Statistical Analysis of Studies on Performance Appraisal of China's Land Consolidation

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Abstract We take the papers, on performance appraisal of land consolidation (including land consolidation benefits, *etc.*) published in the core journals in the Chinese Journal Full-text Database, as the study samples; conduct analysis in terms of the number of papers, the paper source journals, the impact of papers, research methods, research topics, and foundation project for research, through literature search and statistical analysis. The results show that the related scholars pay more and more attention to the study on the performance appraisal of land consolidation, and the number of papers increases overall; the core journals on agriculture, land, environment, economy and other areas, put increasing emphasis on the publishing of papers concerning the performance appraisal of land consolidation; in terms of citation frequency of papers, the impact of papers is wide, but the depth is not enough; the research methods are increasingly diversifying, and the research topics are concentrated; the foundation support is yet to be strengthened for research.

Key words Performance appraisal of land consolidation, Statistical analysis, Literature analysis, Research progress

The land consolidation in China was not researched until the late 1990s, starting late compared with foreign countries. In 2000, China initiated the first batch of land consolidation projects, and in 2002, the papers on land consolidation benefits began to outcrop[1-3]. As the land consolidation projects are launched successively at home, the related researches increase, and the number of papers thereupon climbs[4-8]. The Ministry of Land and Resources launched the work of the performance appraisal of land consolidation in 2008, and the pilot work was started in 2009. The Ministry of Land and Resources redefined the connotation of the performance appraisal of land consolidation, covering the entire content of existing researches on land consolidation, which illuminated the direction for the relevant scholars' researches, further promoted the output of papers and other research results[9-12]. Therefore, the number and impact of papers are enhanced; research methods and research topics are constantly updated and expanded[13-21]; the support of the central and local government for the performance appraisal of land consolidation is also promoted continuously. Many scholars have summarized and opened upon the researches on land consolidation. According to papers, we conduct statistical analysis to clarify the dynamic researches on the performance appraisal of land consolidation, in order to provide a reference for the research on the performance appraisal of land consolidation.

1 Data sources and sample selection

In 2000, China initiated the first batch of land consolidation projects, and many scholars carried out the researches on performance appraisal of land consolidation projects. Because of the lag of the study, after searching the related papers on the performance appraisal of land consolidation in the Chinese Journal Full-text Database, we find that there are no related papers published until 2002. The fixed number of years of journals retrieved is 2002 to 2011; the retrieval date is November 30, 2011; the source categories are core journals; land control + evaluation, land control + performance, land consolidation + evaluation, and land consolidation + performance, are taken as the retrieval theme, respectively, then matching exactly. At the same time, 22 papers are retrieved, by selecting land control and evaluation as key words; 2 papers are retrieved, by selecting land control and performance as key words; 338 papers are retrieved, by selecting land consolidation and evaluation as key words; 17 papers are retrieved, by selecting land consolidation and performance as key words. Therefore, 379 papers are retrieved in total. We analyze and screen the papers, excluding 19 repeated papers and 133 invalid papers, to get 227 valid papers, thus we take 227 valid papers as the study samples.

2 Statistical results and analysis

2.1 Analysis of the number and impact of papers

2.1.1 Change in the number of papers. The number of published papers directly reflects the degree of scholars' attention to the performance appraisal of land consolidation, and the more the papers published, the closer the scholars' attention to the research on the performance appraisal of land consolidation. 227 valid papers were published in nearly 10 years (from 2002 to November 30, 2011), an annual average of 22.7 papers. The greater the number of papers, the more attention the scholars specializing in agriculture, land, *etc.* pay to the re-

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search on the performance appraisal of land consolidation. During the period 2002 – 2007, and 2009, the number of papers published annually was below average; only in 2008, 2010 and 2011, the number of papers published was above average. Since 2008, the researches on the performance appraisal of land consolidation have drawn more and more attention, and the research results tend to be rich.

According to the number of papers published, three stages are divided as follows. The first stage (2002 – 2003): it is the initial production stage of papers, a total of 12 papers in two years, accounting for 5.3% of all papers, an annual average of 6 papers. There are few land consolidation projects, and related studies are in progress, thus the papers are yet to be published. The second stage (2004 – 2007): it is the rise period of papers, with 16 – 20 papers annually, and the number of papers in this period accounts for 31.3% of total number of papers, 5.9 times that at the previous stage. The number of papers is increased significantly. The third stage (2008 – 2011): it is the high-yield period of papers, a total of 144 published papers, accounting for 63.4 %, exceeding the summation of the previous two. In 2008, the number of papers published jumped to 58, the highest value in the past 10 years (Fig. 1). In three years after 2008, the number of papers declined slightly, but not less than 20 per year, indicating that after 2008, the research results on the performance appraisal of land consolidation were increased significantly, closely related to the national and local government support for land consolidation projects. The land consolidation projects have promoted the researches on performance appraisal.

On the whole, the number of papers on the study of the performance appraisal of land consolidation tends to rise, indicating that scholars pay more and more attention to the performance appraisal of land consolidation.

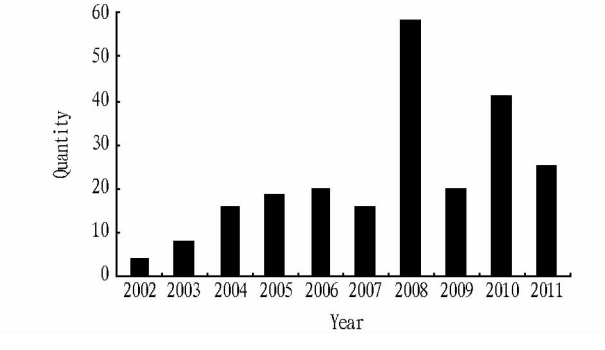

Fig. 1 The number of papers on the performance appraisal of land consolidation in the period 2002 – 2011

2.1.2 The paper source journals. The paper source journals can reflect the status of the performance appraisal of land consolidation in professional journals, and the contribution of professional journals to the study of the performance appraisal of land consolidation. According to the search results, 227 papers are derived from 71 journals on agriculture, land, environment, economy and other areas (Table 1), including *Transactions of the Chinese Society of Agricultural Engineering*, *China Land Science*, *Research of Soil and Water Conservation*, *Bulletin of Soil and Water Conservation*, *Journal of Geographical Sciences*, *Geographical Research*, *Economic Geography*, *Journal of Natural Resources*, *Resource Science* and so on, with wide distribution, indicating that many professional journals have paid attention to the publishing of research results on the performance appraisal of land consolidation.

From Table 1, we can find that over the past 10 years, *Transactions of the Chinese Society of Agricultural Engineering* carried the most papers on the performance appraisal of land consolidation, accounting for 17.6% of the total papers, an annual average of 4 papers. Land consolidation projects are agricultural engineering projects, and *Transactions of the Chinese Society of Agricultural Engineering* is indexed by EI, with high level, great impact, and high quality, which is favored by scholars, therefore, the number of papers is the greatest. The influence of *Journal of Anhui Agricultural Sciences* is not as good as *Transactions of the Chinese Society of Agricultural Engineering*, but it is a publication issued once every ten days, with a large circulation of papers and short publishing cycle of papers, therefore, the number of papers is large, reaching 37, accounting for 16.3% of the total papers. Although the number of papers published in *China Land Science* is less than that of the above two journals, the number of papers is relatively large, compared with the other 68 kinds of journals, an annual average of 1.5. The papers in *Transactions of the Chinese Society of Agricultural Engineering*, *Journal of Anhui Agricultural Sciences* and *China Land Science*, account for 40.5% in total, thus it can be said that most of papers on the performance appraisal of land consolidation are concentrated in these three journals; the number of annual average papers in other journals is less than 1, with significant small number.

2.1.3 Analysis of impact of the papers. The download frequency of papers and citation frequency are two indicators reflecting the impact of papers. Download frequency shows the degree of other scholars' attention, while citation frequency reflects the value of the papers, which can measure the degree of a paper recognized by other scholars, and also show the academic level of the authors, therefore, citation frequency is one main indicator reflecting the impact of papers.

Through retrieval results of papers, we find that 227 papers are downloaded 61 208 times, quoted 2 767 times. The download frequency and citation frequency of the papers on the performance appraisal of land consolidation in all journals are different, and Table 2 lists the top 10.

From both download frequency and citation frequency, the papers in *Transactions of the Chinese Society of Agricultural Engineering* rank first, ahead of other journals, showing that the quality of the papers on the performance appraisal of land consolidation in *Transactions of the Chinese Society of Agricultural Engineering* is high, with high degree of recognition. The citation frequency and download frequency of the papers in *Resource Science*, *China Land Science*, *Journal of Natural Resources*, *Economic Geography*, *Journal of Anhui Agricultural Sciences* are also high, which fall within the second grade; the

citation frequency of the papers in *Geography and Geo-Information Science*, *China Land*, *Journal of Southwest China Normal University*(*Natural Science*), *China Soft Science*, is 50 – 100, which fall within the third grade; the other journals fall within the fourth grade. There are 71 kinds of journal publishing the papers on the performance appraisal of land consolidation, with wide influence, but in terms of citation frequency, the papers are concentrated in *Transactions of the Chinese Society of Agricultural Engineering* and 9 other journals, therefore, the impact of papers published in these 10 journals is deeper.

Table 1 The paper source journals on the performance appraisal of land consolidation

Order	List of journals	Number of papers	The total number and proportion//%	
1	*Transactions of the Chinese Society of Agricultural Engineering*	40	40	17.6
2	*Journal of Anhui Agricultural Sciences*	37	37	16.3
3	*China Land Science*	15	15	6.6
4	*Resources & Industries*	9	9	4.0
5	*Resource Science*	7	7	3.1
6	*Journal of Natural Resources*, *Economic Geography*, *Chinese Agricultural Science Bulletin*	5	15	6.6
7	*Journal of Southwest China Normal University*(*Natural Science*), *Ecological Economy*	4	8	3.5
8	*Territory & Natural Resources Study*, *Ecology and Environmental Sciences*, and 5 other journals	3	21	9.3
9	*China Land*, *Geographical Research*, *Journal of Soil and Water Conservation*, and 13 other journals	2	32	14.1
10	*Journal of Geographical Sciences*, *Journal of Mountain Science*, *Ecology and Environmental Sciences*, and 40 other journals	1	43	18.9

Table 2 Top 10 journals in terms of download frequency and citation frequency of papers

Name of journals	citation frequency	Name of journals	download frequency
Transactions of the Chinese Society of Agricultural Engineering	748	*Transactions of the Chinese Society of Agricultural Engineering*	13 805
Resource Science	417	*China Land Science*	6 684
China Land Science	210	*Journal of Anhui Agricultural Sciences*	6 231
Journal of Natural Resources	203	*Resource Science*	3 787
Economic Geography	144	*Economic Geography*	2 718
Journal of Anhui Agricultural Sciences	112	*Journal of Natural Resources*	2 193
Geography and Geo-Information Science	94	*Geography and Geo-Information Science*	1 635
China Land	72	*Ecology and Environmental Sciences*	1 377
Journal of Southwest China Normal University(*Natural Science*)	58	*Resources & Industries*	1 265
China Soft Science	56	*Chinese Agricultural Science Bulletin*	1 074

2.2 Research methods and research topics of papers

2.2.1 Research theory and methods. Research theory is the basis of the scholars' research, and research methods reflect the researchers' point of view and means in studying problems. Through paper retrieval, we find that most of the theories applied in the papers on the performance appraisal of land consolidation are from economics, ecology and mathematics. Input-output theory in economics is applied most; the landscape pattern theory, the theory of ecological footprint, the ecological compensation theory in ecology are also widely applied; the extension theory and the rough set theory in mathematics are often applied, and especially in recent years, the application of extension theory is increased.

Research methods include the analytic hierarchy process, fuzzy mathematical evaluation method, the composite index method, data envelopment analysis (DEA), the priority evaluation method, the success appraisal method, matter-element and extension model, of which the analytic hierarchy process is used most. Fuzzy mathematical evaluation method is always the main method for the scholars' in-depth study; the success appraisal method, data envelopment analysis (DEA) and other methods expands the research perspective; in recent years, the wide application of matter-element and extension model further broadens the research methods for the performance appraisal of land consolidation.

2.2.2 Research topics. Through statistical analysis of the papers, the existing research topics of the papers on the performance appraisal of land consolidation mainly include land consolidation benefits (ecological benefits, economic benefits, social benefits, comprehensive benefits), land quality, land consolidation potential, the performance appraisal indicator system of land consolidation, *etc*. The papers with the research topics on evaluation of benefits are the most, a total of 107 (50 papers on evaluation of ecological benefits, 43 papers on evaluation of comprehensive benefits, 10 papers on evaluation of economic benefits, 4 papers on evaluation of social benefits), accounting for 47.1% of all papers. Thus, it can be seen that evaluation of land consolidation benefits is the most important research topic, and the economic, social and environmental benefits brought by land consolidation projects are the core content that the society and scholars are concerned about, and also the hot content in the researches on the performance appraisal of land consolidation. Evaluation of land consolidation potential is another research focus, and this research can better improve the economic and ecological benefits, so it draws more attention. There are 42 papers on evaluation of land consolidation potential, accounting for 18.50%, ranking second. There are 15 – 22 papers on land consolidation project plan and risk assessment,

the evaluation indicator system, and assessment of land quality, accounting for less than 10%. And the number of papers on other research topics is small, so they are omitted here.

2.3 Analysis of foundation project for research The situation of papers being supported by foundation at the national level and the level of all ministries and commissions can reflect the degree of the Chinese government's attention to this study, indicating the great importance of the study. Through retrieval, we find that 80 papers are supported by foundation at the national level and the level of all ministries and commissions among 227 papers; in addition, 1 paper is supported by The United Nations Development Programme Fund (Table 3). If two or more papers are funded by the same foundation project, only one project is counted, therefore, 80 papers are supported by 66 foundation projects in total. We have not yet collected statistics concerning the papers supported by the local government funds projects.

There is only 1 paper supported by The United Nations Development Programme Fund, indicating that although China's land consolidation projects draw the attention of the United Nations, the degree of attention is not high. We should strive for more international funding, which can not only help us to improve the level of research and write high-level papers, but also improve the international influence of our papers.

Table 3 Support foundation for papers and projects

Level	Foundation for research	The number of projects	The number of papers
International level	The United Nations Development Programme Fund	1	1
National level and the level of all ministries and commissions	National Natural Science Foundation	32	40
	National Science and Technology Support Program	14	18
	National Social Science Fund	4	5
	National Key Basic Research and Development Program (973)	1	1
	National High Technology Research and Development Program (863)	1	1
	Science and Technology Research Project of the Ministry of Education	2	2
	Knowledge Innovation Project Fund of the Chinese Academy of Sciences	2	2
	Geological Survey Project of the China Geological Survey	4	4
	China Postdoctoral Science Foundation	3	4
	Specialized Research Fund for the Doctoral Program of Higher Education	1	2
	Visiting Scholar Foundation of Key Laboratory in University	1	1
Total		66	81

Note: If two or more papers are funded by the same foundation project, only one project is counted.

The number of papers supported by the National Natural Science Foundation is the greatest (40), accounting for one half of the number of papers supported by foundation at the national level and the level of all ministries and commissions, but only accounting for 17.6% of all 227 papers, indicating that more than 80% of the papers are not supported by the National Natural Science Foundation, and the basic research innovative capacity reflected by the papers on performance appraisal of land consolidation is not enough, therefore, we must raise the level of basic research, and improve the innovation capability based on land consolidation projects. The number of land consolidation projects and papers supported by National Science and Technology Support Program is second only to the number of land consolidation projects and papers supported by the National Natural Science Foundation, therefore, National Science and Technology Support Program is another important force for promoting land consolidation project research. The number of papers supported by National Social Science Fund and other funds is small, less than 5. These funds have not yet become the main force for promoting land consolidation project research, thus in the future, we should strive for the support of these funds.

3 Conclusions

Through literature search and statistical analysis, we analyze the research progress of the performance appraisal of land consolidation in China, using the Chinese Journal Full-text Database. From the statistical analysis results of papers, the papers on the performance appraisal of land consolidation began to outcrop in 2002; subsequently, the number of these papers climbed ceaselessly. Over the past decade, a growing number of research institutions and researchers have joined the research team of the performance appraisal of land consolidation; the scholars have paid more and more attention to the research on performance appraisal of land consolidation. In terms of the paper source journals, *Transactions of the Chinese Society of Agricultural Engineering*, *Journal of Anhui Agricultural Sciences* and *China Land Science*, attach great importance to the publishing of research results on the performance appraisal of land consolidation; more and more academic journals publish the research papers on the performance appraisal of land consolidation. In terms of download frequency and citation frequency, the impact of papers is wide, but not deep. The research methods are increasingly diversified, and there is an increase in the use of econometric models. The research topic is concentrated in the land consolidation benefit, and the economic, social, ecological environmental benefit brought by the land consolidation projects is the hot content of research on the performance appraisal of land consolidation. In terms of the foundation support for the papers, the National Natural Science Foundation is an important force; the number of papers supported by other funds is small, indicating that the novelty of the paper needs to be strengthened, and the papers need to be supported by more funding.

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leaders can lead village to bright future, like Wu Renbao, the former branch secretary of Huaxi Village. Those who intervene with grass-roots election, break laws or violate discipline should be strictly punished in compliance with laws and discipline.

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