

# Land Reallocation in Land Consolidation: A Chinese Mode and Its Future Direction

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**Key words:** land reallocation, land tenure, land distribution, drawing lots

## SUMMARY

Through nearly 30 years of development, modern land consolidation(LC) in China has been gradually forming a relative mature system and plays an important role in farmland supplement, improving agricultural production conditions and eventually increasing farmers` income. This paper aims to reveal the unique of the core stage in modern LC, which is land reallocation, in China, and tries to put forward some modifications to promote its efficiency, realize fairness and improve farmers` satisfaction.

Due to the complexity of China's rural land tenure status, the scarcity of farmland compared to the world`s largest population, and the roar of farmland price resulted from rapid urbanization and land expropriation, land reallocation process in China is highly distinguished from other countries, which is mainly but not all characterized by following features:1) land tenure and administrative mechanism are highly weighted in land reallocation by both academic and practitioners; 2) land reallocation is always carried out in a small area, usually within a villager group, no matter how large the project area is; 3) drawing lots is widely used in determining location of land parcels after LC.

The changing objectives and functions of land consolidation make current land reallocation system hard to adapt to reality, but the development of new technology such as GIS, SDSS and the large scale of rural land registration recently also bring opportunities for land reallocation to be more efficient, fairer and more likely to be accepted by farmers.

We conclude that land reallocation system in China should be improved in following four aspects: 1) legislation and institutionalization of LC as a whole and land reallocation in specific; 2) construction of a mature land evaluation system devote to land reallocation in LC; 3) more attention should be paid to spatial reference factors to make land reallocation more rational; 4) and technical aspects of land reallocation such as ways of land distribution and partitioning should be extensively studied from now on.

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## 1. INTRODUCTION

The LC in China began in Shang Dynasty, dating back more than three thousand years of history. However, modern LC, which was introduced after Reform and Opening, has a relative short history, and even shorter in terms of large scale LC. In China, the emergence and development of LC are closely connected to an important land use policy called Balance of Farmland, which requires occupied farmland for urban development must be compensated by equal area farmland of equal quality. LC is regarded as the most important tool to supply farmland and mutually, to increase farmland area is the critical goal for LC.

After more than 30 years of exploration, LC system of China has been gradually taking shape. In terms of planning system, LC planning now consists of four levels of planning which are national planning, provincial planning, municipal planning and county level planning. Each level has its own function (fig 1), and the complementarity and the collective effectiveness of them could make sure the timing and special layout of LC project matches rural development from strategic level and operational level.

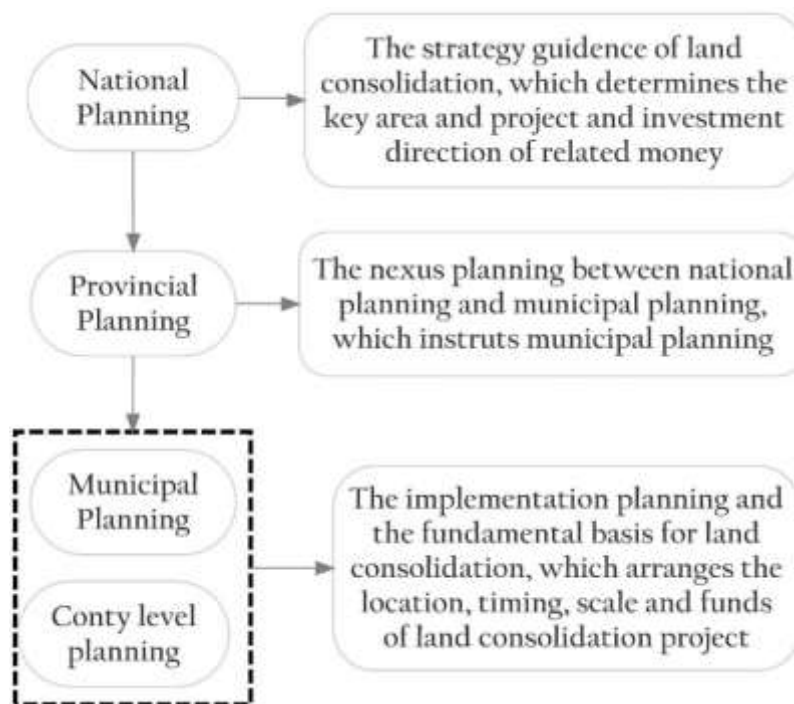


Fig 1. LC Planning System in China

LC also consists of project management system, financial management system, and land tenure management system (Tan et al., 2015). Table 1 shows some important law, regulations and standards related to LC, which consist the policy system of it.

Table 1. Policy system of LC

Kinds of law	Name of law
Law	Constitution; General Principles of the Civil Law; Land Administration Law; Law on Water and Soil Conservation et al.;
regulations	Land Rehabilitation Regulations; On Efforts to a Better Land Development and Consolidation Tenure Management; Notice on Strengthening the Rural Land Tenure Management et al.;
Standards	Land Development and Consolidation Standards; High standard Basic Farmland Construction Standards; Farmland Classification, Gradation an Appraisal Standards; Land Development and Consolidation Project Budget Quota Standard et al.

In addition, despite increasing farmland area is still an important goal of China`s LC, the connotation and objective of it have become more and more complicated. Improving farmland quality and conditions for agricultural production get equal importance to increasing farmland area; Ecological impacts of LC earn more and more attention. Furthermore, ameliorating rural ecological environment and promoting rustic culture have been incorporated into target system of LC, and are taking up a rather critical position in developed areas like Shanghai and Zhejiang. Generally, today`s LC, despite relatively sluggish, is following the trajectory of developed countries like Netherland and Germany (Thomas, 2004; FAO, 2003), in terms of turning into a comprehensive policy tool to coordinate regional development.

Land reallocation, as the most important and complicated stage of LC, has also been developing through accumulated experience from practice and theoretical studies from academy. And due to the unique conditions and land ownership system of China, land reallocation in China is rather different from other countries. However, there is still much to develop for land reallocation, because the number of Government-led LC projects involved land reallocation is relatively small, which is 5697, only accounting for 56.8% of all LC projects.

## 2. COVENTIONAL APPROACH OF LAND REAJUSTMENT

### 2.1 Type of land reallocation

Land reallocation involves the redistribution of area and spatial reallocation of land parcels. Land reallocation is regarded as the change of right holders, that is why it is rarely referred as land reallocation or land parcel reallocation (Zhang,2009; Zhang, 2013) but more regarded as land tenure reallocation in China. According to different type of land right involved, land reallocation is often divided into three types which are land ownership reallocation, land contractual management right reallocation and reallocation of other rights of land (Ye, 2002).

#### 2.1.1 Land ownership reallocation

Land ownership reallocation is the reallocation of land among the different ownership holders to make the boundaries regular and eventually facilitate agricultural production. Unlike other countries, in which land ownership reallocation is the main type of land reallocation, the actual happen of it is relatively rare in China, because land is publicly owned. It occurs only when boundaries among different land ownership holders, which are different government or villages,

are irregular or there is inserted land or enclaves (Fig 2).

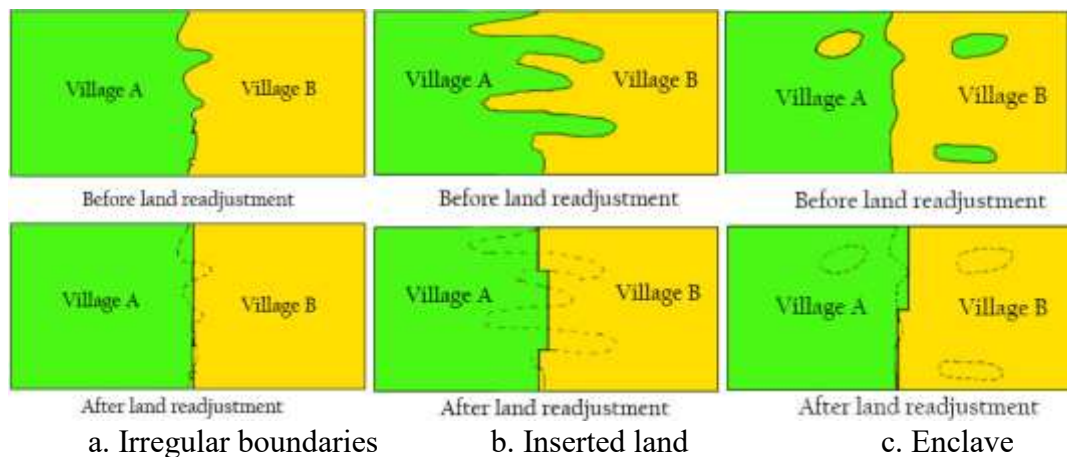


Fig 2. Different kinds of land ownership reallocation

### 2.1.2 Land contractual management right reallocation

Land contractual management right reallocation is mainly to alleviate farmland fragmentation through centralization of scattered land parcels contracted by households. This is the typical land reallocation involving land redistribution and land partitioning and is also the main part of land reallocation in China. Consequently, this paper will mainly focus on this type of land reallocation.

### 2.1.3 Reallocation of other rights of land

Other rights of land consist of leasehold, mortgage and so on. And reallocation of other rights of land means to readjust land carrying rights mentioned above, the procedure and objective of it are mainly the same to land contractual management right reallocation, only this type of land reallocation needs to take into consider the preference of right holders of these rights. However, other rights of land rarely exists on farmland in China, neither does reallocation of it consequently. From this perspective, land reallocation in China is relatively not burdensome (Yu and Wu, 2003).

Table 2 (Wang, 2011) reveals scale of government-led LC projects involving different type of land reallocation. Clearly, Land contractual management right reallocation account for the biggest part, though, it is actually quite small.

Table 2. Related data of LC projects involved land reallocation

Type	Number of province	Area (104hm <sup>2</sup> )	Ratio (%)
Land ownership reallocation	16	23.66	5.47
Land contractual management right reallocation	21	64.67	14.92
Reallocation of other rights of land	12	12.27	2.83

## 2.2 The procedure of land reallocation

### 2.2.1 General procedure of land reallocation

Procedures for land reallocation vary from one country to another but they generally have the same framework, namely contains inquiry of willingness to land reallocation, data gathering, preparation of land reallocation plan and implementation of it. The complete procedure of land reallocation goes throughout the whole process of LC, which is shown in Fig 3.

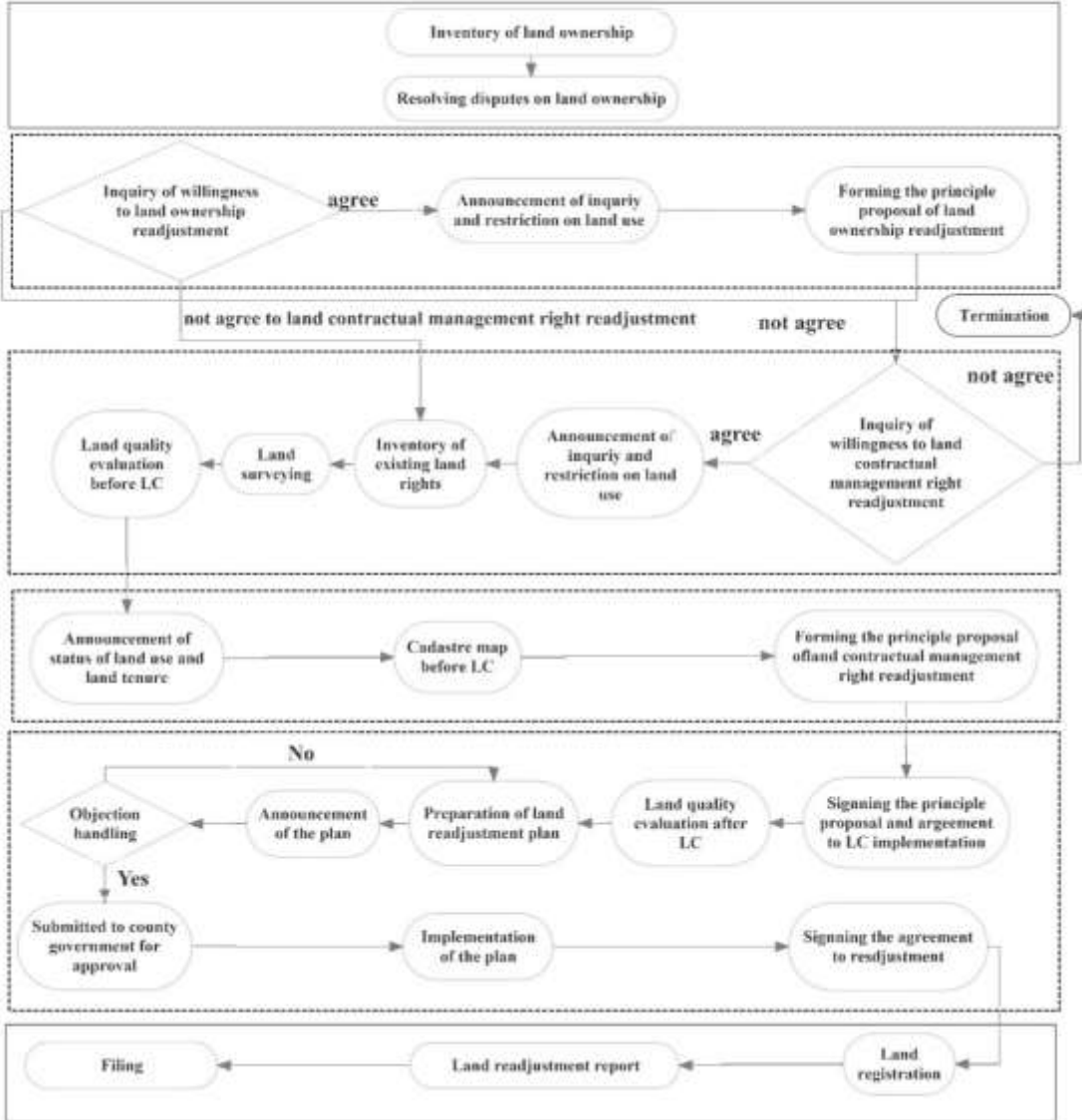


Fig 3. The complete procedure of land reallocation in LC

This general procedure of land reallocation in China differ from other countries mainly in three aspects. Firstly, land reallocation usually takes land ownership reallocation and land contractual management right reallocation both into consideration. The necessity and willingness to them must be analyzed separately. Moreover, due to area of farmland involved in ownership reallocation is always small and location is relatively fixed, it is often solved, if it need to solve, before land contractual management right reallocation.

Secondly, the preference of farmers is held in great honor. The willingness of farmer is necessity to initiation of both land ownership reallocation and land contractual management right reallocation. Farmers` preference still prevail in preparation of land reallocation plan, and final result of the plan must be revised according to farmers` predilection. As is shown in fig 3,

farmers' preference must be taken into account in feasibility study, planning and design and implementation stage of LC projects, making it truly the critical factor of LC projects.

Finally, planning and design of agricultural infrastructure and land reallocation are mutual restraints (Feng, 2011). To reduce workload in land reallocation stage is always considered in planning and design stage, for a well-planned infrastructure network will make it easy to form regular land parcels. Correspondingly, the redistribution of land area and location and land portioning are all restricted by infrastructure network.

### 2.2.2 Specific procedure of land contractual management right reallocation

Land contractual management right reallocation is the main and typical part of land reallocation in China. Contradictory to many other countries, not all farmland in LC projects is confronted with reallocation. In some projects, land only need to readjust when it is occupied by infrastructure, or when its holders want to readjust. According to statistics by Wang et al. (2008), in Shandong province, only 51.25% LC projects involving land contractual management right reallocation readjust all farmland within projects area.

Institutions which responsible for land reallocation varies from one project to another, including village committee, village group, town government and land bureau or the cooperation of them. The conventional approach of land reallocation, which is called drawing lots based model, is highly relied on the knowledge and experience of planner, so the good choice of a leader responsible for land reallocation can be critical for the success to it. It generally contains the following four stage.

(1) Calculation of land area after LC. According to Land Administration Law and the trend of protecting interests of farmers in China, contracted land cannot be withdrawn by any means during contracting period. Therefore, land area contracted by households doesn't change a lot after LC. Main changes yield from two aspects: distribution of new farmland produced by wasteland reclamation or pond landfilling, and conversion of area between land in different position according to the differences in land value. Theoretically, participation share of land occupied by infrastructure also will cause changes in land area of households, but this part of change is rarely considered by planner to date (Yu and Wu, 2003).

(2) Determining the approximate location of land parcels. LC projects always cover farmland in more than one village group. However, land parcels should be put somewhere adjacent to their corresponding settlements to make sure the convenience of agricultural production. Therefore, land reallocation is often carried out within village groups and approximate location of land parcels will be determined based on this principle.

(3) Determining the order of land partitioning. The definitive location of land parcels is determined with the help of drawing lots. In specific, farmers get their order of land partitioning through drawing lots in general assembly of all members in project area. Then planner determines the starting point and where to move towards in land blocks through consultations with farmers. To realize the centralization of land parcels, the drawing lots is carried out based on the principle of 'one farmer, one parcel'. In addition, if farmers want their land parcels to be adjacent, they can use one lot to represent all their parcels, and this is encouraged during land reallocation for it is beneficial for large scale agriculture.

(4) Land partitioning. This stage consists of determination of final location, shape and boundaries of land parcels based on the order and strike got from last stage. The shape of parcel is rectangular in principle, but finally will be determined by planner under the restrictions of infrastructure network, project boundary and other natural and agricultural conditions (Tang et

al., 2015). Once all land parcels are generated, the procedure of land contractual management right reallocation finished

### 2.2.3 Comments on conventional approach

The so called drawing lots based reallocation is the achievement of more than 30 years of accumulation of practical experience. Compared to methods used in other countries, it is more adaptive to China's reality mainly due to its inherent efficiency and procedural fairness.

However, despite the merit of conventional approach, pressure from the need of scale agriculture, the transformation of LC to a more complicated and comprehensive way and the promotion of rural land registration make the shortcoming of fully exposed.

Firstly, anxiousness of government to finish LC projects brings about the low ratio of land reallocation, which is no more than 1/3. In China, most LC projects are led by government, and the implementation of LC projects is an important assessment indicator of leaders' performance. Solving this extremely complex problem will not only delay the schedule of LC project, but also will take risk of incurring protest and resentment of farmers. Therefore, the dominant strategy of government is to skip this troublesome stage.

Secondly, the random redistribution of land location makes it very hard to match area or value between land parcels and land blocks, finally leads to an unpleasant situation where many parcels are cut by roads or ditches. Besides, it will also cause big changes in location after LC. These inherent drawbacks of drawing lots sometimes lead to unwillingness to land reallocation.

Finally, like conventional approach in many other countries, land reallocation in China is highly relied on artificial work. The experience and knowledge of planners will cause huge impacts on results of land reallocations, especially in land partitioning stage. The shape and definitive location of land are all determined by planners, which is not only time consuming, but also error inviting.

## **3. A FRAMWORK FOR FUTHER RESEARCH**

### **3.1 New situation of land reallocation**

Confined to the lagging agricultural technology and level of economic development in China's rural area, land fragmentation is not a major problem needs to solve in early LC projects. Nowadays, however, the improvement of China's economic level and increase of population lead to the increasingly intense demand for large-scale agricultural production, and the rapid urbanization process in China has essentially provided a great opportunity for it. Consequently, a large scale of land adjustment become a necessity in LC.

In addition, due to lack of land registration and spatial data on contracted farmland before, mistakes are sometimes tolerable and the procedure is relatively easier. Actually there is no need of cadastral map in most of LC projects even nowadays. The promotion of land registration in rural area lately requires higher accuracy and more complicated procedure in land reallocation than before. However, land registration also brings opportunity to introduce technology of high efficiency such as GIS and SDSS.

The transformation of LC also makes land adjustment more complicated because the objectives of LC become more multivariate, the cover of LC project area is wider and more and more stakeholders are involved.

## 3.2 Land reallocation framework

All these challenges make land reallocation one of central issues in LC research, stimulating researchers in China to bring about so many creative ideas to solve the problem of unwillingness of farmers, inefficiency and disputes on land distribution. However, despite land reallocation process is a stage involving both administrative and technical steps (Essadiki and Ettarid, 2002), most of attention are paid to administrative steps in China, such as legislation of land reallocation and improvement of public participation.

Clearly, the drawbacks of conventional approach for land reallocation lie in both administrative and technical steps. Furthermore, administrative aspects of land reallocation are interactive to technical aspects: the administrative model usually determines the fundamental efficiency of land reallocation and makes a big difference in choice of technology, which will be shown in next section; a good choice of technical mode makes land reallocation go well with high efficiency and realization of objectives.

Therefore, we put forward to a framework incorporating both administrative aspects and technical steps for future study. This framework is based on previous research from both in and out of China, hoping to make related studies more systematic and eventually put forward to a more adaptive approach for land reallocation in China. The framework is shown in fig 4.

### 3.2.1 Construction of institution

Due to the introduction of modern LC to China is relatively late, institutional system of it is still immature by now. Given that land reallocation isn't seriously considered until 21 centuries, it is no wonder that there is lack of legislation and organizations for it. For the legislation would make the procedure and implementation of land reallocation more stable and transparent, which is beneficial to acceptance of farmers, it is the fundamental need for improvement of land reallocation.

In addition, the way how LC was promoted and implemented also makes big differences on the result of land reallocation. Despite the unwillingness of farmers to land reallocation in government-led LC projects, there is emergence of volunteer land readjustment in many province of China (Lu, 2012), showing the need of land reallocation and mismatch between LC projects and farmers' need.

Therefore, all these institutional factors can greatly affect the result of land reallocation, and should be studied deeply.

### 3.2.2 Land value redistribution

Value redistribution is a critical stage of land reallocation, which involves both administrative and technical factors. Main tasks of this stage is to redistribute contracted land and to carry out farmland transfer.

Redistribution of contracted land mainly involves the distribution of new farmland, calculation of conversion rate between land at different location and calculation of participation share of infrastructure. This stage is highly weighted in China for now, because the farmland is extremely scarce in China that average land holding size is 0.67ha (Demetriou D et al., 2012), a little difference will cause huge disputes. Another reason is that land quality varies a lot within project area because of variation in terrain, making the construction of farmland evaluation system a focus of both scholars and practitioners.



Though withdraw of contracted farmland is forbidden, volunteer farmland transfer is encouraged lately. Due to scarcity, simply centralization of farmland contracted by one farmer can only do a limited favor for large-scale agriculture. If government plays an active role of promotion of land transfer during LC, the procedure, efficiency and result of land reallocation will be a whole lot different.

### 3.2.3 Land location redistribution

Redistribution of location is to determine approximate location of land parcels, it is the most difficult stage of land reallocation not only because it involves countless factors, more importantly, because farmers' preference prevail at this stage. A technical optimization model can possibly maximize reallocation efficiency and convenience of agricultural production, but it means little if farmers don't like it.

Therefore, the objectives of this stage should at least contain two part: to get the willingness of farmers and to facilitate agriculture production. For realization of the first target, impact factors of farmers' preference should be clearly understood, and behavior pattern of farmers involved in interaction with other farmers and planners should also be studied. Additionally, the way to present and evaluate farmers' preference influences the result of location redistribution too.

Under the premise of understanding farmers' preference, location redistribution is process of optimization of special layout. Technical models should be engaged in this step. The use of operations research model with the help of emerging technologies such as GIS and SDSS can greatly improve efficiency and accuracy of land redistribution. This is what lacks in related research in China, and should be extensively studied from now on.

### 3.2.4 Land partitioning

Land partitioning is a technical stage of land reallocation which rarely affected by farmers' preference. Main tasks of it is to determine the final location and shape of land parcels. It is a geometric problem of designing optimize land parcels for farming subject to production technology, natural conditions of project areas, infrastructure network and so on. The evaluation indicators and methods and constraint conditions of land parcels design should be clearly understood and studied. Due to lack of spatial data, this stage has been rarely studied before, however, rural land registration has brought great opportunities for it.

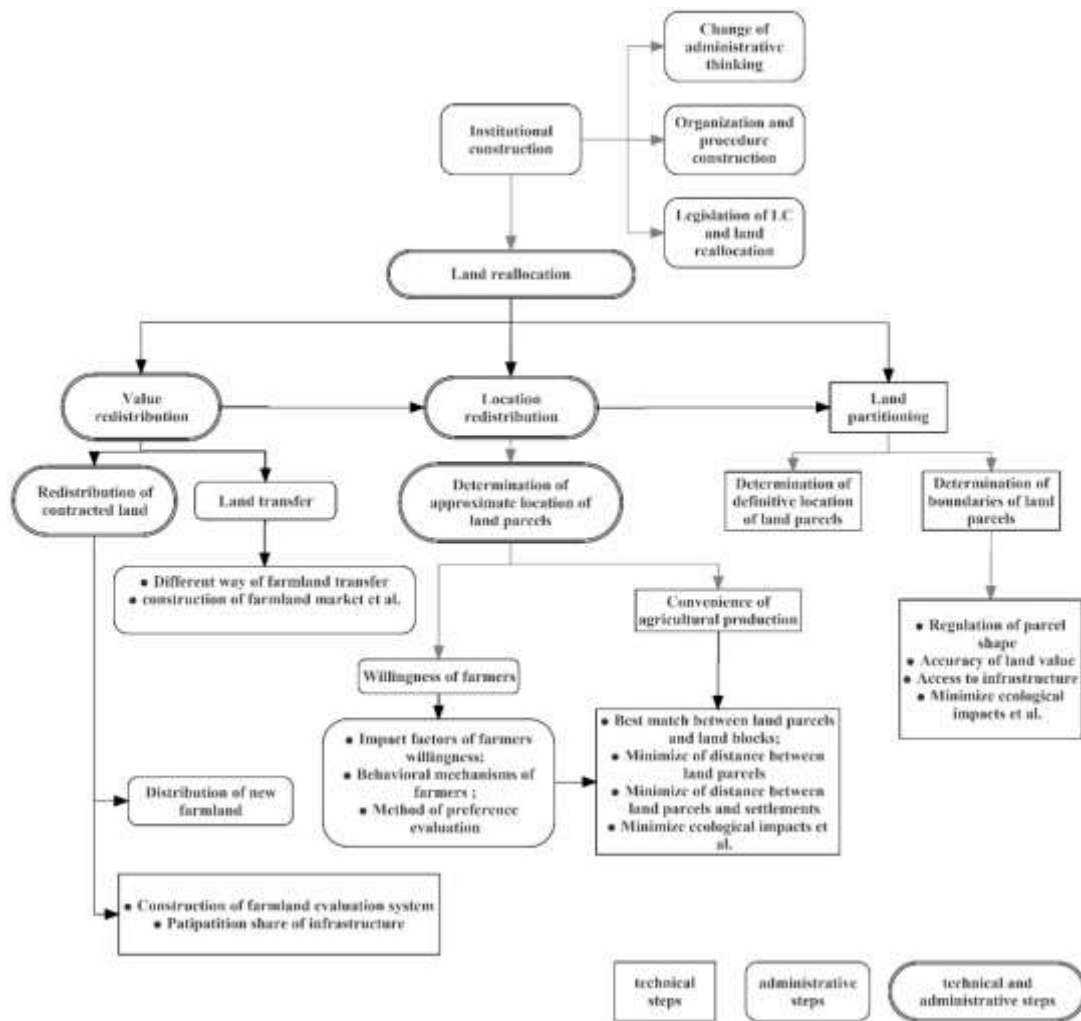


Fig 4. The framework for land reallocation in China

#### 4. CASE STUDY

In this section, we show the conventional approach for land reallocation in China intuitively through a LC projects in Jiangxi province, and how different ways of land value redistribution have effects on subsequent steps can be understood to some extent.

##### 4.1 Overview

The project shown in this section is located in Pengze County, Jiujiang City of Jiangxi, which contains two separated parts located in Huangling and Dongsheng town. We only gather data of Huangling part, but it is enough to explain how conventional approach works.

The scale of project area of Huangling part is 183.49 ha, involving farmland of Fanrong and Jinhuang two villages. The number of households and farmers in Fanrong involved in this project is 265 and 1042 respectively, and the numbers are 440 and 1429 in village Jinhuang. This project started up in 2013 due to lack of agriculture infrastructure and extremely land fragmentation, which is shown in fig 5 and table 3.

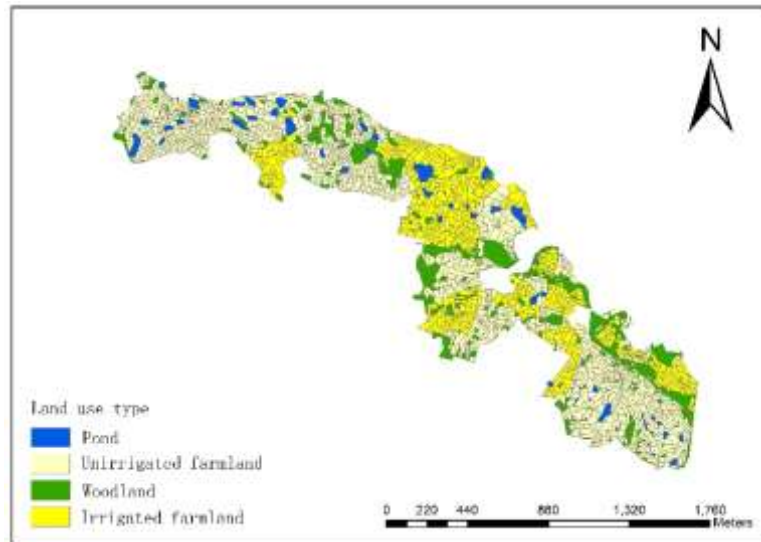


Fig 5. Status of cadastre and main type of land use

Table 3. Statistics of main type of land use in project area unit: ha

	Irrigated farmland	Unirrigated farmland	Woodland	Pond	Number of land parcels
Jinhuang	45.00	49.79	22.28	3.09	1030
Fanrong	5.13	39.83	9.51	4.18	1653
Total	50.13	89.62	31.79	7.27	2683

The average number of land parcels of households is 3.83 in project area, and the average size of land parcels is only 0.051ha, showing the extremely fragment situation of farmland in project area. The need for land reallocation is quite urgent.

#### 4.2 Drawing lots based model

The following picture shows the results of drawing lots based land reallocation. Clearly the landscape has been improved after land reallocation. Left part of fig 6 shows that farmland is generally gathered around its corresponding settlement, which makes it convenient for agriculture production.

Right part of fig 6 and table 4 shows cadastre situation after land consolidation. Number of land parcels in project area is reduced from 2683 to 805, correspondingly, the average number of land parcels of households is reduced and average size of land parcels increase by more than 3 times. All these changes are proof of relief of land fragmentation.

Table 4. Change of landscape after land reallocation

	Farmland area(ha)	Number of land parcels	Average holding size(ha)	Average number of land parcels of households	Average size of land parcels(ha)
Before	139.75	2683	0.20	3.83	0.051
After	168.47	805	0.24	1.14	0.210

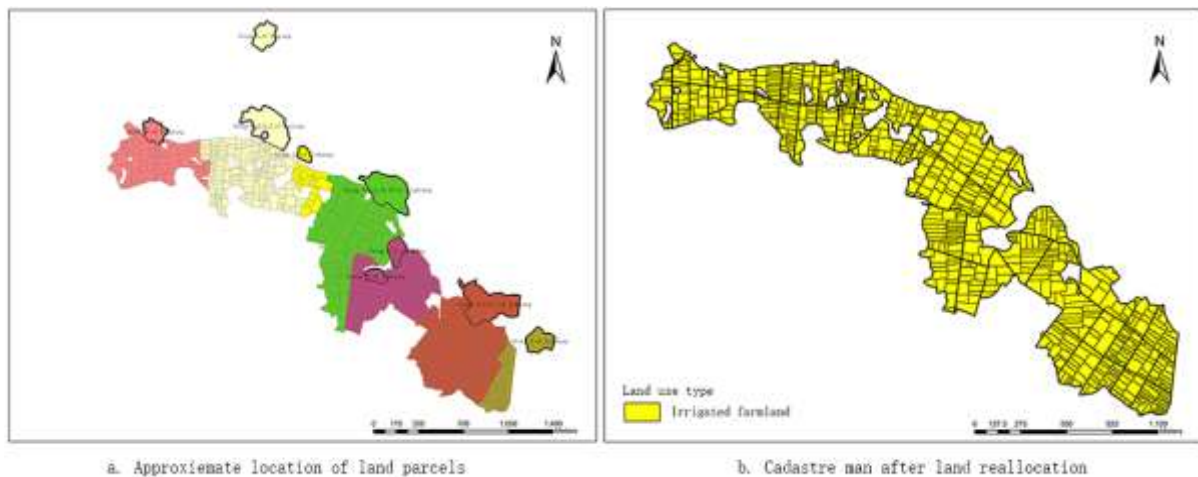


Fig 6. The result of drawing lots based land reallocation

However, despite total area of farmland has increased from 139.75 ha to 168.47ha, the average holding size of households only increase 0.04ha. The less of farmland per capita is the inherent defects of China that cannot be solved by simply centralization of land within households. Also, due to mismatch between land parcels and land blocks in location redistribution stage and the limitations of manpower in land partitioning stage, there are still 77 households (10.92%) have more than one parcel though the principle is “one household, one parcel”. All these drawbacks are hidden threat to farmers` satisfaction, and actually this plan of land reallocation incurs strongly protest of farmers, eventually end up with being abandoned.

#### 4.3 Land transfer based model

To ensure the LC project go well, land bureau of Pengze county plays an active and critical role of promotion farmland transfer. Because LC improves production conditions and quality of farmland, the rent price of farmland in project area has doubled, making most of famers willing to transfer their farmland. Consequently, 638 out of 705 household transfer their land to two farmers, leaving farmland of only 65 households needs to be reallocated. All land parcels of these households are reallocated to location of highest value where near their settlements, which is shown in fig 7, and this plan of land reallocation is implemented successfully

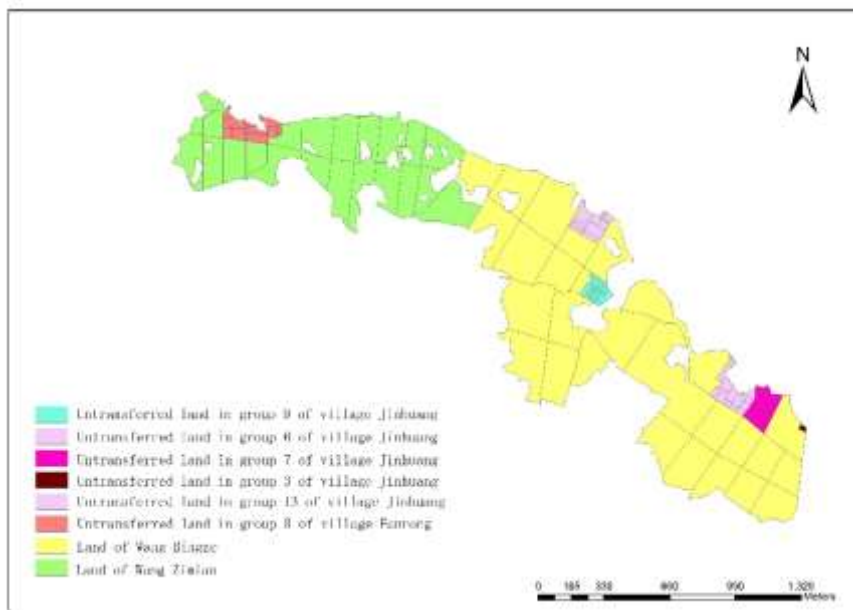


Fig 7. The result of transfer based reallocation

#### 4.4 Discussion on the results

As is shown above, traditional approach of land reallocation in this project failed to be implemented mainly because of contrast between great workload and few benefits of land reallocation. Due to scarcity of farmland, the average holding size of households is still very small after large scale of land reallocation, which make few farmers want to be engaged in it.

On the contrary, land transfer can exactly solve this problem. After farmland transfer, one of transferees have about 110ha farmland to manage, which definitely realize the objective of large-scale agriculture. And the key factors of success of this kind of land reallocation can be summarized as the following aspects: government plays an active role of encouraging land transfer, mutual improvement between land transfer and LC, and a high proportion of non-agricultural employment in project area. In fact, the last factor is the premise of the popularity for this plan because only high proportion of non-agricultural employment would free so much farmland to be transferred. And we think this case would be a great example for developing countries experiencing rapid urbanization.

In addition, the new model shown in this section, which is land transfer based isn't a panacea for land reallocation in LC, because there are so many factors affecting land transfer and land reallocation. A more important revelation we get from this case is that different administrative models and ways of land value can make a big difference on subsequent steps, and fundamentally determine the efficiency and results of land reallocation.

## 5. CONCLUSION

Through the overview of development of LC and the conventional approach for land reallocation, we get the main features of land reallocation system in China: 1) The complex and fuzzy property right system on farmland makes land tenure one of central issues of land reallocation for both practitioners and scholars; 2) Land reallocation is always carried out in a small area, usually within a villager group, no matter how large the project area is; 3) The search

for efficiency and procedure fairness leads to the choice of drawing lots in land location redistribution; 4) Land partitioning is a stage has over-reliance on artificial work, which makes it not only time consuming but also errors inviting.

This mode of land reallocation is something derived from traditional LC and can be adaptive to China's reality during early stage of LC. However, the need for large-scale agriculture, the promotion of land registration and land the transformation of LC bring much pressure to it lately, and stimulate researchers to find new ways to solve this problem.

Furthermore, land reallocation is a process involving both administrative and technical aspects, and they are actually interactive. Therefore, we suggest through a framework that both administrative and technical steps should be taken into consider for future study and mainly focus on 1) Legislation and institutionalization of LC as a whole and land reallocation in specific; 2) Construction of a mature farmland evaluation system devote to land reallocation; 3) The impact factors of stakeholders' preference and their behavior pattern in land reallocation and 4) The technical aspects of land location redistribution and land partitioning.

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