

# Rural Land Use Progress and Its Implication for Rural Revitalization in China

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Land is the solid basis for human existence, living, and production activities. Through agriculture, forestry, mining, and other uses, land provides the food, water, and energy necessary for human survival, as well as substantial economic returns. Land use is susceptible to long-term anthropogenic changes. Sustainable land use is significant to the economic development of human society, while unsustainable land management results in a decline in ecosystem services and brings about negative impacts on regional sustainable development [1,2].

China faces an intense human–land relationship, with little average cultivated land per capita. Rapid urbanization and industrialization have induced various land issues with respect to the degradation of cultivated land, the expansion of constructed land, and the loss of ecological land. As an agricultural country with a large rural population, the type and structure of China’s rural land use have undergone significant changes, mainly due to rapid socio-economic development in recent decades [3]. Especially since 2000, some measures and projects have been carried out to prevent issues of rural decline. The improving infrastructure and essential public services in rural areas not only involve the greatest investments but also occupy valuable land resources. For example, targeted poverty alleviation and rural revitalization strategies significantly promote the development of the rural economy, which needs abundant land as a space carrier and is accompanied by rapid land use changes and modifications [4]. However, in the meantime, rural restructuring is usually associated with changes in farmland and rural housing land, even affecting ecological land use. By 2050, China’s rural areas should have robust agriculture, beautiful landscapes, and prosperous farmers. Although rural land engineering can be adopted to optimize the human–land relationship and promote rural sustainable development [2]. Land use sustainability is still listed as a priority in the aspects of the coordinated development of rural regional functions, rural transformation, and urban–rural integration [5].

Agriculture, rural areas, and farmers are known as the “Three rural issues” which are fundamental to China’s development and the well-being of rural people. The modernization of agriculture and rural areas will place more emphasis on the use of overworked rural land. Therefore, this themed Special Issue mainly focuses on the evolution processes, spatial–temporal patterns, and eco-environmental effects of rural land use in China, and the influencing factors and mechanisms of rural land use transition are also addressed. A total of twenty-three articles were successfully peer-reviewed in this Special Issue. The published articles can be classified into three topics, including land consolidation and land system reform, land use patterns and their eco-environmental effects, and land transfer and its influencing factors. The results and prospects will propose useful theories and practical policies for the consolidation of rural settlements, the sustainable use of farmland, and land system reform in the context of rapid urbanization and urban–rural development.



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There are nine articles within this section. Land consolidation mainly refers to hollow villages, rural settlements, sandy land, and pilot projects, while land system reform was studied from the perspectives of farmers and social investors, agricultural modernization, and scale and revenue.

Qu et al. (Appendix A, 1) adopted a typical village-investigation method and the actor–network theory to obtain a rural governance policy and its application conditions. The diversified governance modes and dynamic governance process of hollow villages provided targeted suggestions to resolve the problems during the consolidation and governance of hollow villages. Cao and Song (Appendix A, 2) divided the spatiotemporal variations in a rural settlement into an expansion pattern, merge pattern, retreated pattern, and urbanization pattern. Chinese policies for homesteads have played profoundly regulating and guiding roles in the spatial distribution changes and evolution stages of rural settlements. In China’s metropolitan fringe area, rural settlements showed the morphological types strip, arcbelt, cluster, and scatter. These distribution patterns were related to agricultural production, rural economic development, and cultural and policy factors (Appendix A, 3). In an arid sandy area, the limiting factor exclusion method was used to reveal the appropriate tillage of sandy land and regional desertification prevention (Appendix A, 4).

Social capitals investments and farmers’ willingness play important roles in land consolidation. The concerns and needs of social investors and farmers in decision-making for comprehensive land consolidation projects (Appendix A, 5) and the remediation of contaminated farmland (Appendix A, 6) were explored using a methods of evaluation index system, an empirical analysis, and structural equation and random forest models, respectively. The results indicate that land consolidation should consider social investors’ attention to transaction income and industrial operating income and farmers’ attention to perceived benefits and suitable technologies. Sun et al. (Appendix A, 7) found that land certification programs had significant effects on the farmland “stickiness” of rural labor due to the enhanced land production function. The results also suggest that a land certification program can improve the relationship between smallholders and modern agriculture. Cai et al. (Appendix A, 8) explored the promotion of the reform of the farmland rights system to agricultural modernization, examining the practice of Yuyang District in Northwestern China. Administrative intervention in the reform of the farmland rights system from decentralization to centralization can help achieve agricultural modernization. Jin et al. (Appendix A, 9) used a quadratic econometric model to analyze the relationship between the scale and revenue of the land-use balance quota. The inverted “U” relationship and spatial heterogeneity results indicate that the appropriate size of the land-use quota should be comprehensively considered during governmental policy making.

Nine articles focused on driving forces, spatiotemporal changes, and crop planting and production. At the provincial level, Wu et al. (Appendix A, 10) analyzed the effects of changed territorial spatial patterns on eco-environmental quality based on the functional classification system of “production-living-ecological. However, the steady improvement of the eco-environmental quality was directly affected by the annual average precipitation, the proportion of non-agricultural area, and socio-economic factors. The coupled interaction between human and nature factors had enhancing effects on changes in the eco-environmental quality in Qinghai Province, China. At the family farm level, efficiency and influencing factors were studied from the perspectives of different regions and operation types, using the Data Envelopment Analysis model and Tobit model, respectively. Breeding family farms had the highest efficiency compared to other types of family farms. In addition, the varied factors influencing family farms’ efficiency in different regions and types suggested that local governments and operators should choose differentiated management measures to improve the lower efficiency of family farms (Appendix A, 11). The conversion of cultivated land into non-agricultural land in China’s Karst mountainous areas faces trade-offs between social development and ecological risk. Han et al. (Appendix A, 12)

indicated that the conversion of cultivated land into forest land and shrub–grassland can reduce the ecological risk to the landscape while maintaining food security.

Significant differences in spatiotemporal patterns, landscape characteristics, and land-use changes between China’s paddy fields and drylands have been found from 1990 to 2020, using land-use raster data. The results suggest the protection of arable land on sunny slopes and in plain areas and, meanwhile, the strengthened sustainable utilization of water resources in the provinces of Xinjiang and Gansu (Appendix A, 13). The multiple functions and the green transition of cultivated land utilization are important ways to implement ecological progress and food security strategies. In the major grain-producing areas of Northeast China, the level of agricultural development determined the spatiotemporal evolution of the multifunctional coupling coordination degree of cultivated land (Appendix A, 14). Spatiotemporal coincidences were found with great consistency in changes in the “water-land-food-carbon” system and their coupling coordination degrees under the green transition of cultivated land utilization (Appendix A, 15).

Chen et al. (Appendix A, 16) indicated that the spatial patterns in China’s soybean planting had significantly changed from 1949 to 2019; however, a fluctuating upward trend of soybean production and an unchanged area of soybeans sown were found. Different policies were proposed to alleviate the national soybean shortage problem in Southern China, the Huang–Huai–Hai Plain, and the Northeast China Plain. Li et al. (Appendix A, 17) used remote-sensing interpretation data to reveal the spatiotemporal evolution of the crop-planting structure in Hailun County of Northeast China. This study suggested that adjustments to the crop-planting structure should be conducted via the optimization of the crop area proportion and the spatial distribution of crops at the county level.

Five papers focused on the issue of land transfer. Gao et al. (Appendix A, 18) conducted a questionnaire-based survey to verify the function of the herd effect in farmers’ land transfer behavior. The results demonstrated the herd effects of government on promoting land transfer by constructing farmland infrastructure and developing the land transfer market. The other four papers concerned the interaction mechanisms between land transfer and family structure, livelihood, household consumption, and labor migration. Zhang et al. (Appendix A, 19) studied the effects of family structure on the area of land transferred out. Elite families with party members had more individual land area in paid subcontracting than households with a grassroots cadre. Liu et al. (Appendix A, 20) revealed that the leaseback and re-contracting model of land transfer is the best way to increase farmers’ livelihood capital, while Hong and Lou (Appendix A, 21) indicated that rural households involved with the transfer-in and transfer-out of land can promote non-food and food consumption expenditure, respectively. Wang et al. (Appendix A, 22) measured the coupling coordination degree between farmland transfer and labor migration in China using socioeconomic data. The primary coupling coordination stage was found to have large differences in the degree between regions in the coordinated development of farmland transfer and labor migration. In addition, Feng et al. (Appendix A, 23) examined the effects of China’s high-standard farmland construction policy on the agricultural total factor productivity. Their results suggest that the high-standard farmland construction policy has significantly promoted the agricultural total factor productivity through the enhancement of agricultural technology change and technical efficiency.

Rural land use can be divided into agricultural land and rural constructed land [6]. Rural land use in China is a hot topic concerning the government, scholars, and rural residents. This Special Issue organized 23 papers to discuss it from different scales and perspectives, using different methods. Some interesting and important conceptual–theoretical and empirical contributions were made to progress the research on rural land use in China. However, there are still some themes that need to be noted in future studies of rural land use in China.

Firstly, the integrity and stability of rural ecological function are the basis of agricultural production and rural living. Previous studies have noted the coordinated development among rural production–living–ecological functions and their optimization strategies. In

the context of dramatic human activities, the evolution of rural ecological space has brought out serious resource and environmental problems. The synergy and tradeoff of ecosystem services, the nexus of land–water–food–energy, and the pollution of water, soil, and gas causing changes in the rural production–living–ecological space still require more attention. In addition, China’s central government has issued guidelines for setting up and improving a mechanism to realize the value of ecological products amid green development efforts. Rural areas have abundant ecological resources and traditional culture resources which can be measured, mortgaged, and transacted through the integration of policy, technology, industry, and markets. Potential rural land use transitions and land management should be noted.

Secondly, the number and structure of the rural permanent population have significantly changed. The reduction in and aging of the rural labor force pose challenges to agricultural production. In addition, climate change brings both challenges and opportunities to agricultural production. Who will tend the cultivated land and operate the agricultural machinery? How can climate-smart agriculture be implemented? These issues need to be addressed using top-down guidance and bottom-up engagement. Extensive research should be conducted to provide suitable policies and empirical modes for government and local farmers. Furthermore, the continuous expansion of the number of the people who have returned or moved to the countryside to start a business or innovate will result in changes in rural land use.

Lastly, China’s rural areas have diverse types and distinct development levels. The regional coordination of human–land relationships and land use optimization are essential for rural revitalization. The challenges arising from continuous urbanization and extreme climate change threaten sustainable land use and rural development. It is urgent to learn from other countries’ rural transformation experiences and modes, especially with respect to land use policies and planning, land system reform, and the comprehensive consolidation of land.

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## Appendix A

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