

Development of a smartphone-based information platform for rural land sublease in China

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Keywords: Land sublease; government informatization; land sublease service; information platform construction

Abstract: This paper compares the current situation of development, clarifies the problems that need to be solved by the information platform of rural land sublease, and then constructs a smartphone-based information platform and draws conclusions and suggestions, firstly, based on the analysis of rural land sublease policy and platform as a realistic basis, the design of rural land sublease information platform is carried out by using comparative analysis method and object-oriented analysis and design method. By constructing and analyzing the rural land sublease information platform, we deepen the informationization of land sublease government services and enhance the dynamic land title registration function. Based on the construction of the rural land sublease information platform, the government is promoted to explore the orderly opening and utilization of information resources, and provide all-in-one land sublease governmental information services in line with the needs and user habits of the new era. In today's new era of mobile network, the cell phone platform can better serve to realize the rights and obligations of land sublease regulated by the Land Contract Law of the People's Republic of China, improve the efficiency of rural land resources, and promote rural revitalization. With the gradual establishment of land sublease management information systems in various places, government information services such as land title registration inquiries are gradually standardized. However, there are still problems such as fragmentation of information on land sublease management and transactions, asymmetry of land sublease information, and low technical level.

1. Related policies and platforms research, development status

1.1 Policies related to rural land sublease

The Law of the People's Republic of China on Land Administration (1998), the Law of the People's Republic of China on Rural Land Contracts (2002), the Measures for Public Inquiry of Land Registration Information (2002), the Measures of the People's Republic of China on the Administration of Subletting of Rural Land Contract Management Rights (2005), the Opinions on Guiding the Orderly Subletting of Rural Land Management Rights to Develop Moderate Scale Agricultural Operations (2014), and the "Code of Practice for the Registration of Land Contract

Management Rights and Land Management Rights (for Trial Implementation)" (2022) and other land policies can be seen that the state allows subletting of land contract management rights through subcontracting for rent, swap, transfer or other means, and land registration information can be inquired in accordance with the law, and the state requires strengthening land sublease use and contract standardization management.

1.2 Status of development of rural land sublease platform

The government has authorized the establishment of rural trading platforms at different levels, such as Chengdu Rural Exchange, Wuhan Comprehensive Rural Exchange and Yanhu District Rural Trading Network in Yuncheng City. They have the advantages of clear platform layout, rich functional modules and fair and objective information, but at the same time have the disadvantages of slow update of information, difficult access to services, and large differences in the level of local information development. The rural land subleasing platforms built by enterprises, such as soil flow network, land search network, land resources network, etc, have developed rapidly in the past 10 years and have the advantages of easy access to services and wide service area, but their information authenticity is difficult to guarantee and provide shallow land subleasing services.

1.3 Research on rural land sublease management theory and platform construction

The research on rural land subletting mainly focuses on land subletting mode, subletting mechanism, current situation and countermeasures (about 29,988 articles), and there are relatively few studies on the construction of rural land sublease platform, including 11 studies on land sublease management information system and about 38 studies on the construction of rural land subletting platform.

In the study of rural land sublease management information system, GIS component-based development tools combined with visual programming language^[1], ArcGIS Engine, Oracle database^[2] and other related technologies are mainly applied to build rural sublease management information system. Among them, the driving research is to propose the construction of rural land sublease management information platform in B/S mode under the premise of the title management information system^[3].

In the study on the construction of rural land sublease platform, Meng Zhang et al. discussed the concept of building a government-led rural land sublease network platform service^[4], and Jianbin Dai^[5] et al. discussed the relevant functions that can be achieved by the rural land trading platform.

2. Analysis of rural land sublease information platform

2.1 Problems to be solved by the rural land sublease platform

Through the study of the policy and analysis of the development status, the problems to be solved in the construction of the information platform of rural land sublease are extracted: Firstly, the application of government service information in the field of land sublease must be deepened. Secondly, it is necessary to extend the function of land title registration with the help of land sublease information platform. Third, it is necessary to play the role of guaranteeing the land sublease contract in the land title sublease. Fourth, it is necessary to build a land sublease information platform carrier with easy access to services.

2.2 Core functions of the rural land sublease platform

The service object of rural land sublease information platform (hereinafter referred to as information platform) is mainly the supply and demand subject of rural land sublease, and the function positioning of information platform can be analyzed from the perspective of supply and demand subject of rural land sublease (Figure 1), and the deepening of land sublease government service informatization can be realized through the function analysis of information platform.

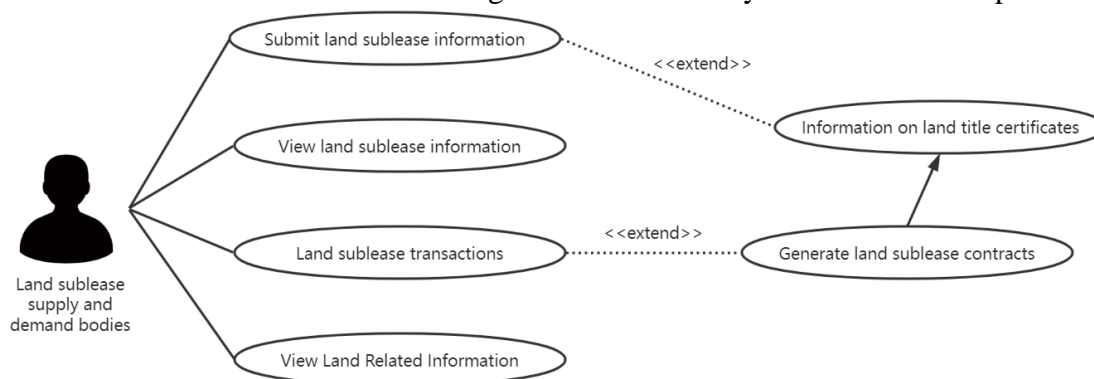


Figure 1: User usage map of the rural land sublease information platform

2.2.1 Sublease information release function

Land sublessor have the demand to release land sublease information in the information platform, land sublessor determine the identity of information submission and submit online information of land certificates that can be subleased, the identity of the right holder, and select the desired sublease mode (such as subcontracting, leasing, shareholding, etc.), improve the type of land sublease, sublease time limit, price and other information, submit to the information platform for review and categorization into the corresponding classification channels. Realize information release, reflecting the informationization of government services for land sublease.

2.2.2 Sublease information inquiry function

Both land subtenant and land sublessor need to check land sublease information. The sublessor need to check the dynamics of the land property sublease market, so that they can make timely adjustments according to the market situation and protect their reasonable rights and interests. The subtenant need to check the information of different sublease methods to find the resources that match their needs.

2.2.3 Online transaction function of sublease

The online land transaction function is the core requirement of the information platform, which can reflect the standardized binding effect of land sublease contract and the dynamic extension of land rights registration. After the lease of the land, the applicant can submit the transaction application online after determining the intention of subleasing the land, and after completing the transaction payment, the information platform needs to generate special contracts (such as farmland subcontract, farmland swap contract, etc.) according to the type and subleasing mode, and divide the rights and interests according to the legal rights and responsibilities, especially the contract involving the subleasing of rural collective land, which needs to be confirmed by the villagers. Sub-letting facts and changes in rights and interests, all contracts are directly authenticated through the information platform to guarantee the authenticity and validity of transactions.

3. Design of rural land sublease information platform

The construction of rural land sublease information platform based on WeChat applet can make the informatization of land sublease management government services easier to realize, and with the help of cloud storage and cloud server, the access to land sublease management information system and land title registration system can be easily realized, and users can also get and feedback information conveniently.

3.1 Core function design of the platform

The functional structure of rural land sublease information platform based on WeChat applet is designed in Figure 2. The whole information platform is divided into 4 modules: information release, land market, my account and information service, through which the bridge between land sublease management information and transaction information is built, and the dynamic extension of land sublease standardized management and land title registration is realized with the help of land sublease contract.

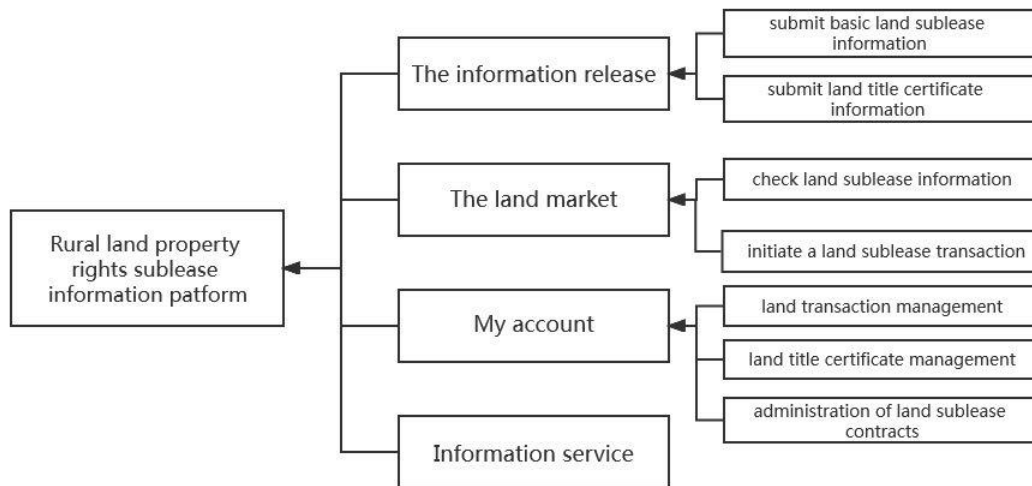


Figure 2: Functional modules of the rural land sublease information platform

3.1.1 Information Release Function

In the information release function, users submit information on rural land that can be subleased through the form interface of the information platform, and the platform automatically extracts the submitted information to determine the authenticity of the land sublease information and whether it can be subleased through the intention mode.

3.1.2 Land Market Function

The land market function is mainly responsible for the query and retrieval of land sublease information. The land sublessor can check all kinds of information after logging into the information platform, contact the intended land sublessor, and then initiate the transaction application online after both parties have confirmed the intention of subletting, and generate the order of land property subletting.

3.1.3 My Account Function

My Account function mainly undertakes the transaction management, contract management and title management of land sublease. After the supply and demand subjects of land sublease initiate online transactions, they will enter into the transaction management process and determine whether to generate land title sublease contracts (drafts) according to the intention of both parties after they make appointments to show them. After both parties confirm and pay for the transaction, a formal contract is generated, stipulating the division of land rights and interests (such as the type of changed rights and interests, the time limit of rights and interests, whether to support other ways to sublet again, etc.), and the sublease contract is authenticated.

When the subject of land sublease is rural collective land, the electronic contract (draft) of collective land sublease to be confirmed is sent through the information platform to the real-name certified village group members, who submit their opinions on the contract and complete the approval of relevant departments through facial recognition, fingerprint recognition and other identification methods, and the official contract is fed back to the sublease subject and relevant departments to change the registration information of the right certificate.

3.1.4 Information Service

It mainly introduces the policies and cases related to rural land subleasing and supports the interaction of land subleasing information.

3.2 Database design

The database of rural land sublease information platform needs to be connected with many subsystems such as land title registration management and land sublease management, so the database design requires data standardization, low redundancy, high independence and easy diffusion.

3.2.1 Database design in information distribution

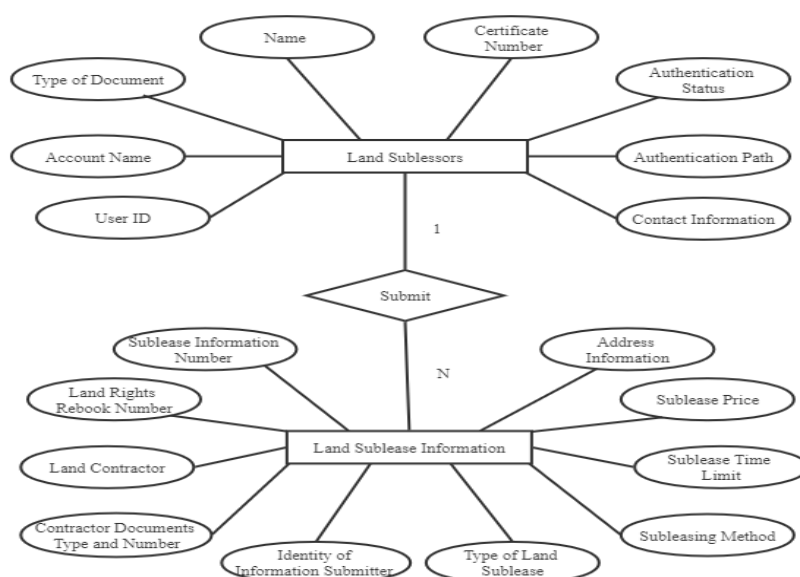


Figure 3: Entity-Relationship (E-R) model of information submitted by users of the rural land sublease information platform

Users logging into the information platform will invoke the WeChat account to automatically generate the information platform account, and a land sublessor can submit multiple land transfer information, which involves the database conceptual model shown in Figure 3, and the conceptual model is transformed into the corresponding database forms (Table 1 and Table 2).

Table 1: User information of the rural land sublease information platform

Field Name	Description	Data Type	Field Length	Remarks and Instructions
user-id	Account Number	int	30	Primary Key
name	Name	char	20	Non-empty
tele	Phone Number	varchar	11	Non-empty
authenticate	Whether to authenticate	bool	1	Non-empty
authentication	Authentication Method	varchar	20	Non-empty, the authentication mode can be card binding authentication or certificate authentication

Table 2: Land sublease information of the rural land sublease information platform

Field Name	Description	Data Type	Field Length	Remarks and Instructions
Information-Id	Sublease Information Number	varchar	30	Primary Key
LWarrant-Id	Land Rights Certificate Number	varchar	80	Non-empty
Land-contractor	Land Contractor	varchar	80	Non-empty
Type-contractor	Contractor Subject Type	varchar	20	Non-empty, including rural residents, urban residents, business corporations, farmers' cooperatives and other types
Identity-submitter	Identity of Information Submitter	varchar	20	The status type can be either contractor or agent.
Land-location	Land Location	varchar	255	Non-empty
Land-sort	Land Type	char	30	Non-empty
Duration	Time Limit for Land Sublease	int	10	Non-empty
Circulation-route	Sublease Method	varchar	20	Non-empty, land sublease method includes exchange, subcontract, shareholding, cooperation, leasing and other forms
Price	Sublease Price	money	15	Non-empty
Datetime	Date of Submission	datetime	20	Non-empty

3.2.2 Database design in the land sublease transaction

When the land sublease transaction is completed by both parties, the land sublease contract is generated from the land sublease order, in which the conceptual model involved is shown in Figure 4, and is transformed into a land sublease contract table (Table 3) with reference to the provincial model land sublease contracts in Anhui Province and Hubei Province.

Table 3: Basic information of land sublease contract on the rural land sublease information platform

Field Name	Description	Data Type	Field Length	Remarks and Instructions
CNT-Id	Contract Number	varchar	80	Primary Key
LWarrant-id	Land Rights Certificate Number	varchar	80	Foreign Key
CNT-place	Place of Contract	varchar	80	Non-empty, land sublease address
CNT-date	Date of Signing	time	20	Non-empty
CNT-type	Contract Type	varchar	20	Foreign key, it depends on the type of land to be subleased, the method of sublease .Different types of contracts different, the corresponding contract descriptions are different.
CNT-description	Contract Instructions	varchar	5000	Non-empty, description of land sublease considerations, norms, specific terms, rights and obligations of the parties, contract changes and cancellation, etc.
CNT-status	Contract Status	varchar	20	Non-empty, confirm by contract status whether the renewal of the land title certificate is completed and whether the collective whether the land sublease has completed the collection of opinions and approval, and whether it is ready for the next The next sublease transaction
Order-Id	Sublease Order Number	varchar	30	Foreign key, a bridge between the land sublease order management database and the land sublease contract management database
PartyA-(contractor)	Party A (Contractor)	char	20	Non-empty
PartyA-document type	Type of Party A Document	char	10	Non-empty, Party A may provide ID card, social unified organization code certificate, etc.
PartyA-document number	Party A Document Number	varchar	30	Non-empty
Tel	Contact Number	string	13	Non-empty
Type-contractor	Contractor Subject Type	varchar	20	Non-empty, including rural residents, urban residents, business corporations, farmers' cooperatives and other types
Agent-PartyA	Party A's Attorney	varchar	30	Non-empty
...
Parcel-name	Parcel Name	varchar	30	Non-empty, transfer object field
Land-use	Land Use	char	30	Non-empty, transfer object field
Land-sort	Land Type	char	30	Non-empty, transfer object field
Acreage	Area	decimal	10	Non-empty, transfer object field
Duration	Time Limit for Sublease	int	10	Non-empty
Price	Sublease Price	money	15	Non-empty

Note: The field design of the land title certificate information table refers to the rural land contract management right certificate.

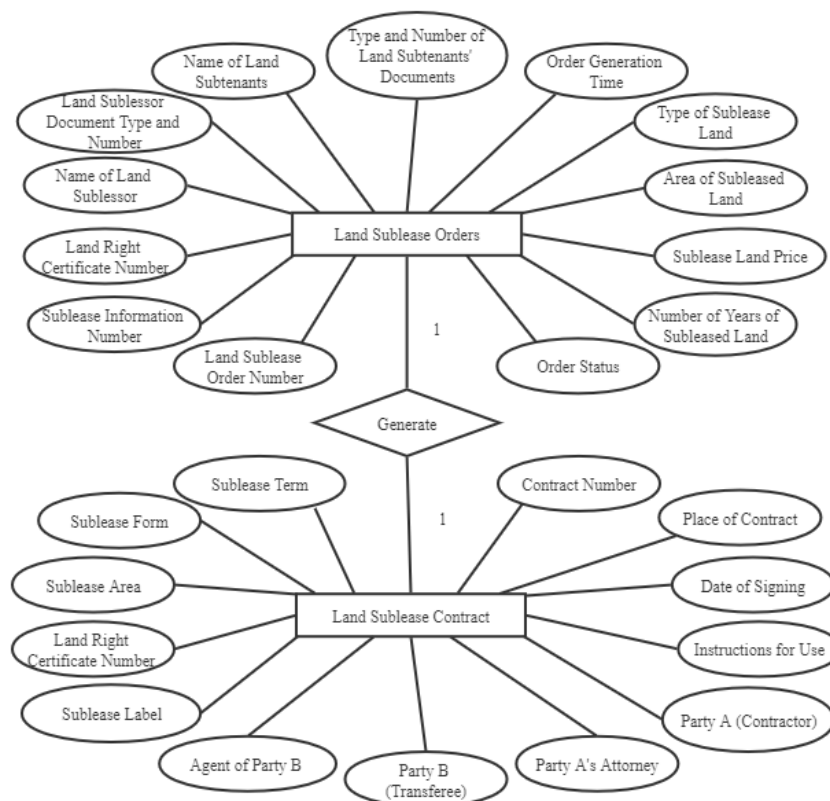


Figure 4: Order generation contract E-R model of the rural land sublease information platform

3.2.3 Database design in land sublease management

Table 4: Information of land subleasing right certificate of the rural land sublease information platform

Field Name	Description	Data Type	Field Length	Remarks and Instructions
LWarrant-id number	Land Rights Certificate	varchar	80	Primary Key
Warrant-time Year	Land Rights Certificate	int	10	Non-empty
Warrant-name	Land Grantor	char	20	Non-empty
Contractor	Land Contractor	char	20	Non-empty
Count-Contractor	Number of Plots Contracted	int	10	Non-empty
Number-land	Parcel Code	varchar	30	Non-empty
Transferee	Land Transferee	char	20	Non-empty
Location	Four Boundaries of Sublease Land	varchar	20	Non-empty, the scope of the land sublease can be effectively recorded through the parcel's four boundaries
Acreage	Area	decimal	10	Non-empty
Circulation-route	Circulation Method	varchar	20	Non-empty
Right-type	Type of Land Interest Change	varchar	20	Non-empty, the use of different ways to sublease land, so that the original land interest properties change and affect the re-disposal of land property rights by land interest holders
...

Note: The field design of the land title certificate information table refers to the rural land contract management right certificate.

The dynamic update of land sublease right certificate is realized through the field extraction of

land sublease contract content. The table of land sublease right certificate information of land sublessor is shown in Table 4, while the land under-lease side generates new right certificate registration information and certificate.

3.3 Interface design

The main four levels of pages include information release, land market, information service and my account, and the page entrance is fixed in the bottom function bar of the app, which is easy for users to switch. (Figure 5)

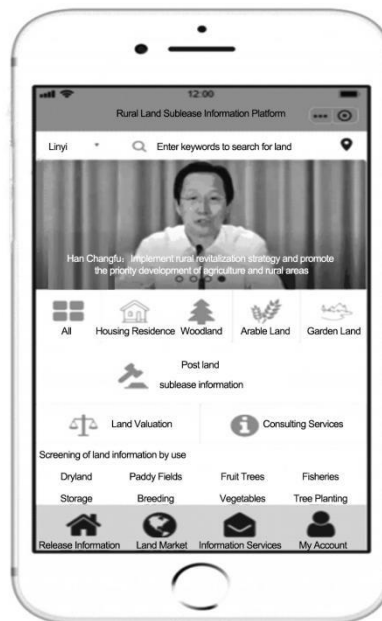


Figure 5: "Release information" function interface of the rural land sublease information platform

4. Conclusions and Recommendations

4.1 Conclusions

The information platform constructed in this study has obvious differences from the current rural land sublease management system and land sublease trading platform (Table 5), and the two main advantages are as follows.

(1) It deepens the informationization of land sublease government services. The platform can bridge the information gap between different land sublease management systems and trading platforms, especially in dealing with rural collective land, greatly simplifying the collection of village group opinions, safeguarding the right to information and benefit of collective land sublease for village group members, and helping to reduce disputes over collective land sublease rights.

(2) It can assume the dynamic land titling registration function. The platform can combine the land sublease transaction end with the land sublease management end, and through the link access of database, the extraction of specific fields, and the transmission of land sublease contract elements, it can realize the dynamic update of land confirmation registration, thus regulating the transaction behavior and reducing the transaction disputes.

Table 5: Comparative analysis of the rural land sublease information platform and existing platforms

Platform Type	Information Service Content	Main Function	Social Significance and Value
Government Land Sublease Management Information System	single limited function, no information on land sublease market	land sublease information management; land sublease certificate management	Ensuring the orderly management of land sublease is the foundation of land sublease market informatization
Existing Government-led Flow Transfer Platform	comprehensive information, high authenticity, different levels of platform time validity gap, high organization of information	land sublease information display; land sublease policy information interpretation; land transfer statistics	Guarantee the smooth and orderly sublease of rural land
Existing Corporate Land Sublease Platform	relatively comprehensive information, difficult to guarantee the authenticity of information, and High timeliness of information, difference in orderliness of information in different platforms big difference	collecting, organizing and displaying land sublease supply and demand information; interpreting land sublease policies, cases and news; providing value-added services such as land sublease evaluation and land creator training	Expanding the economic benefits of the rural land stream market
Rural Land Sublease Information Platform	comprehensive information, high authenticity, high timeliness, and information with High orderliness	rural land sublease information collection, review, collation, display; online transaction and management of rural land sublease; registration and management of land sublease certificate	While fully respecting the market allocation role of rural land sublease, it realizes the optimization of rural land sublease management and maximizes the protection of farmers' land rights and interests, and is an extension of the informationization of land sublease government services.

4.2 Suggestions

Through the combing of the framework and contents of this study, it is found that there is still some room for the development of government service informatization in the field of land sublease in China. Based on the results of the previous research, the following suggestions are made.

4.2.1 The government should gradually explore to realize the orderly opening and utilization of land sublease information

With the change of land sublease transaction, the land title information will be changed accordingly. If this information cannot be opened and used to serve the land sublease subject in time, it may cause the loss of the rights and interests of the land sublease subject.

4.2.2 The informationization of land sublease government services should be changed from one-stop to integrated

Developing and designing an independent information management system for each link area and integrating the service ports in one website service is an important initiative of one-stop service

for governmental information service. The integrated land sublease government information service is an important part of the current national integrated government big data system construction work, aiming to realize the automatic invocation of different database systems according to users' needs through one port, and provide users with more simple and clear land sublease government services.

4.2.3 Land sublease information services should be in line with the development of the times and users' habits

At present, the land sublease information service provided by the government mainly relies on offline service and online website service, and extends from the traditional computer terminal to the mobile intelligent terminal represented by smart phones and the lightweight application represented by WeChat mini-program, which helps to provide users with more acceptable and convenient land sublease government information service.

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