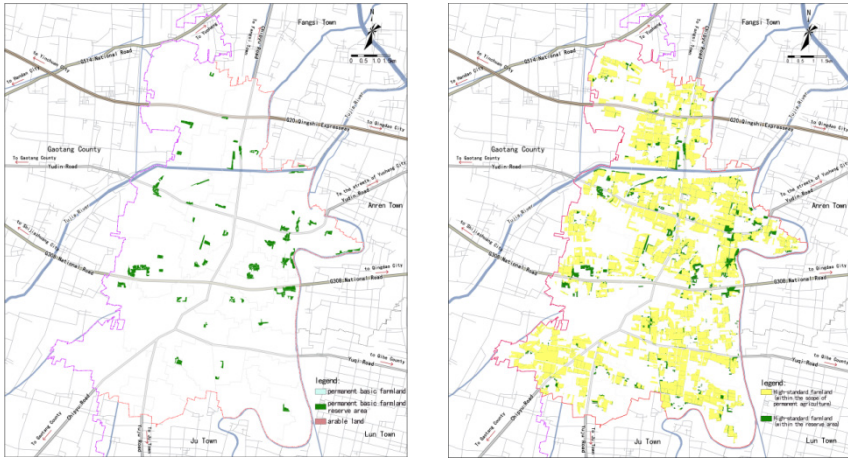


Fig. 2. Distribution of permanent basic farmland reserve areas in Xinzhai Town (left) Distribution of high-standard farmland construction areas (right)

4.1.2 Planning of Overflowing Cultivated Land Reserve and Micro-field Adoption Mode to Promote Cultivated Land Scale and Fine Management

Enhance the seepage of arable land reserves, through the filling and remediation of waste ditches and ponds, leveling the field cans, demolition of scattered farmhouses, centralized living, etc., so that the original dispersed in the mansion side, roadside, field side, etc., known as the "ten side of the land" of the scattered parcels of land to be used, and to promote arable land, "small field into a large field to promote "small fields into large fields" and scale operation. These new seepage of arable land resources do not have the historical background of small farmers family business, can be set up by the village collective shareholding economic cooperatives to unify the operation. At the same time, Xinzhai Town can choose a certain amount of overflow arable land for the experimental field, further divided into different sizes of regular fields, planning "micro-field adoption" of the refined farming business model, to attract new farmers, urban residents, social capital and other agricultural forces to operate or invest in the "profit share of dividends Profit-sharing" and "land rental" are the ways of income for the village collectives. Before, during and after the refinement of crop cultivation, village collectives can also provide agricultural services to increase the operating income of the joint-stock economic cooperatives.

4.2 Doing a Good Job of "Production"

4.2.1 Accelerating the Excavation of Construction Land to Meet Land Demand for Industrial Development

Based on the evaluation of the suitability of construction land, the mechanism for guaranteeing industrial land has been improved along the lines of "total control, prior-

itization of stock, implementation in the near future and reservation in the long term". Firstly, the total amount of land will be controlled, and 43.2 hectares of industrial land will be planned for the development of industry, logistics and warehousing and commerce outside the urban development boundary, and 51.55 hectares of industrial land will be planned within the urban development boundary. Secondly, the stock of land is optimized, the boundaries of rural settlement expansion are scientifically delineated, the construction of key villages for public services is strengthened, and scattered and sporadic settlements are gradually reduced and merged. Land use restructuring will be carried out to address the hollowing out of villages, and unused rural residential land will be adjusted to public welfare or business construction land under the condition of safeguarding the rights and interests of farmers. Finally, land for industrial projects under construction will be implemented and supplemented to meet the basic requirements for industrial development, accelerating the development of centralized broiler chicken breeding centers and the construction of grain drying, agricultural product origin warehousing, and cold chain logistics facilities. In the future, 43 hectares of land indicators for village construction will be reserved for land restructuring, and the indicators will be prepared when there is industrial development.

4.2.2 Explore the Development Mode of Integration of the Three Industries Based on Agriculture

Strengthen the agricultural and sideline product processing industry and create a distinctive brand. Extend the food crop industry chain, use Xinzhai Town high-end equipment manufacturing advantages, promote high-end equipment manufacturing technology innovation and industrialization, and apply to the agricultural by-product processing industry. In terms of shaping the characteristic agri-tourism industry strategy, focus on seizing the characteristics of the crop growth time pattern, developing seasonal agri-tourism experience and regular agri-tourism experience, and using the Internet to develop the characteristic exoticized agri-tourism experience, and providing customers with the option of going to the offline experience, and introducing the traffic into the offline ^[5].

In addition, with the catalytic effect of "micro-field adoption", after the micro-field operation has gained a good income, new farmers, urban citizens and other business entities can spontaneously explore income-generating avenues for the integrated development of one, two and three industries such as agricultural product processing and parent-child agricultural experience on the adopted micro-fields, and the village collectives of the shareholding economic cooperatives can get more economic income through "profit sharing" on the well-developed micro-fields, realizing the double benefits of farmland construction and villagers' economic income. The village collective joint-stock economic cooperatives can also get more economic income from these well-developed microfields through "profit-sharing", realizing the double benefits of farmland construction and villagers' economic income.

4.3 Doing a Good Job of "Residence"

4.3.1 Establishing New Rural Communities and Exploring New Models of Rural Development

Gaozuo Town, Jianhu County, Yancheng City, Jiangsu Province, as a typical case of the 2024 Territorial Comprehensive Land Improvement Pilot Project, has promoted the construction of livable life through the construction of five characteristic new rural communities. In addition, it solved the problem of difficult housing for people in difficulty by building a happy home recreation community, which received unanimous praise from the public. Xinzhai Town Lianghe New Village is a preliminary exploration of new rural construction, based on learning from the experience of advanced pilot areas and the practice of the town, to further optimize the existing home base remediation policy, for villages with serious population loss, according to the model of building first and then relocating, rolling relocation, local pumping and combing ^[5], and to promote the villagers to resettle centrally in the area close to the township or to the key villages of the public service based on the protection of their original rights and interests.

4.3.2 Constructing a Grid-Based Governance System and Promoting the Normalization of Community Governance

In order to achieve comprehensive revitalization of the countryside, it is necessary to comprehensively improve the entire land area at the beginning of the livable space supply, but also need to be maintained at a later stage of normalized rural governance. Gaozuo Town, Jianhu County, Yancheng City, Jiangsu Province, to establish a "general grid - comprehensive grid - micro-grid" multi-level grid governance system, the scientific configuration of community activity centers, party service centers and other public space and urban residents, villagers, party and government personnel and other social forces in the grid system of the functional positioning and operating mechanism, to achieve multiple governance to promote community Efficient governance. For example, in the early stage of the construction of new rural communities, there are residents living in the same community but the rights and interests of residents under the jurisdiction of the original administrative village is not fully integrated state, resulting in conflict and cross community governance. Therefore, Xinzhai Town in the grid governance system should be formed by the community and the original village party building leadership team composed of community health, recreational activities, land transfer dividends, etc., the integrated grid members and by the party pioneers or grass-roots people as a micro-grid members.

5 Summary

In the context of rural revitalization, this paper focuses on comprehensive land improvement in small towns, exploring the path of comprehensive land improvement on the basis of clarifying the degree of suitability of different land spaces for agricultural production, urban construction and other human activities, with a view to safeguard-

ing the role of land as a basic element in promoting rural revitalization. The study proposes to strengthen the permanent basic farmland reserve area and the construction of high-standard farmland in farmland construction in order to grasp the spatial layout of agriculture and keep the bottom line of farmland construction. On this basis, the study proposes to promote the scale and fine management of arable land through overflowing arable land reserve and micro-field adoption mode; in terms of industrial development, the study proposes to meet the demand for land for industrial development based on the evaluation of the suitability of construction land and puts forward a new model for the integration of the three industries, such as the adoption of micro-field land. Finally, in terms of livable space, integrating land to build new rural communities and constructing a grid-based governance system to promote sustainable community development. In addition to the above spatial measures, a mechanism should be explored for the flow of land elements across regions, urban and rural areas and resources, so as to promote the efficient and high-quality flow of land elements through institutional restructuring.

Appendix

Exhibit 1. Sinzhai Township Agricultural Land Suitability Evaluation Index System

factor	Evaluation indicators	Description of indicators	Appropriateness rubric	(an official standard	value of a score	weights
water re-sources	Distance to major waterways	Reflecting water security for agricultural production	unsuitable	≥1500 meters	0	0.19
			general	1000-1500 meters	3	
			desirable	500-1000 meters	6	
			optimal	0-500 meters	9	
	Density of ditches	Reflecting water security for agricultural production	unsuitable	0-0.16	0	0.17
			general	0.16-0.32	3	
			desirable	0.32-0.48	6	
			most suitable	0.48-1.00	9	
land re-sources	NDVI	One of the important parameters reflecting the growth	unsuitable	0-0.19	0	0.27
			general	0.19-0.37	3	
			desirable	0.37-0.59	6	
			optimal	0.59-1.00	9	
	Tillage texture	Reflects soil aeration, moisturization, water retention and ease of cultivation.	unsuitable	meadow salt	0	0.25
			general	salted tidal soil	3	
			desirable	dehumidified soil	6	
			optimal	damp soil	9	
human influence	Status of land use	Reflecting regional land use	unsuitable	Waters/wetlands	0	0.12

			general	building site	3	
			desirable	unutilized land	6	
			optimal	agricultural land	9	

Exhibit 2. Sinzhai Township Construction Land Suitability Evaluation Indicator System

factor	Evaluation indicators	Description of indicators	evaluation	(an official) standard	value of a score	weights	
transport condition	national highway	Reflects the ease of making productive and living connections within and outside the town.	optimal	0-300m from national highway	9	0.16	0.35
			desirable	300-600m from the national highway	6		
			general	600-1200m from the national highway	3		
			unsuitable	More than 1200m from the national highway	0		
	county road		optimal	0-300m from county road	9	0.15	
			desirable	300-600m from county road	6		
			general	600-1200m from county road	3		
			unsuitable	More than 1200m from the county road	0		
	country road		optimal	0-300m from country road	9	0.09	
			desirable	300-600m from township road	6		
			general	600-1200m from country road	3		
			unsuitable	More than 1200m from a township road	0		
hydro-meteorology	waters	Water conditions reflecting production	most suitable	0-300m from river	0	0.2	
			desirable	300-600m from the river	9		
			general	600-1200m from the river	6		
			unsuitable	More than 1200m from the river	3		
natural ecology	woodland	Reflecting the environmental quality of production and life	general	Less than 500m from the forest area	3	0.15	
			desirable	More than 500m from the forest area	6		
locational appeal	spatial distance	Reflecting infrastructure conditions that support economic development	optimal	0-300m from the town development boundary, or within the development boundary	9	0.3	
			desirable	300-600m from the town development boundary, or	6		

				within the development boundary		
			general	600-1500m from town development boundary or 0-300m from village	3	
			unsuitable	More than 1500m from the town development boundary, or more than 600m from the village	0	

Reference

1. Liu C , Wang F , Mackillop F .A critical discussion of the BREEAM Communities Method as Applied to Chinese Eco-village Assessment[J].Sustainable Cities and Society, 2020:102172.DOI:10.1016/j.scs.2020.102172.

2. Montgomery B ,Suzana Dragičević,Jozo Dujmović.Using Soft Computing Logic and the Logic Scoring of Preference Method for Agricultural Land Suitability Evaluation[J]. Springer International Publishing, 2017.DOI:10.1007/978-3-319-22786-3_20.

3. PAN Mingwei,WANG Fayen,YANG Shudi. Evaluation of construction land suitability and reserve resource potential based on GIS[J]. Science and Industry, 2024, 24(13): 189-195.

4. JIANG Yifeng, LUO Danyi, ZHANG Yingnan. Mechanisms and Implications of Comprehensive Land Improvement for Village Revitalization in the Whole Area--Taking Dongheng Village in Deqing County, Zhejiang Province as an Example[J]. Resource Science,2025,47(01):97-109.

5. JIN Xiaobin,ZHANG Xiaolin,FAN Yeting,et al. Exploration of rural development types and comprehensive land management model of the whole region in the view of rural development elements[J]. Modern Urban Research,2021,(03):2-10.

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