

# A Few Thoughts on Ecological Landscape Construction for Rural Land Improvement

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## Abstract

**Aiming at the current problems of rural land remediation and the needs of rural ecological landscape construction in China, through analyzing the landscape effect brought by the engineering means used in rural land remediation (reclamation of rural settlements, land leveling project, road improvement project, farmland water conservancy project) to the construction of rural ecological landscape, and putting forward the possible problems in the above engineering means, we aim to elucidate the relationship between rural land remediation and the regional ecological environment, The purpose of this study is to clarify the relationship between rural land remediation and regional ecological environment and landscape pattern, and to provide scientific guidelines for the technical requirements and engineering adaptability of rural land remediation.**

## Keywords

**Rural land improvement; Ecological landscape construction; Land leveling; Rural roads.**

## 1. INTRODUCTION

Land remediation is the process of remediation, redevelopment and optimization of fields, water, roads, forests and villages in a certain area in accordance with the objectives and uses determined by the overall land use planning, urban planning and special planning for land remediation, and by adopting administrative, economic and legal means, and by applying engineering and construction measures, land remediation will inevitably have a certain impact on the landscape pattern and ecological environment[1].

Land remediation in a broad sense, including land consolidation, land reclamation and land development[2], land remediation in a narrow sense is mainly for agricultural land remediation, agricultural land consolidation in China has a wide range of large amount of works, is the main aspect of land remediation, rural land remediation can be divided into farmland consolidation and village remediation in two aspects.

Landscape ecology originated from land research, rural land ecological landscape mainly includes farmland, village, forest, water, roads and so on. Rural land remediation is an important

initiative to improve rural production and ecological conditions in a short period of time, and in the short term, it will cause strong disturbance to rural ecosystems and landscape patterns[3]. Through the implementation of land remediation such as land leveling projects, rural road projects, farmland water conservancy projects and other engineering measures, the various elements of the rural ecological landscape can be integrated into a reasonable spatial layout, so that the various elements cooperate with each other and become more coordinated, and at the same time, it can improve the imbalance of the rural ecological development, promote the construction of the new countryside and coordinated urban and rural development, and promote the harmonious stability of the rural society and the long-term sustainable development, and build a beautiful The new face of the countryside[4-5].

## **2. OVERVIEW OF THE DEVELOPMENT OF RURAL LAND IMPROVEMENT IN CHINA**

Rural land remediation work in China has experienced a long period of development and reform, and has begun to show results. Initially, rural land improvement work is mainly to increase the usable arable land area, but neglected the rural ecological environment, landscape pattern protection and planning, resulting in the emergence of a series of problems, some experts put forward such as reserve land land rectification resources of poor quality, rural landscape construction is not coordinated and other issues. Utopian Wenju and others conducted a survey and study of more than 200 villages across the country and found that more than 60% of villages had average or poor rural landscapes, and more than 80% of villages had insufficient road planning, greening, and badly damaged ditches, roads, forests and canals, and the ecological function of the countryside had been seriously degraded[6-7].

In recent years, the domestic ecological landscape research on rural land improvement is more extensive, and many scholars have also put forward corresponding countermeasures and recommendations in this regard[8]. Based on this, land remediation work is also accompanied by the continuous promotion of social and economic new requirements, new center of gravity, pay more attention to the quantity, quality, ecological trinity development, especially rural land remediation work focuses on improving the quality of the land and ecological environment, landscape aesthetics and other aspects of the construction, to strengthen the ecological landscape service capacity.

## **3. RURAL LAND IMPROVEMENT PROJECTS AND THEIR LANDSCAPE EFFECTS**

This paper mainly focuses on the main rural land improvement engineering means (settlement reclamation, land leveling, rural road engineering, farmland water conservancy) and its landscape effect to be analyzed.

### **3.1. Rural settlement reclamation and its landscape effect**

On the one hand, with the advance of urbanization, urban expansion has gradually occupied rural land; on the other hand, the existing rural settlements and infrastructure sites are widely dispersed, occupy a lot of land, and have low utilization rates, and the land use in hilly and mountainous areas is especially rough, and the rural labor force is exported in large quantities, and a lot of residential bases are abandoned, and the "hollow villages" are constantly appearing, and the reclamation projects for rural settlements are mostly for the purpose of reclaiming the land. At present, most of the reclamation projects in rural settlements are carried out for abandoned and unused residence bases, and the reclamation of settlements and the construction of new residences have significantly improved the living conditions of farmers. The reclaimed settlements are mainly converted into agricultural land, and the land is used for

farming, forestry and gardening according to local conditions, which is conducive to the transformation of rural land use and the restoration of the rural ecological environment, and objectively better solves the relationship between the income of farmers and the restoration of the ecological environment, which has caused a certain impact on the rural ecological landscape. Settlements into farmland will make the level of landscape diversity decline, so that the land use type box landscape patches tend to regularization and agglomeration[9].

### **3.2. Land leveling project and its landscape effect**

Land leveling project is generally the field consolidation and slope conversion of farmland, which can change the landscape pattern of farmland. Land leveling project is more common in the current stage of rural land remediation work, and there are more studies in this area, mostly focusing on the research and application of new technologies and methods, and there are different engineering means according to the topographic and geomorphological characteristics of the region[10]. At present, there are also studies focusing on the impact of land leveling projects on the ecological landscape, land leveling has carried out the material exchange of plots, changing the flow process of matter, energy and information, field merging reduces the degree of land fragmentation, slope to terraces field shape is more regular, to a certain extent, exacerbated the degree of landscape fragmentation, the use of slopes to terraces is more experimental in the hilly and mountainous areas, improves the conditions of production, and is conducive to the implementation of mechanization, large-scale farming, and centralized irrigation and drainage.

### **3.3. Rural road improvement project and its landscape effect**

Rural roads, including production roads and field roads, are an important part of rural infrastructure and an ecological corridor in the farmland ecosystem, which is crucial to the exchange of materials between regions and the travel of residents[11]. Especially in some mountainous areas, due to terrain conditions and economic constraints, rural road infrastructure is weak, which seriously restricts local socio-economic development. In order to promote the construction of new rural areas and meet the development needs of modern agricultural production, optimizing the structure of rural roads and improving transportation facilities have become the urgent needs of rural modernization. Rural road improvement as an important part of rural land improvement, the project has an important role in improving rural road conditions. At the same time, rural roads, as farmland ecosystem corridors, play a role in material exchange between regional ecosystems, which on the one hand increases biodiversity, but on the other hand reduces the connectivity of land parcels and exacerbates the degree of fragmentation of land parcels, and the interference of man-made spatial patterns of road corridors will inevitably also have a direct or indirect impact on regional landscape patterns and farmland ecosystems.

### **3.4. Farmland water conservancy projects and their landscape effects**

Farmland water conservancy facilities are one of the main infrastructures in rural areas, which on the one hand can improve the conditions of agricultural production, and on the other hand can resist floods and droughts, guarantee food security and protect the regional ecological environment. In the rural land improvement that has been carried out, a lot of attention is paid to the construction of farmland water projects, through the implementation of farmland water conservancy projects[12], it can carry out reasonable regional water resource allocation, improve the utilization rate of agricultural water resources, reduce regional soil erosion and water resource disasters, and improve the regional farmland irrigation and drainage system. At the same time, the farmland water conservancy project (water intake project, water transmission and distribution project, drainage project) has an important ecological landscape function, which will affect the regional landscape pattern and farmland ecosystems, the point

project does not have much impact on the existing landscape, mainly the linear project, which affects the division and connectivity of the landscape, influences the regional material and energy exchanges and human activities[13], aggravates the fragmentation of the regional patch, and the farmland water conservancy project remediation exactly optimize the regional landscape by building in this linear corridor to facilitate life and improve the environment.

#### 4. A FEW THOUGHTS ON RURAL LAND REMEDIATION

Through the above discussion, it can be seen that land remediation is vital to the construction of rural ecological landscape, which is an important task for the sustainable development of rural areas at this stage in China, but it also raises a number of problems that are worth thinking about.

(1) settlement reclamation project, may lead to more chaotic landscape, if the use of the whole village promotion can be land remediation and new rural construction, through the adjustment of land property rights, relocation of villages and points, will be the appropriate concentration of settlements, intensive land use, re-division, and based on the needs of the farmers, the land use structure, appropriate adjustments to clarify the proportion of production and living land of the farmers, the formation of a large-scale, orderly settlement of villages. The whole-village promotion makes the number of settlements decrease, the scale of settlements increase significantly, the shape of land-use type patches become more regular, the spatial agglomeration of land-use types and their landscapes increase, and the land use pattern tends to be simple and orderly, especially in the context of China's small-farming economy and land fragmentation, which is of great significance for solving the land problem and adapting to the development of the society. However, there are still a lot of uncertainties in the construction of land use after reclamation as well as the coordination of farmers' income and risk resistance, which is yet to be further improved by the policy system and technical demand.

(2) There are also some problems in the land leveling project. Some experts pointed out that in the process of land leveling, big digging and filling, neglecting the protection of the cultivation layer, only pursuing the appearance of spectacular consistency, leading to a decline in soil fertility, in some areas of the layout of the irrational distribution of irregularity can not be said to have caused an adverse impact on the soil physical traits and nutrients, regional biodiversity, and it is difficult to improve the land ecological environment and restoration; field consolidation makes the leveling and construction, and coordinates the farmers' income and risk resistance is still a lot of uncertainty, pending further improvement of the policy system and technical needs. Repair; field merging makes the leveled land and supporting field facilities, water conservancy facilities can not be a good match, slope to ladder changed the original slope process, terracing height difference enhances the water and soil potential energy of the slope, the collapse of the field cans, which will inevitably lead to serious losses and ecological and environmental problems.

(3) Rural roads are greatly affected by topography and geomorphology, and the implementation of road construction according to local conditions is an important technical issue in rural land improvement projects. Under the current situation, rural roads are mostly used with high grade concrete, excessive hardening of roads, without paying attention to the construction of ecological corridors, destroying the biological living environment and reducing the ability of biological passage, in order to build an ecological countryside and create an ecological environment in which human beings and nature coexist harmoniously, the rural road remediation should pay attention to the construction of ecological landscapes, and make more efforts in the design of the project, the use of materials and the construction technology, and should be combined with the remediation of the geographical region's Ecological environment characteristics, give full consideration to the ditch, forest network, road full organic

combination, the use of permeable environmental protection materials, pay attention to the construction of protective belts, for plant and animal activities to establish channels, reflecting the ecological beauty of the countryside.

(4) In different terrain and geomorphological conditions, how to rationally layout and plan and design water conservancy engineering facilities is an important issue in the improvement of farmland water conservancy projects, but the solution to the problem is difficult, requiring a large amount of capital investment, multi-sectoral coordination, so the primary task of farmland water conservancy improvement projects should be placed on the repair and rectification of the old projects, combined with the existing water sources, if the funds and conditions in various aspects allow, When funds and other conditions permit, new water conservancy facilities should be built to meet the demand, taking into account the existing water sources, topography, distribution of drainage systems, rural planning and ecological layout. Improvement or construction of farmland water conservancy projects should follow the guidelines of coordination and adaptation of the environment and engineering, select materials according to local conditions, minimize human interference in the environment, line project should form a green corridor, and the region can form an ecological network system, to play its due service and aesthetic value.

(5) should pay attention to the study of rural landscape value, each countryside has its own landscape style, is formed by the interaction of local hydrology, geology, biology, farmland pattern, buildings, etc., is an important feature that distinguishes a region from other regions, is a record book of the evolution of history, has a humanistic landscape, cultural and aesthetic value. Rural land improvement should be combined with its own characteristics, rational planning, reasonable support, to avoid uniformity, and improve the regional ecological landscape service function.

In conclusion, rural land remediation is a double-edged sword, on the one hand, it can improve the layout of farmland and production conditions, change the size of landscape patches, and improve the coordination of farmland landscape; but on the other hand, to a certain extent, it destroys the structure and function of the original natural ecological landscape, so that the ecosystem regulatory capacity declines, which is not conducive to the sustainable development of rural ecological landscape, and it should be maintained to solve the problem by maintaining the cycle of nature, respecting the various ecological processes, try to maintain the original flavor, do not destroy the ecological landscape, reduce artificial interference, and build ecologically beautiful villages according to local conditions.

## 5. CONCLUSION

At present, the ecological landscape construction technology of rural land remediation is still in the stage of gradual development, and this paper analyzes and discusses the landscape benefits and problems brought by rural land remediation under urban-rural integration from the aspect of existing rural land remediation projects (settlement reclamation, land leveling, rural roads, farmland water conservancy), aiming at clarifying the relationship between the response of land use, biodiversity and landscape pattern. The aim is to clarify the relationship between land use, biodiversity and landscape pattern, and to provide theoretical references for the applicability and technical requirements of rural land improvement. However, the research and analysis of landscape ecological process, landscape technology and applicability of engineering measures in rural land improvement still need a lot of detailed work and practical exploration.



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## REFERENCES

- [1] Shao Liya, Chen Rongrong, Hou Junguo, Cheng Fei, Fu Kai. Evaluation of Ecological Suitability of Urban Construction Land--Taking Rongchang County of Chongqing Municipality as an Example[J]. China Agricultural Resources and Zoning, 2013, 34(06):86-92.
- [2] Leonardo Uriel Arellano-Méndez, Arturo Mora-Olivo, Carlos Zamora-Tovar, Edilia de la Rosa-Manzano, Jorge Ariel Torres-Castillo, Javier Bello-Pineda. structural complexity of tropical seagrasses meadows in a temperate lagoon in the Gulf of Mexico. a landscape ecology approach[J]. Journal of Coastal Conservation, 2019, 23(6).
- [3] Song Jiang. Functions and Policy Suggestions of Rural Land Improvement Project in Rural Revitalization Strategy--Taking Xiushan Tujia-Miao County of Chongqing Municipality as an Example[J]. Rural Economy and Technology, 2019, 30(12):193-194.
- [4] Kong Xuesong, Wang Jing, Jin Zhifeng. Thinking about the transformation and innovation of rural land remediation for rural revitalization[J]. China Land Science, 2019, 33(05):95-10
- [5] An Guoqiang. Comparative study on ecological protection issues in rural land consolidation in China and Germany--Taking Shandong Province and Bavaria land improvement project as an example[J]. Journal of Shandong Normal University (Natural Science Edition), 2018, 33(02):182-189.
- [6] Sun Yanwei, Long Teng, Gu Shoubai. Analysis of the preparation of construction standards for land remediation projects in Shanghai under the background of comprehensive land remediation[J]. Journal of Agricultural Engineering, 2018, 34(11):261-267.
- [7] Uiu Wenju, Yu Zhenrong. Countermeasures for the application of theories, methods and techniques of land remediation to enhance ecological landscape construction[J]. China Land Science, 2011, 25(06): 4-9+19.
- [8] Yu Zhenrong. Strategies for ecological landscape construction in rural land improvement in China[J]. Journal of Agricultural Engineering, 2011, 27(04):1-6.
- [9] Cai Pengcheng, Liu Feixiang, Su Qi. Practical Exploration of Developing Circular Agriculture under the Perspective of Rural Ecological Environmental Protection--Taking Longyan City of Fujian Province as the Research Area[J]. Science and Industry, 2012, 12(08):10-12.
- [10] LI Liangtao, WANG Haoyuan, YU Zhenrong. Research progress on plant diversity and ecological service function of farmland boundary[J]. Chinese Agronomy Bulletin, 2018, 34(19):26-32.
- [11] WEI Yaohua, CHEN Rongrong, YANG Chaoxian, XIN Guixin. Research on the spatial differentiation of ruralness and development type of village areas in hilly areas--Taking Rongchang District of Chongqing as an example[J]. Geographic Research and Development, 2019, 38(03):170-175.
- [12] Chen Yinlong. Rural environment improvement needs to integrate resources[N]. China Environment News, 2013-04-29(008).
- [13] Wei Hongbin, Luo Ming, Ju Zhengshan, Wang Jun, Wu Kening. Review on the Research Priorities of China's Land Remediation in the Twelfth Five-Year Plan and Prospects for the Thirteenth Five-Year Plan[J]. Soil and Water Conservation Research, 2017, 24(02):371-377.