

## Article

# Land Consolidation in Rural China: Historical Stages, Typical Modes, and Improvement Paths

Yuanzhi Guo <sup>1,2,\*</sup>  and Jieyong Wang <sup>1,2,3</sup> 

<sup>1</sup> Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China

<sup>2</sup> Key Laboratory of Regional Sustainable Development Modeling, Chinese Academy of Sciences, Beijing 100101, China

<sup>3</sup> University of Chinese Academy of Sciences, Beijing 100049, China

\* Correspondence: guoyz.16b@igsnr.ac.cn

**Abstract:** Land consolidation is an important means to optimize land-use structure and improve the level of intensive and economical use of land, and it is also a critical measure to coordinate economic and social development and promote cultivated-land protection. Therefore, the scientific advancement of land consolidation is of great significance to comprehensively promote rural revitalization and build a modern agricultural power. In this study, we explore the history of rural China's land consolidation since 1949 and divide it into five stages: start-up stage (1949–1977), exploration stage (1978–1997), rapid development stage (1998–2007), quality improvement stage (2008–2018) and comprehensive consolidation stage (2019 to present). In different stages, there are obvious differences in national policy orientation on land consolidation. The differences in organization and implementation entities determine that government-led land consolidation, enterprise-driven land consolidation and villager-initiated land consolidation are the three main modes of rural land consolidation in China. To overcome the problems existing in current rural development and boost rural and agricultural modernization, it is urgent to adhere to planning-led and ecological priorities, build a diversified input pattern, innovate the public participation mechanism and strengthen full-process supervision, scientifically promoting the whole-region comprehensive land consolidation in rural China.

**Keywords:** land consolidation; historical stages; typical modes; improvement paths; rural revitalization; China



**Citation:** Guo, Y.; Wang, J. Land Consolidation in Rural China: Historical Stages, Typical Modes, and Improvement Paths. *Land* **2023**, *12*, 491. <https://doi.org/10.3390/land12020491>

Academic Editor: Birgit Schmoock

Received: 11 January 2023

Revised: 9 February 2023

Accepted: 11 February 2023

Published: 16 February 2023



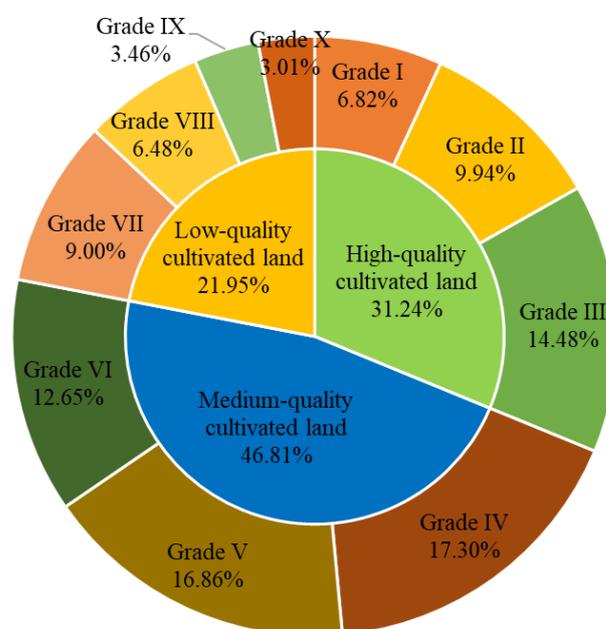
**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

Land is vital to human survival and development [1,2]. As a resource, land is the material basis and spatial carrier for human production, living and survival, and it can provide various products and services to human society [3]. Due to its profitability and scarcity, land is also an asset, which is mainly manifested in property relations and economic attributes [4]. In a market economy, once land, especially the developed construction land, enters the market for transaction and mortgage, it acquires the attribute of capital and can generate profits and realize added value [5]. Therefore, land has become a factor of production that combines the attributes of resources, assets and capital [6], and it is a natural-economic complex that integrates natural elements and labor results, which participates in the continuous operation of the macroeconomy at the roots.

China is a large agricultural country [7]. The basic national conditions of more people and less land determine that the core of the issues concerning agriculture, rural areas and farmers is land. In this context, the Chinese government is committed to deepening land system reform, thus activating rural land elements and helping agricultural and rural development to a higher level [4,8,9]. However, the fairness-oriented land distribution method artificially intensifies the fragmentation of cultivated land, resulting in the waste of cultivated land, which is not conducive to the improvement of agricultural production

efficiency [4,10]. On the other hand, due to factors such as the mismatch of water and land resources and poor farmland infrastructure, low- and medium-yield fields account for a large proportion in rural China [11]. According to the Ministry of Agriculture and Rural Affairs of the People's Republic of China (PRC), the proportions of medium-quality (grade IV to VI) and low-quality (grade VII to X) cultivated land nationwide in 2019 were 46.81% and 21.95%, respectively [12] (Figure 1). To maximize land output, agricultural operators often overexploit land and use many modern inputs such as pesticides and chemical fertilizers to obtain food, exacerbating the contamination of cultivated land [13–15]. Additionally, the rapid industrialization and urbanization have led to a massive shift of rural population to urban areas, resulting in the widespread abandonment of cultivated land and idle rural construction land [9,16]. As a result, land consolidation, which aims to improve land-use efficiency through remediating the land that is inefficiently used, irrationally used, unused and damaged by production and construction activities and natural disasters [17], has become an important method for the sustainable development of China's agricultural and rural areas.



**Figure 1.** Statistics of China's cultivated land quality grade in 2019.

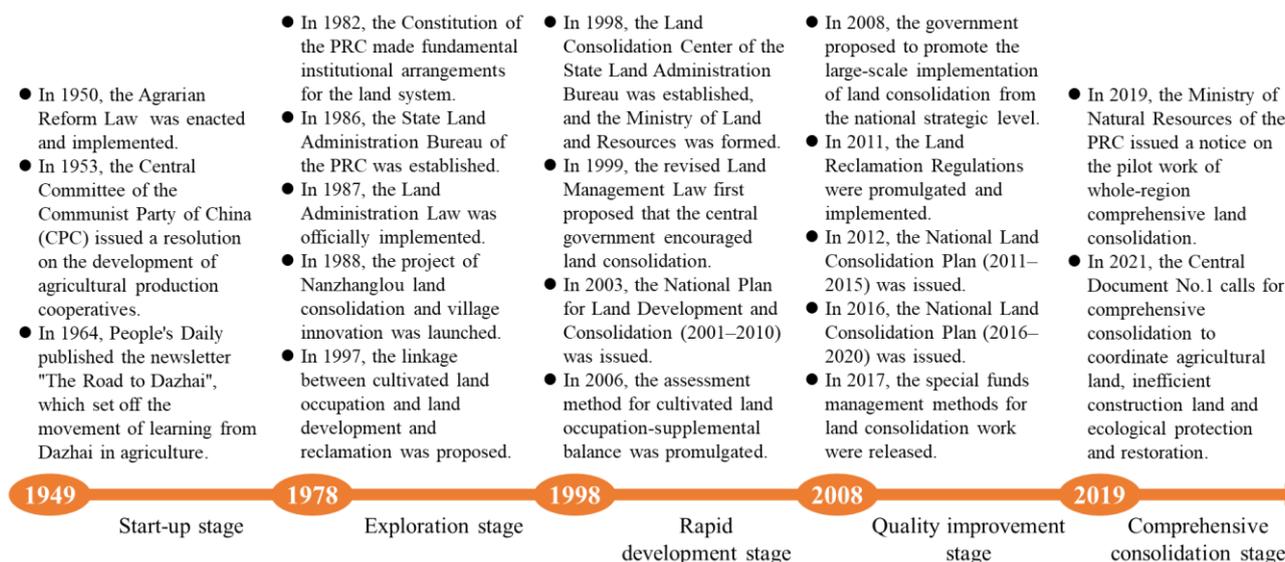
Because of the important role of land consolidation in promoting agricultural and rural modernization and accelerating urban-rural integrated development [18–21], economics, management, geography and other disciplines have conducted in-depth studies on rural land consolidation from different perspectives. These mainly include land consolidation modes [22,23], land consolidation planning [24], public participation in land consolidation [25] and engineering technologies of land consolidation [26,27], as well as ecological and environmental impacts of land consolidation [6,28,29]. Driven by scientific research, China's rural land consolidation has been deepened and expanded, and its goal has changed from replenishing the quantity of cultivated land and ensuring national food security to improving the quality of cultivated land, enhancing comprehensive benefits and promoting regional sustainable development [6,19]. In the stage of building a well-off society in all aspects, land consolidation is an important way to get rid of poverty [6]. In developed countries, rural land consolidation has also experienced a long development process, with research focusing on the benefit evaluation of land consolidation [30], the landscape ecology of land consolidation [31] and the summary of typical experience in land consolidation [32]. With social and economic development, land consolidation in developed countries is advancing in the direction of ecology, standardization, technology

and diversification [33], and relevant research is becoming increasingly comprehensive, connotative and diversified.

In 2020, the elimination of absolute poverty in rural China meant that the focus of issues concerning agriculture, rural areas and farmers shifted from poverty alleviation to rural revitalization. In terms of its connotation, rural revitalization requires the activation of various elements in rural areas to optimize element structure, enhance territorial functions and reshape rural forms, building a coupled pattern of population, land and industry [19]. This dramatic change has brought new challenges and requirements to rural land consolidation to meet the needs of agricultural and rural modernization. In this study, we explore the improvement paths of land consolidation in rural China through a review of historical processes and typical modes, thus strengthening the foundation of rural development, ensuring national food security and contributing to the construction of a modern agricultural power. Section 2 reviews the history of rural land consolidation in China since 1949, Section 3 sorts out the typical modes of rural land consolidation in China, and Section 4 puts forward the improvement paths for the main problems existing in China's rural land consolidation, followed by the conclusion and discussion of this research.

## 2. Historical Stages of Land Consolidation in Rural China

Land consolidation has a long history in China [6,34]. From the well-field system to the arm-farming system and then the occupied-field system and equal-field system, China has continuously practiced land consolidation in its thousands of years of farming history [35]. However, these practices are simple and have not formed a systematic and complete theoretical and methodological system. After the founding of the PRC in 1949, land consolidation with land development, land reclamation and land conservation as the main content continued to advance, opening China's rural land consolidation in the modern sense [36]. Throughout the past 70 years of land consolidation, it can be divided into five stages, i.e., start-up stage (1949–1977), exploration stage (1978–1997), rapid development stage (1998–2007), quality improvement stage (2008–2018) and comprehensive consolidation stage (2019 to present) (Figure 2).



**Figure 2.** Historical stages of rural land consolidation in China since 1949.

### 2.1. Start-Up Stage (1949–1977)

In the early days of the PRC, the government introduced the farmers' land ownership system. Beginning in the early 1950s, the government launched a large-scale agricultural cooperative movement, gradually transforming the private ownership of rural land into the collective ownership. In the 1960s, the movement of learning from Dazhai in agricul-

ture rose across the country, and the main goal of land consolidation in various regions was to turn existing cultivated land into stable and high-yield cultivated land that could guarantee the harvest from drought and flood. Correspondingly, the main content of land consolidation was the large-scale construction of water conservancy, and land productivity increased rapidly. After a short-term adjustment of production relations, land consolidation in this stage mainly revolved around the construction of water conservancy, which greatly promoted food production and improved farmers' livelihoods, but the level of land consolidation was low due to the limitations of insufficient theoretical cognition and lack of engineering technology, and some unreasonable practices brought damage to the ecological environment.

### *2.2. Exploration Stage (1978–1997)*

Since the reform and opening-up, the human-environment conflict in rural areas caused by rapid industrialization and urbanization has attracted great attention from the government. In 1982, the revised Constitution of the PRC established the institutional arrangement of state and collective ownership of land. In 1986, the State Council established the State Land Administration Bureau. In June of the same year, the newly implemented Land Administration Law of the PRC set rational use of land and effective protection of cultivated land as the main objective of legislation. In 1988, the Hans Seidel Foundation selected Nanzhanglou Village to implement the Sino–German cooperation project of “Land Consolidation and Village Innovation”, which opened the international cooperation in China's rural land consolidation. In 1997, the Notice on Further Strengthening Land Management and Effective Protecting Cultivated Land first proposed the policy of linking the occupation of cultivated land with land development and reclamation. Guided by a series of documents, land consolidation achieved great development in this stage, and the main content of land consolidation was land leveling, field merging and improvement of infrastructure. By combining foreign experiences with China's reality, beneficial practice had been carried out in the connotation and modes of land consolidation.

### *2.3. Rapid Development Stage (1998–2007)*

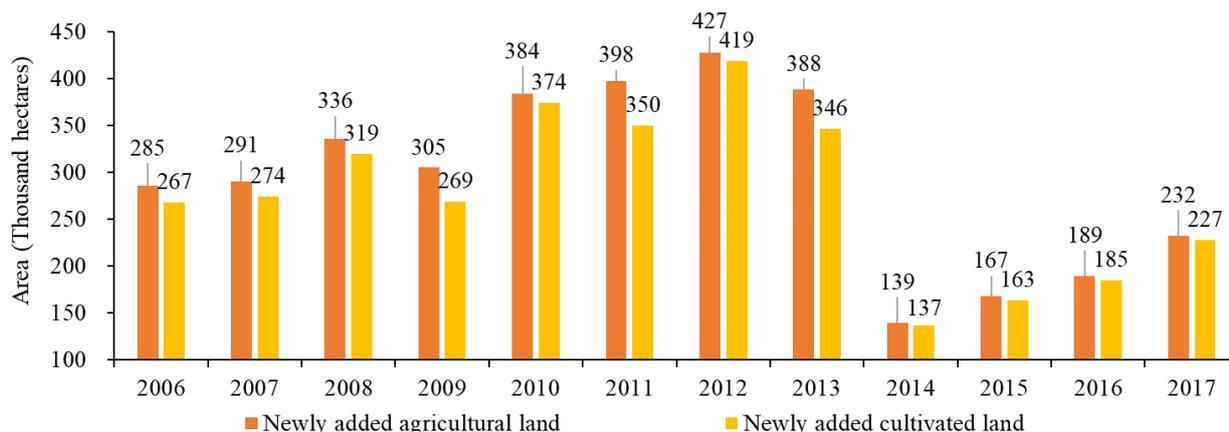
In 1998, the Land Consolidation Center of the State Land Administration Bureau was approved for establishment. In the same year, the State Council promoted institutional reform, and the Ministry of Land and Resources was jointly established by the State Land Administration Bureau, the Ministry of Geology and Mineral Resources, the State Bureau of Surveying and Mapping and the State Oceanic Administration. In 1999, the revised Land Administration Law proposed that the state encourage land consolidation, highlighting the high importance the government attached to land consolidation. In 2003, the National Plan for Land Development and Consolidation (2001–2010) made arrangements for land consolidation at the national level and identified 10 key areas for land consolidation, involving 1180 counties (Figure 3). In 2006, the Assessment Method for Cultivated Land Occupation-Supplemental Balance incorporated land consolidation into the performance appraisal of governments at all levels. In this stage, the scope of land consolidation was expanded to “land development and consolidation”, the goal changed from increasing the quantity of cultivated land to improving the quality of cultivated land, and the construction of institutional standards and technical systems became increasingly standardized. As a result, China's rural land consolidation funds and the number of projects grew rapidly, helping land consolidation to advance in an all-round way, and some places also began to explore the beneficial combination of cultivated land construction and village land consolidation.



**Figure 3.** Key areas for land consolidation identified in the National Plan for Land Development and Consolidation (2001–2010), including the North China Plain, Northeast Plain, Middle and Lower Yangtze River Plain, Zhejiang–Fujian Hilly Plain, South China Hilly Plain, Sichuan Basin and Qinba Mountains, Yunnan–Guizhou Plateau, Loess Plateau, Inner Mongolia Plateau and Oasis areas at the foot of Tianshan Mountains in Xinjiang.

#### 2.4. Quality Improvement Stage (2008–2018)

In 2008, the Decision on Several Major Issues Concerning Advancing Rural Reform and Development clearly proposed the large-scale implementation of land consolidation. In 2011, the State Council promulgated and implemented the Land Reclamation Regulations. In 2012, the National Land Consolidation Plan (2011–2015) was issued, and in 2016, the National Land Consolidation Plan (2016–2020) was approved, forming a four-level planning system of “country-province-city-county” with clear objectives and positioning and mutual connection. In 2017, the Measures for the Administration of Special Funds for Land Consolidation defined the use scope of special funds for land consolidation and clarified the responsibilities of financial and land departments in the allocation, management and supervision of special funds. Generally, the construction of basic cultivated land continued to be strengthened in this stage, and the basic goals of land consolidation were to enhance the quality of cultivated land, increase the area of cultivated land (Figure 4) and improve agricultural production conditions. In line with the construction of ecological civilization and high-quality development, ecological protection and environmental improvement also became important contents of land consolidation. Meanwhile, the implementation of land consolidation projects was also an important gripper for building a new socialist countryside and coordinating urban and rural development.



**Figure 4.** China's newly added agricultural and cultivated land area through land consolidation in 2006–2017.

### 2.5. Comprehensive Consolidation Stage (2019 to Present)

With the promotion of building a moderately prosperous society in all aspects, the focus of issues concerning agriculture, rural areas and farmers gradually shifted to rural revitalization. In terms of land consolidation, rural revitalization requires the promotion of comprehensive consolidation of mountains, water, forests, fields, lakes and grass, improving rural production-living-ecological space and boosting the harmonious coexistence of humans and nature. The Notice on the Pilot Work of Whole-Region Comprehensive Land Consolidation issued in 2019 marked a new round of construction in land consolidation. In 2021, the Central Document No.1 called for comprehensive means to carry out land consolidation, coordinate ecological restoration and the consolidation of agricultural land and inefficient construction land, promote cultivated land protection and the intensive and economical use of land, and help the comprehensive promotion of rural revitalization. In this stage, the connotation of land consolidation was expanded to whole-region comprehensive land consolidation, which became an important path to realize rural revitalization. The new development concept required that land consolidation should be coordinated and organically integrated with regional planning and strengthen the innovative demonstration and leading role of the pilot projects. In 2020, the Ministry of Natural Resources of the PRC approved more than 300 pilot townships for whole-region comprehensive land consolidation.

## 3. Typical Modes of Land Consolidation in Rural China

As a means of coordinating human-environment relationship, land consolidation plays an important role in enhancing the intensive and economical use of rural land, improving rural production-living conditions and promoting urban–rural integrated development [29]. Based on natural and human conditions, many creative land consolidation practices have been carried out in various regions, and many effective modes with local characteristics have been explored and concluded. From the perspective of organizational and implementation entities, land consolidation modes in rural China mainly include government-led land consolidation, enterprise-driven land consolidation and villager-initiated land consolidation.

### 3.1. Government-Led Land Consolidation

As land consolidation involves many departments such as agriculture, forestry, water conservancy, electricity, etc., governments at all levels are the main entities of project investment and implementation under the current system. Accordingly, government-led land consolidation has been the main mode of rural land consolidation since the founding of PRC. Specifically, the government organizes the preparation of special plans for land consolidation around regional major development strategies and employs land consolidation as a platform to integrate agriculture-related projects and funds and coordinate

practices such as agricultural land preparation, farmable land development and ecological restoration. Meanwhile, the government strengthens supervision and assessment to ensure work progress, project quality and financial security, and establishes a post-construction management and maintenance system to ensure that the achievements of land consolidation continue to be effective after project completion and acceptance. According to the difference of executive departments, government-led land consolidation can be divided into land consolidation led by land department and a government investment-financing platform. In general, this mode based on administrative management is conducive to the formation of a pattern of departmental linkage and joint management, which boosts standardized management and promotes the construction of high-standard basic farmland, laying a solid foundation for sustainable agricultural and rural development.

Gully land consolidation is a practice that integrates dam system construction, saline-alkali land transformation, unused land development and ecological construction for the special landforms of hills and gullies on the Loess Plateau. In September 2012, the gully land consolidation in Yan'an was identified as a major national land consolidation project. To ensure the smooth progress of the project, Yan'an and the counties under its jurisdiction established a leading group with the main government leader as the group leader and the heads of the land, water conservancy, finance, agriculture, forestry and other departments as the group members. Meanwhile, a special office was set up to be responsible for overall guidance and project implementation. Among them, the Yan'an Gully Land Consolidation Office has introduced more than 20 management systems, involving major project implementation management, land inventory, bidding management, design changes, project acceptance, land transfer and file management, which have made clear provisions for all aspects of the major project. Correspondingly, all counties adhered to high-standard and high-quality construction, and concentrated resources such as funds and technologies to promote gully land consolidation. At the end of 2018, the gully land consolidation completed a construction scale of 340 km<sup>2</sup>, adding more than 66 km<sup>2</sup> of new cultivated land, and the project area basically reached the mud not out of the gully, effectively consolidating the achievements of returning cultivated land to forest.

### 3.2. Enterprise-Driven Land Consolidation

As the most important entity in a market economy, the enterprises are indispensable forces in rural land consolidation. Correspondingly, enterprise-driven land consolidation has become an important mode of rural land consolidation. The emergence of this model stems from the continuous improvement of the market mechanism, and its role has become increasingly prominent, especially in the rapid development stage and after. First, the enterprises declare land consolidation projects to the government and promote the transfer of land management rights in the project area. Second, the government conducts qualification certification, supporting funds review and approval filing for enterprises. Then, the enterprises combine their own development plans to carry out land consolidation to meet the needs of modern agricultural development or characteristic agricultural products planting. After the project is completed and accepted by land departments, the enterprises apply for subsidies from relevant departments. Further, the enterprises directly/indirectly increase farmers' wage and property incomes by employing local farmers, imparting agricultural production techniques and promoting contract farming. In general, the most prominent feature of this mode is the flexibility and diversity of funding sources, which relieves the government's financial pressure. The principle of "who invests, who benefits" helps the society to share the achievements of land consolidation. In this process, the capital value of land is manifested, which is beneficial for farmers to enjoy the land appreciation brought by social and economic development.

Fuping is in the east of Taihang Mountains, and there is little contiguous land in the county, making it difficult to carry out large-scale agricultural production. However, the county has 1707 km<sup>2</sup> of unused land, including 347 km<sup>2</sup> of unused land with a slope below 25°. Against this background, Fuping introduces the market mechanism to implement

high-standard development of mountainous areas, and explores a comprehensive mountain development practice of government planning guidance, village-level organization promotion, farmers' equity participation and enterprise development and management. First, the government guides the villagers to convert their management rights of barren hills into shares according to the area, and transfers them to village committees, which take shares in the land and cooperate with an agricultural development company to carry out comprehensive development of barren hills. Second, the agricultural development company employs a professional team for planning and design and uses modern engineering technologies and mechanized operation methods to carry out high-standard land consolidation of barren hills. Third, the company carries out large-scale operation and standardized management on the developed land in accordance with the county industrial development plan. In addition to land rent, the company's operating benefits are divided in half with farmers, and farmers' share income and salaries are linked to enterprise management benefits. By 2022, 67 km<sup>2</sup> of high-standard forestry and fruit base had been built in project areas. If all the barren hills in the county are developed, it is estimated that 133 km<sup>2</sup> of cultivated land will be added, equivalent to the current total cultivated land area of the county.

### *3.3. Villager-Initiated Land Consolidation*

The advancement of land consolidation requires giving full play to the role of farmers [37]. As a mode explored by various regions and characterized by the implementation entity reform, villager-initiated land consolidation gives full play to the dominant position of farmers and strictly enforces supervisory responsibilities to ensure that farmers can fully enjoy the fruits of land consolidation. Although this mode runs through the entire process of rural land consolidation in China, its scale has always been small due to insufficient farmers' capital. Under the guidance of government departments, village collectives apply for land consolidation projects according to the actual situation of their villages. Villagers undertake all or most of the land consolidation work, and the county government will grant the village collective rewards and subsidies after the project is accepted. As a result, villagers get wage income by participating in project implementation and obtain property income by land transfer, while land consolidation is conducive to the development of moderate scale operation and characteristic agricultural products cultivation, thus increasing villagers' business income. In this mode, villagers use state funds to improve their own land, realizing the effective combination of land consolidation and land-use optimization. Meanwhile, the play of the critical role of farmers is conducive to the adjustment of land contract and management rights according to farmers' wishes and the exchange and adjustment of scattered land and the revitalization of idle and inefficient land according to the development vision determined by the village plan, creating conditions for the transfer of land management rights, the adjustment of traditional production methods and the development of rural secondary and tertiary industries.

The land consolidation practice of "merging small plots to large plot" originated in Guangxi. It refers to farmers or village collectives renovating the scattered cultivated land into concentrated plots with relatively balanced field areas under the premise of respecting villagers' wishes and keeping the area of cultivated land unchanged, and handling the registration of changes in land contract and management rights for confirmation. Specifically, the village committee conducts a preliminary investigation on the time, area and public wishes of land consolidation before a land merge, ensuring that the land merge has a broad mass base. Subsequently, a villager meeting is held to carry out democratic resolutions and discuss plans. Then, the villagers form a working group to verify the land type and area of the original plot and organize the implementation after all villagers pass the proposal. When the land merger is completed, the village collective, on behalf of the farmers, applies to the government for a new land contract management certificate, which legally protects farmers' interests. To promote the practice of "merging small plots to large plot", governments at all levels have strengthened their services, organized land department, finance department, agriculture department, etc. to go into the fields and

guide farmers to registration statistics, draw engineering drawings, and plan and design as well as construct, which effectively increases farmers' satisfaction with the land merge.

#### 4. Improvement Paths of Land Consolidation in Rural China

The issues concerning agriculture, rural areas and farmers are fundamental issues related to the national economy and people's livelihoods [38]. Driven by the transformation of principle social contradiction, the 19th National Congress of the CPC proposed the implementation of rural revitalization strategy and made it the general grasp of the issues concerning agriculture, rural areas and farmers in the new era. This strategy focuses on the problems faced by rural development in the course of industrialization and urbanization, such as the rapid non-agriculturalization of production factors, the rapid aging and weakening of social subjects, the severe waste of construction land and the serious pollution of the water and soil environment. It aims to realize the comprehensive revitalization of the rural economy, society and ecology and urban–rural integrated development through all-round construction [19,39,40]. In this context, the rural revitalization strategy puts forward new requirements for rural land consolidation and creates conditions for its transformation and upgrade. On the other hand, with the continuous development of rural land consolidation, the working ideas in many places have changed from a single land consolidation to a comprehensive consolidation of “fields, water, roads, forests, villages, and houses”. At the same time, people's understanding of land consolidation puts more emphasis on the comprehensiveness of its concept. Based on increasing the area of cultivated land and improving the quality of cultivated land, more attention is paid to the comprehensive consideration of villages and towns as a spatial unit, thus making overall planning and comprehensive improvement as well as consolidating the construction foundation for a modern agricultural power.

In the new era, rural land consolidation emphasizes a more comprehensive, coordinated, orderly and dynamic system view to realize full-spatial planning, full-departmental collaboration, full-element control and full-process management, thus meeting the needs of agricultural and rural modernization [41]. However, due to the urban–rural dual structure, China's rural land consolidation generally faces problems such as lack of scientific leadership and unified planning, difficulties in raising funds because of large project costs, weak public participation because of insufficient policy publicity, poor quality and inefficient use of the newly added cultivated land, and neglect of ecological protection and environmental governance [37,42–44]. These deficiencies are not conducive to the further advancement of rural land consolidation and are important challenges to rural sustainable development. Meanwhile, the experience of developed countries shows that the scientific promotion of rural land consolidation requires planning in advance and formulating detailed operating procedures based on the law, strengthening the division of labor and collaboration between departments, improving the investment and financing system, and strengthening public participation [45–47]. Therefore, some targeted measures need to be taken to overcome the problems in China's rural land consolidation, helping the transformation and upgrading of rural land management and the revitalization of the countryside.

##### 4.1. Focusing on Planning-Led and Highlighting Ecological Priority

Since rural land consolidation is a systematic project involving all aspects of agricultural and rural development, planning must be prioritized to promote it in an integrated manner. The government should take the territorial spatial planning and village planning as the basis and the results of the third national land survey as the base, conscientiously implement the most stringent systems of cultivated land protection and environmental protection, and scientifically and rationally formulate rural land consolidation plans. The planning scheme should comprehensively consider the contents of fields, water, roads, forests, villages and houses, coordinate population concentration, industrial transformation and land allocation, provide more space for the optimal allocation of natural resources, and implement the consolidation tasks, indicators and layout requirements in specific plots. At

the same time, it is necessary to adhere to one-time planning and advance year by year, that is, formulate short-term, medium-term and long-term implementation plans based on the overall planning, specify the time and scale of specific implementation, and ensure that rural land consolidation is carried out step by step according to the planning. In addition, attention should also be paid to the flexibility of the planning to leave enough space for future development.

In the context of ecological civilization construction, the goal of rural land consolidation has been expanded to improve the natural ecological environment, protect the rural landscapes and promote rural sustainable development [48]. Therefore, rural land consolidation must practice the concept that “lucid waters and lush mountains are golden mountains and silver mountains”, place ecological protection and restoration in a prominent position, coordinate the overall protection and comprehensive management of mountains, water, forests, fields, lakes and grass, and promote the harmonious coexistence of rural humans and nature. On the one hand, it is necessary to implement rural land consolidation and ecological restoration projects to optimize the layout of rural production–life–ecological spaces, solve the problems of fragmentation, disorder and inefficiency in rural land use, and construct a new pattern of beautiful territory with contiguous cultivated land, concentrated construction land and efficient spatial form. On the other hand, with a focus on ecologically fragile areas, it is necessary to promote the comprehensive consolidation of agricultural land such as high-standard cultivated land construction and improvement of cultivated land quality, the rural construction land consolidation such as reclamation of construction land and redevelopment of inefficient construction land, and the comprehensive ecological improvement such as comprehensive management of abandoned mines and river basin management.

#### *4.2. Integrating Project Funds to Build a Diversified Input Pattern*

The preliminary planning and design, project approval and construction, and management and maintenance of rural land consolidation all require sufficient funding to ensure smooth progress. However, the dominant position of governments at all levels in financial investment determines that rural land consolidation generally faces problems such as insufficient total amount and single channel. Facing the new tasks and requirements for rural land consolidation put forward by rural revitalization and ecological civilization construction, the government should coordinate the planning, improve the investment guarantee system and innovate the investment and financing mechanism, accelerating the formation of a diversified investment and financing pattern with fiscal priority, financial preference and social participation. In this way, a comprehensive investment path for rural land consolidation will be formed and the investment in rural land consolidation will continue to be increased, which promote the transformation and upgrading of rural land consolidation.

Specifically, the government should optimize and integrate the land- and agriculture-related funds from various departments such as natural resources, water conservancy, transportation, ecological protection, etc., and build a long-term mechanism for the coordination of funds in the field of land consolidation that matches authority and responsibility as well as links up the top and bottom. Meanwhile, the government should set up a special fund for “whole-region comprehensive land consolidation” to support the unified planning and construction of all projects in the whole region, and give full play to the advantages of fund integration, which can avoid the phenomenon of repeated construction and be able to handle major events and create highlights, achieving the goal of “scientific investment, standardized arrangement and efficient use” of land consolidation funds. On the other hand, the government should introduce preferential policies, strengthen the guidance for social capital participation in rural land consolidation and promote the practice of rural land consolidation through the public–private partnership (PPP) mode. More attention should also be paid to the professional management of funds, and the rights and interests of investors should be protected while accelerating the advancement of the projects.

Additionally, the government should expand a variety of financing channels, encourage financial institutions to innovate rural financial products and financial services, and explore financial innovations that use the surplus construction land index for land consolidation as collateral, thus providing long-term credit support for rural land consolidation.

#### *4.3. Increasing Policy Promotion to Innovate Public Participation Mechanism*

Farmers are the key stakeholders and the most direct evaluators of rural land consolidation. Internationally, one of the common methods to scientifically promote land consolidation is to establish and improve public participation mechanisms, thus improving the land consolidation management system and enhancing the effectiveness of land consolidation [49]. In the new era, promoting the sustainable development of rural land consolidation in China firstly requires respecting farmers' wishes, extensively soliciting farmers' opinions on land consolidation and signing relevant agreements in accordance with the law to fully protect their rights to information and participation as well as their property rights and disposal rights. On the other hand, the government should make full use of the media such as television, newspapers, radio and the internet to strengthen the publicity of policies related to rural land consolidation and guide farmers to understand and participate in all aspects of rural land consolidation such as planning and design, site selection, implementation and acceptance. Meanwhile, the government should give full play to the role of brochures and bulletin boards to enhance farmers' understanding of the meaning, goals and construction content of rural land consolidation, eliminate their ideological concerns as far as possible, improve their confidence in rural land remediation and enhance their consciousness and enthusiasm to participate in land consolidation.

Broadening the channels for farmers to participate in land consolidation and allowing farmers to express their opinions on land consolidation will not only enable the project to gain widespread support and recognition from farmers, but will also facilitate ensuring that the land consolidation is scientific and feasible. In the project approval stage, the authorities responsible for land consolidation need to fully visit the people in the project area and organize research seminars with the representatives of the public to widely solicit opinions. In the stage of planning formation, it is necessary to carry out in-depth surveys in villages and fully listen to farmers' demands to ensure that the planning is in line with farmers' wishes. Especially when it comes to the key contents such as village development positioning and industrial development, the experts' views and the farmers' ideas should be organically integrated, so that the planning is more grounded and easier to implement. In the stage of project implementation, public representatives should be invited to participate in project supervision and management. When it comes to the transfer of land management rights, personnel resettlement, house demolition, etc., rural land consolidation must adhere to the principle of "villager voluntary first, government guidance second", and forcible advance by administrative orders is strictly prohibited to protect the legitimate rights and interests of villagers.

#### *4.4. Strengthening Full-Process Supervision to Improve the Effectiveness*

Supervision is an important task throughout the entire process of rural land consolidation, and it is an important guarantee for high-standard and high-quality completion of rural land consolidation. Therefore, it is necessary to establish a full-process supervision and management mechanism in the early, middle and late stages of land consolidation, comprehensively improving the effectiveness of rural land consolidation. First, the supervision of project approval should be strictly enforced. It is necessary to make full use of the results of the third national land survey and strengthen project review and expert demonstration to ensure scientific site selection and standardized implementation of the projects. Second, the supervision of project implementation should be strictly enforced. The project should be organized and implemented in strict accordance with the project planning, and a "trinity" supervision mechanism of departmental supervision, professional supervision and public supervision needs to be adopted to supervise and manage the entire

construction process and ensure the quality of the project. Third, the supervision of project acceptance should be strictly enforced. After the completion of the project, the natural resources department should organize experts in land resource management, water conservancy, financial management, etc., to conduct on-site inspection and acceptance. Projects with untrue quantity, substandard quality or non-compliance with relevant regulations should not pass the inspection and acceptance. Fourth, post-project supervision should be strictly enforced. After the acceptance of the project, the newly added cultivated land in the project area would be transferred under the premise of ensuring that the land area of each contracted operator remains unchanged. Meanwhile, the completed water conservancy and electricity infrastructures would be handed over in a timely manner, and management contracts need to be signed with local government to clarify responsibilities and obligations to ensure that the project will play a long-lasting role and generate long-lasting benefits.

In the information age, the government should also rely on a basic territorial spatial information platform to integrate current and planning data related to rural land consolidation, build a comprehensive land consolidation supervision system and design a “one map” application that incorporates functions such as planning management, comprehensive evaluation, project implementation, monitoring and early warning and statistical analysis, realizing the information management and control of the entire process of whole-region comprehensive land consolidation from project establishment, approval, implementation and acceptance. As a result, the management of rural land consolidation will realize the transformation from extensive to fine.

## 5. Discussion and Conclusions

China has a long history of farming. At different times, rural land consolidation in China has existed in different forms and played an important role in the national economic and social development. Especially in the process of rapid industrialization and urbanization, rural land consolidation has become a common means to solve land-use problems, ensure national food security, and promote agricultural and rural modernization and urban–rural integrated development [6,17,19,29]. Throughout the land consolidation practice since the founding of the PRC in 1949, it can be divided into the start-up stage (1949–1977), exploration stage (1978–1997), the rapid development stage (1998–2007), the quality improvement stage (2008–2018) and the comprehensive consolidation stage (2019 to present). In this process, the concept of land consolidation has changed from “land remediation” to “whole-region comprehensive land consolidation”, and many efficient land consolidation modes have been explored in accordance with local human and natural conditions. According to the differences in organization and implementation entities, government-led land consolidation, enterprise-driven land consolidation and villager-initiated land consolidation are the three main modes of land consolidation in rural China. In line with the socio-economic transformation and land supply-side reform, the current deficiencies in rural China in population, land and industry have made land consolidation face difficulties in funding, motivation, organization and implementation. Thus, it is urgent to take targeted measures to promote the transformation and upgrading of land consolidation and boost rural revitalization, mainly including focusing on planning-led and highlighting ecological priority, integrating project funds to build a diversified input pattern, increasing policy promotion to innovate mass participation mechanism and strengthening full-process supervision to improve the effectiveness of land consolidation.

Practice has proved that land consolidation assumes the important task of stabilizing growth, adjusting structure, promoting reform and benefiting people’s livelihood in the context of the new normal, and plays an irreplaceable role in coordinating urban–rural development and promoting cultivated land protection and ecological civilization construction [19,21]. Therefore, it is an effective measure to solve China’s issues concerning agriculture, rural areas and farmers. With the development of the times and the transformation of social demands, the role of rural land consolidation centered on the whole-region comprehensive land consolidation will be further highlighted, and its positioning will

be further strengthened [50]. In the new historical stage, it is necessary to focus on the general requirements of rural revitalization strategy, that is, prosperous industry, ecological livability, civilized countryside, effective governance and affluent living, implement new concepts, stimulate new dynamics, further highlight the platform attribute of land consolidation, and promote the realization of the goal of agricultural and rural modernization while developing in a standardized and orderly manner. Meanwhile, it is necessary to pay more attention to the leading role of national territorial spatial planning, adhere to mechanism innovation, classification promotion and key breakthroughs, optimize the allocation of various elements in rural areas through strengthening land policy supply, continue to promote the pilot of whole-region comprehensive land consolidation and explore new samples of rural revitalization and urban–rural integrated development.

Land is the most basic means of production in agriculture and the most basic security for farmers' livelihoods [51,52]. However, various irrational practices in rural China's land use have led to the ineffective transformation of rural land resources into a basis for social and economic development [3]. As an inseparable part of the modern territorial spatial governance system, whole-region comprehensive land consolidation is an optimization and governance activity with the implementation of territorial spatial planning at its core, aiming to fully exploit the potential of natural resources, optimize spatial layout, protect and restore natural ecology and promote the comprehensive revitalization of the countryside through modern concepts and means [40,53]. At present, the pilot of whole-region comprehensive land consolidation is in full swing across the country. Under the current institutional arrangement, the price distortion of land resources is not only detrimental to the development of whole-region comprehensive land consolidation, but also leads to outstanding human–land conflicts in rural China. Therefore, it is urgent to further deepen rural land system reform, guide the orderly transfer of rural land management rights, cultivate diversified agricultural production and operation entities, establish a sound agricultural socialization service system and develop various forms of moderate scale operation, thus providing a solid institutional guarantee for whole-region comprehensive land consolidation.

**Author Contributions:** Conceptualization, Y.G. and J.W.; methodology, Y.G.; Software, Y.G.; validation, Y.G.; formal analysis, Y.G.; investigation, Y.G. and J.W.; resources, Y.G.; data curation, Y.G.; writing—original draft, Y.G.; writing—review and editing, Y.G. and J.W.; visualization, Y.G.; supervision, Y.G. and J.W.; project administration, Y.G. and J.W.; funding acquisition, Y.G. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was supported by the National Natural Science Foundation of China (Grant No. 42001203, 41931293).

**Data Availability Statement:** The associated dataset of the study is available upon request to the corresponding author.

**Acknowledgments:** The authors are greatly thankful to all the reviewers and editors.

**Conflicts of Interest:** The authors declare that they have no conflict of interest.

## References

1. Abhilash, P.C. Restoring the un-restored: Strategies for restoring global land during the UN decade on ecosystem restoration (UN-DEC). *Land* **2021**, *10*, 201. [\[CrossRef\]](#)
2. Su, M.; Guo, R.; Hong, W. Institutional transition and implementation path for cultivated land protection in highly urbanized regions: A case study of Shenzhen, China. *Land Use Policy* **2019**, *81*, 493–501. [\[CrossRef\]](#)
3. Guo, Y.; Liu, Y. Sustainable poverty alleviation and green development in China's underdeveloped areas. *J. Geogr. Sci.* **2022**, *32*, 23–43. [\[CrossRef\]](#)
4. Guo, Y.; Liu, Y. Poverty alleviation through land assetization and its implications for rural revitalization in China. *Land Use Policy* **2021**, *105*, 105418. [\[CrossRef\]](#)
5. Cheng, J.; Zhao, J.; Zhu, D.; Zhang, H. Limits of land capitalization and its economic effects: Evidence from China. *Land* **2021**, *10*, 1346. [\[CrossRef\]](#)

6. Zhou, Y.; Guo, L.; Liu, Y. Land consolidation boosting poverty alleviation in China: Theory and practice. *Land Use Policy* **2019**, *82*, 339–348. [CrossRef]
7. Guo, Y.; Wang, J. Identifying the determinants of nongrain farming in China and its implications for agricultural development. *Land* **2021**, *10*, 902. [CrossRef]
8. Shi, X.; Gao, X.; Fang, S. Land system reform in rural China: Path and mechanism. *Land* **2022**, *11*, 1241. [CrossRef]
9. Zhou, Y.; Li, X.; Liu, Y. Rural land system reforms in China: History, issues, measures and prospects. *Land Use Policy* **2020**, *91*, 104330. [CrossRef]
10. Wang, S.; Li, D.; Li, T.; Liu, C. Land use transitions and farm performance in China: A perspective of land fragmentation. *Land* **2021**, *10*, 792. [CrossRef]
11. Wang, M.; Sun, X.; Fan, Z.; Yue, T. Investigation of future land use change and implications for cropland quality: The case of China. *Sustainability* **2019**, *11*, 3327. [CrossRef]
12. Ministry of Agriculture and Rural Affairs of the PRC. Communiqué on China’s Cultivated Land Quality Grade in 2019. Available online: [http://www.moa.gov.cn/nybg/2020/202004/202005/t20200506\\_6343095.htm](http://www.moa.gov.cn/nybg/2020/202004/202005/t20200506_6343095.htm) (accessed on 6 May 2020).
13. Chen, Q.; Xie, H. Temporal-spatial differentiation and optimization analysis of cultivated land green utilization efficiency in China. *Land* **2019**, *8*, 158. [CrossRef]
14. Li, Y.; Zhang, J. Agricultural diffuse pollution from fertilisers and pesticides in China. *Water Sci. Technol.* **1999**, *39*, 25–32. [CrossRef]
15. Zhen, L.; Routray, J.K.; Zebisch, M.A.; Chen, G.; Xie, G.; Cheng, S. Three dimensions of sustainability of farming practices in the North China Plain: A case study from Ningjin County of Shandong Province, PR China. *Agric. Ecosyst. Environ.* **2005**, *105*, 507–522. [CrossRef]
16. Wen, Q.; Li, J.; Ding, J.; Wang, J. Evolutionary process and mechanism of population hollowing out in rural villages in the farming-pastoral ecotone of Northern China: A case study of Yanchi County, Ningxia. *Land Use Policy* **2023**, *125*, 106506. [CrossRef]
17. Liu, Y. *Urban-Rural Transformation Geography*; Springer: Singapore, 2021.
18. Liu, J.; Jin, X.; Xu, W.; Sun, R.; Han, B.; Yang, X.; Gu, Z.; Xu, C.; Sui, X.; Zhou, Y. Influential factors and classification of cultivated land fragmentation, and implications for future land consolidation: A case study of Jiangsu Province in eastern China. *Land Use Policy* **2019**, *88*, 104185. [CrossRef]
19. Long, H.; Zhang, Y.; Tu, S. Rural vitalization in China: A perspective of land consolidation. *J. Geogr. Sci.* **2019**, *29*, 517–530. [CrossRef]
20. Yin, Q.; Zhou, S.; Lv, C.; Zhang, Y.; Sui, X.; Wang, X. Comprehensive land consolidation as a tool to promote rural restructuring in China: Theoretical framework and case study. *Land* **2022**, *11*, 1932. [CrossRef]
21. Zhang, D.; Yu, L.; Wang, W. Promoting Effect of Whole-Region Comprehensive Land Consolidation on Rural Revitalization from the Perspective of Farm Households: A China Study. *Land* **2022**, *11*, 1854. [CrossRef]
22. Xin, G.; Yang, C.; Wei, C.; Zhang, R. Mode and practice of land consolidation based on human-earth harmonization. *Trans. Chin. Soc. Agric. Eng.* **2015**, *31*, 262–275.
23. Zang, Y.; Liu, Y.; Yang, Y.; Wang, Y. Typical models of land consolidation for poverty alleviation. *Geogr. Res.* **2019**, *38*, 856–868.
24. Bao, H.; Xu, B. Planning mode for land remediation based on ecological priority: A case of Qixing town of Jiaxing. *Econ. Geogr.* **2009**, *29*, 1903–1906.
25. Zhang, X.; de Vries, W.T.; Li, G.; Ye, Y.; Zheng, H.; Wang, M. A behavioral analysis of farmers during land reallocation processes of land consolidation in China: Insights from Guangxi and Shandong provinces. *Land Use Policy* **2019**, *89*, 104230. [CrossRef]
26. Liu, Y.; Feng, W.; Li, Y. Modern agricultural geographical engineering and agricultural high-quality development: Case study of loess hilly and gully region. *Acta Geogr. Sin.* **2020**, *75*, 2029–2046.
27. Liu, Y.; Wang, Y. Rural land engineering and poverty alleviation: Lessons from typical regions in China. *J. Geogr. Sci.* **2019**, *29*, 643–657. [CrossRef]
28. Guo, B.; Fang, Y.; Jin, X. Monitoring the effects of land consolidation on the ecological environmental quality based on remote sensing: A case study of Chaohu Lake Basin, China. *Land Use Policy* **2020**, *95*, 104569. [CrossRef]
29. Li, Y.; Li, Y.; Fang, P.; Long, H. Impacts of land consolidation on rural human–environment system in typical watershed of the Loess Plateau and implications for rural development policy. *Land Use Policy* **2019**, *86*, 339–350.
30. Demetriou, D. The assessment of land valuation in land consolidation schemes: The need for a new land valuation framework. *Land Use Policy* **2016**, *54*, 487–498. [CrossRef]
31. Michailidou, E. Integrated land consolidation: A community-based initiative for Greek mountainous regions. *Reg. Insights* **2012**, *3*, 18–20. [CrossRef]
32. Janus, J.; Lopacka, M.; John, E. Land consolidation in mountain areas: Case study from southern Poland. *Geod. Cartogr.* **2017**, *66*, 241–251. [CrossRef]
33. Zhang, Z. Development characteristics of sustainable land consolidation in foreign countries and its implications for China. *Ecol. Econ.* **2007**, *10*, 144–147.
34. Huang, Q.; Li, M.; Chen, Z.; Li, F. Land consolidation: An approach for sustainable development in rural China. *Ambio* **2011**, *40*, 93–95. [CrossRef] [PubMed]

35. Hu, B.; Yan, Z.; Liao, C. *Theory, Methodology and Practice of Regional Ecological Economics*; China Environmental Science Press: Beijing, China, 2005.
36. Feng, Y.; Kong, L.; Guo, Y. Development history and prospect of land consolidation in China. *Guizhou Agric. Sci.* **2018**, *46*, 135–139.
37. Li, Y.; Liu, Y.; Long, H.; Cui, W. Community-based rural residential land consolidation and allocation can help to revitalize hollowed villages in traditional agricultural areas of China: Evidence from Dancheng County, Henan Province. *Land Use Policy* **2014**, *39*, 188–198. [[CrossRef](#)]
38. Long, H.; Liu, Y.; Li, X.; Chen, Y. Building new countryside in China: A geographical perspective. *Land Use Policy* **2010**, *27*, 457–470. [[CrossRef](#)]
39. Guo, Y.; Liu, Y. The process of rural development and paths for rural revitalization in China. *Acta Geogr. Sin.* **2021**, *76*, 1408–1421.
40. Liu, Y. Research on the urban-rural integration and rural revitalization in the new era in China. *Acta Geogr. Sin.* **2018**, *73*, 637–650.
41. Kong, X.; Wang, J.; Jin, Z.; Nai, L. Transformation and innovation of rural land consolidation towards rural vitalization. *China Land Sci.* **2019**, *33*, 95–102.
42. Gao, X.; Peng, A.; Peng, Z.; Wang, K.; Zhu, L. Problems and countermeasures of rural land integrated consolidation. *China Land Sci.* **2011**, *25*, 4–8.
43. Xiao, W.; Hou, L.; Yue, W. Connotation, difficulties and countermeasures of whole-region comprehensive land improvement. *China Land* **2022**, *7*, 12–15.
44. Li, Y.; Wu, W.; Liu, Y. Land consolidation for rural sustainability in China: Practical reflections and policy implications. *Land Use Policy* **2018**, *74*, 137–141. [[CrossRef](#)]
45. Sky, P.K. Land consolidation in Norway in an international perspective. *Span. J. Rural Dev.* **2015**, *6*, 81–90. [[CrossRef](#)]
46. Van den Noort, P.C. Land consolidation in the Netherlands. *Land Use Policy* **1987**, *4*, 11–13. [[CrossRef](#)]
47. Vitikainen, A. An overview of land consolidation in Europe. *Nordic J. Surv. Real Estate Res.* **2014**, *1*, 25–44.
48. Han, B.; Jin, X.; Shen, C.; Xiang, X.; Cao, S.; Sun, R.; Zhou, Y. Jiangnan water town land consolidation planning based on landscape ecological evaluation and minimum cumulative resistance model. *Trans. Chin. Soc. Agric. Eng.* **2019**, *35*, 235–245.
49. Niroula, G.S.; Thapa, G.B. Impacts and causes of land fragmentation, and lessons learned from land consolidation in South Asia. *Land Use Policy* **2005**, *22*, 358–372. [[CrossRef](#)]
50. Yun, W.; Zhu, D.; Tang, H. Reshaping and innovation of China land consolidation strategy. *Trans. Chin. Soc. Agric. Eng.* **2016**, *32*, 1–8.
51. Gohar, A.A.; Cashman, A.; El-bardisy, H.A.E.H. Modeling the impacts of water-land allocation alternatives on food security and agricultural livelihoods in Egypt: Welfare analysis approach. *Environ. Dev.* **2021**, *39*, 100650. [[CrossRef](#)]
52. Tanrivermis, H. Agricultural land use change and sustainable use of land resources in the Mediterranean region of Turkey. *J. Arid Environ.* **2003**, *54*, 553–564. [[CrossRef](#)]
53. Yang, J.; Li, X.; Yang, X. Thought and exploration of comprehensive land consolidation planning in the whole region. *Nat. Resour. Inform.* **2021**, *4*, 31–36.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.