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Review and bibliometric analysis of Chinese agricultural economics research: 2006-2015

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Abstract

Purpose – The purpose of this paper is to reveal the distributional characteristics and evolutional patterns in source periodicals, topics, authors, funding, and institutes of research papers in Chinese Agricultural Economics so as to understand the current situations and developmental tendency of Chinese agricultural economics research over the past decade.

Design/methodology/approach – Using the citation analysis method, this paper analyzed the distributional characteristics and evolution of source periodicals, fields, authors and topics of 2,203 highly cited journal papers from the database of China National Knowledge Infrastructure (CNKI) and 189 cited journal papers from database of Social Sciences Citation Index (SSCI) in agricultural economics first-authored by Chinese scholars from 2006 to 2015.

Findings – First, over the past decade, agricultural economics research in China has seen a rapid development. Specially, 103 scholars and 42 institutes have played key roles in the development, and 12 Chinese periodicals and 3 international journals have been the most influential outlets. Second, the coverage of the topics in Chinese agricultural economics research is broad and has expanded over the past decade. The rural land issue has been the most popular topic, while the issues regarding rural institutional arrangements and industrialization in rural areas have been explored extensively. However, issues in other fields, such as agricultural markets and trade, rural labor, food safety, etc. have to be further studied. Third, the improvements of economic theory and quantitative analytic techniques, the supports from research funding, and an increase in the collaboration between Chinese scholars and those from other countries have made great contribution to the rapid development of Chinese agricultural economics research over the past decade.

Originality/value – This paper is an original work that identifies the most influential journal papers including highly cited journal papers from CNKI and cited journal papers from SSCI, using citation frequency and standard Essential Science Indicators method. This is a contribution relative to the methods used by previous studies, which did not account for frequency of citation of a paper. Moreover, this study is based on data from two databases, CNKI and SSCI, suggesting that the coverage of sample papers is broader compared to those of previous studies.

Keywords Bibliometric analysis, Agricultural economics research, Cited papers from SSCI, Highly cited journal papers from CNKI

Paper type Research paper

1. Introduction

Agricultural economics covers a wide range of topics. Ever since the 1950s, it has been expanded to cover new sub-fields like farm management, agricultural production economics, agricultural product marketing, agricultural technology economics, international agricultural trade, etc. (Zhong *et al.*, 2013). Traditionally, persuasively critical analysis and evaluation methods have been used by scholars based on their

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accumulation of many years to understand the tendency of research development related to agricultural economics. In the recent years, some scholars have applied bibliometric methods to the development of agricultural economics. However, this kind of studies is consequently few. For example, with journal papers from the databases of China National Knowledge Infrastructure (CNKI[1]) and Social Sciences Citation Index (SSCI) over the past decade and the bibliometric tool of Citespace, Zhang *et al.* (2016) summarized the history and outlook of the future trends in the field of agricultural economic management in China and the world. According to Zhang *et al.* (2016), agricultural resource economics, environmental economics, agricultural products and factors marketing, and rural finance insurance are expected to remain the research focus in China and the world. By analyzing influential papers from high-ranking journals, Feng *et al.* (2014, 2016) found that the dominant economic theory in agricultural economics has been changed from Marx's theory to modern western economic theory, while the method used in the analysis has been transformed from qualitative analysis to quantitative analysis. By analyzing papers published in the journal of *China Rural Survey* between 1995 and 2013 and *Problems of Agricultural Economy* between 2000 and 2014, Chen (2014) and Duan and Chen (2015) showed a variation in research direction over the period. They find that applied research and research focusing on individuals' and households' behaviors as well as econometric analysis and case studies have become widely used, while main data sources have expanded from second-hand to first-hand data.

While the previous studies mentioned above are helpful in revealing trends in the development and patterns of Chinese agricultural economics, there still remain some drawbacks. First, most of the previous analyses focused only on papers from one or several domestic journals, thus limiting the coverage of the sample. Second, although parts of the previous studies accounted for citation issues, they have not taken the citation as an important index/variable in their analyses. Given that the more frequently a paper is cited, the more attention it attracts from peers, citation is therefore an important index reflecting the valuation, peer attention and social influence of papers. Thus, limiting the sample to domestic journals, and giving less attention to citation in such studies limit their abilities to properly reflect the development trend of agricultural economics research in China. To fill these gaps, this paper uses a sample of highly cited journal papers in the field of agricultural economics published by Chinese scholars not only in journals in China but also in journals in other countries over the past decade. This enables us to reveal the distributional characteristics and evolutionary patterns in source periodicals, topics, authors, funding, and institutes, as well as to understand the current situations and developmental tendency of Chinese agricultural economics research. By identifying and analyzing the influential journal papers at home and abroad in the past decade, and using the two databases of CNKI and SSCI and comparing their results, this paper provides information that contributes to better understanding of agricultural economics research in China.

The rest of this paper is organized as follows. In Section 2, we present the analysis method and the sources of data used. Section 3 discusses the distribution of sample papers and their journal sources, while Section 4 presents the author analysis. In Section 5, we discuss the sources of funding received by the sample papers, and Section 6 analyzes research topics. Section 7 provides the conclusion and discussions of our findings.

2. Method and source of data

2.1 Method

Bibliometric involves the quantitative analysis of the literature of a subject domain, as represented by Bibliographic entities, such as keywords, authors and citations (Willett, 2008). The bibliographic information is conducive to understanding the scientific structure and the relationship among research fields, which is helpful in decision making in

the formation of science and technology development strategy (Sun, 2012). At present, this method has been widely applied to many fields, and simultaneously, a great amount of impressive achievements in describing the evolution of fields have been made using this method (Chen *et al.*, 2014). For example, Hoepner *et al.* (2012) analyzed the influential articles, journals, authors and institutes of environmental and ecological economics in the twenty-first century by using the method. With statistical analysis of the general situation, authors, scientific funding sources and topics of highly cited journal papers from CNKI and SSCI, this paper reflects the research actuality and developmental trend of Chinese agricultural economics from 2006 to 2015.

2.2 Source of data

For domestic Chinese sample journal papers, this paper utilizes highly cited journal papers on Agricultural Economics from CNKI[2] between 2006 and 2015 under the discipline of "Economy and Management." The selection criteria for highly cited papers is based on high-frequency thresholds. Different scholars use different methods according to their field, but two standardized methods exist. One method is based on calculation formula propoesd by D. Price, $M = 0.749\sqrt{N_{\max}}$, in which M is the high-frequency threshold, $N_{\max}$ is the highest citation frequency of academic papers in a certain period. This method is used by papers, such as Wang and Wu (2012) and Hu and Tang (2015). The other method is based on Essential Science Indicators (ESI for short), a document evaluating and analyzing tool from the US Institute for Scientific Information. The criterion of selecting highly cited papers is the top 1 percent in a certain field for a certain year, and the time period of counting citation frequency of papers is last ten years[3]. Taking the influence of publication duration on citation frequency into consideration, the second method is more widely used. Hence, this paper employs the second method. Based on the ESI method, papers with citation frequency greater than or equal to 1 in the field of "Agricultural Economics" between 2006 and 2015 have been sorted by year, and the top 1 percent in each year have been chosen as highly cited papers[4].

For English papers published by Chinese[5] scholars in the field of agricultural economics research, SSCI serves as the data resource. Over the past decade, there have been 6,799 papers published in SSCI journals in the field of agricultural economics research, including 4,742 cited papers. According to the ESI standard, only 47 highly cited papers are included and among them only 2 have Chinese scholars listed as the first author[6]. Therefore, highly cited journal papers from SSCI cannot represent influential international research publication by Chinese scholars in the field of agricultural economics. Being cited means these journal papers are socially influential. Thus, we choose the cited journal papers from SSCI as the English sample documents. In the SSCI database, the key word for subject category, time and country is, respectively, set to "Agricultural Economics & Policy," "2006-2015" and "PEOPLES R CHINA" for retrieval.

3. Distribution of sample papers and their journal sources

3.1 Annual distribution of related papers and their citation frequency

Over the past decade, Chinese agricultural economics research has started playing a larger role in the development of agricultural economics, with rapid development in quantity and quality (based on citation frequency), swift growth of related international research works, and rising social influence.

Apart from the unquotable materials (like notifications and newsletters), 695,161 papers have been published from 2006 to 2015 (with average citation frequency of 0.21) in the field of Agricultural Economics under the subset of "Economy and Management" in the database of CNKI. The quantity of papers published in the field has seen an increase from 2006 to 2013

(except for the decrease in 2014 and 2015), while related papers have seen an annual increase of 32.6 percent (1,818 pieces). Of the total number of publications, there are 483,216 papers that have not been cited, accounting for about 69.51 percent, while about 211,945 papers have been cited with the citation frequency of one or more taking up 30.49 percent. According to Table I, the proportion of cited papers has seen an annual decrease from 2006 to 2015, reflecting the influence of publishing duration upon citation frequency. However, while the quantity of cited papers during these ten years has been slowly rising in the first five years (i.e. 2006-2010), it has been decreasing slowly in the latter five years (i.e. 2011-2015). Furthermore, the number of sample papers from CNKI and the proportion in each year have shown the same pattern of change. This characteristic roughly coincides with the regular pattern that "papers are mostly cited after publishing in two to three years" (Liu and Qi, 2014).

From 2006 to 2015, SSCI journals have published 335 papers whose authors include Chinese scholars in the field of agricultural economics (with average citation frequency of 4.84). It ranks fourth following the USA (3,260), Australia (455) and German (402), and constitutes 4.93 percent of all international papers (6,799) published in the field during this period. In terms of absolute value, the number is not spectacular. But, if one looks at the past trend, there is an annual growth rate of 28.23 percent or 7.4 papers increase annually, roughly 9.38 times from 2006 to 2015. Its proportion has also seen a stable increase of 10.52 percent in 2015. Of the 335 papers published with Chinese authors, 233 or 69.5 percent are cited papers with 189 of them (81.11 percent) having Chinese scholars as the first author. The annual change in the characteristic of citation frequency is in accordance with the sample papers from CNKI; annual citation frequency decreases after peaking at about five to six years after publication (the results are shown in Table II).

3.2 Distribution of sample papers

From 2006 to 2015, there have been 2,203 highly cited Chinese journal papers in the field of "agricultural economics" from CNKI. With a total of 145,362 citations, each paper has approximately been cited 66 times on average. Regarding the distribution of the citation frequency of cited paper, three papers were cited more than 500 times, while nine papers (0.41 percent) were cited more than 300 times. In total, 362 papers (36.9 percent) were cited

Year	Number of related papers (piece)	Number or proportion of cited papers (piece or %)	Number and proportion of highly cited papers (piece or %)	Number and proportion (pieces or %) of highly cited papers with a citation frequency less than average (66 times)	Annual average citation frequency (time)
2006	55,773	22,372 (40.11)	225 (1.01)	0 (0)	124.71
2007	57,876	23,816 (41.15)	241 (1.01)	7 (2.90)	104.57
2008	63,946	25,344 (39.63)	254 (1.00)	94 (37.01)	84.84
2009	66,309	26,393 (39.80)	273 (1.03)	141 (51.65)	78.12
2010	68,795	27,332 (39.73)	276 (1.01)	189 (68.48)	63.64
2011	70,466	26,510 (37.62)	272 (1.03)	229 (84.19)	48.86
2012	77,011	23,917 (31.06)	256 (1.07)	242 (94.53)	38.65
2013	80,963	19,933 (24.62)	226 (1.13)	220 (97.35)	25.98
2014	80,069	13,445 (16.79)	152 (1.13)	151 (99.34)	15.61
2015	73,953	2,883 (3.9)	28 (0.97)	28 (100)	8.32
total	695,161	211,945 (30.49)	2,203 (1.04)	1,301 (59.06)	65.98

Notes: numbers in the parenthesis are the corresponding proportions; the numbers in the fourth and fifth row refer to the proportion of cited and highly cited papers, respectively. The reason of the numbers in the fourth row are not 1 percent exactly is that papers with same citation frequency as the top 1 percent in each year are included as the sample

Source: Statistical results of data from CNKI

Table I.
Annual distribution of related papers from CNKI and their citation frequency

Year	Number of papers published internationally (piece)	Number and proportion of papers with Chinese author (piece or %)	Total cited papers (piece)	The citation quantity and proportion (pieces or %) of papers whose first author is Chinese	Average citation frequency (time)
2006	486	8 (1.65)	8	5 (62.50)	28.8
2007	660	6 (0.91)	3	2 (33.33)	8
2008	703	12 (1.71)	12	10 (83.33)	17.3
2009	757	30 (3.96)	22	16 (53.33)	9.4
2010	626	28 (4.47)	24	18 (64.29)	7.8
2011	709	36 (5.08)	28	23 (63.89)	7.8
2012	674	49 (7.27)	41	34 (69.39)	4.9
2013	719	54 (7.51)	40	34 (62.96)	4.9
2014	752	57 (7.58)	29	25 (43.86)	2.2
2015	713	75 (10.52)	26	22 (29.33)	2.4
total	6,799	335 (4.93)	233	189 (81.11)	6.6

Note: Numbers in the parenthesis are the corresponding proportion
Source: Statistical results of data from SSCI

Table II.
Annual distribution of related papers from SSCI and their citation frequencies

for about 100 times, and 1,248 papers (56.65 percent) received citations no less than 50 times, while 1,761 papers (79.94 percent) received about 30 citations. The number of papers receiving less than 30 citations but more than 10 was 409 (18.57 percent), while 33 (1.5 percent) papers were cited less than 10 times. This suggests that majority of the Chinese sample papers in the field of agricultural economics in last ten years have received no less than 50 citations.

From 2006 to 2015, the 189 papers published in SSCI journals with Chinese lead authors in the field of agricultural economics received a total of 1,283 citations (about 6.79 citations per paper). The distribution of these papers' citation frequency is quite different from the highly cited journal papers from CNKI because of the different statistical source. There are two papers that were cited more than 50 times, which are just 1 percent of the total. And 20 papers (5.63 percent) were cited no less than 30 times, 119 papers (63 percent) were cited less than 5 times, and 57 papers (30 percent) were cited only once. The cited agricultural economics papers with Chinese lead authors in SSCI journals were mainly cited less than five times.

What is more, the cited journal paper from CNKI whose citation frequency is no less than the average level (66 times), taking 40 percent, mainly distributed in 2006-2008 (the results are shown in the fifth column of Table I). In 2006 and 2007, the cited papers from CNKI that were cited less than the average level accounted for 100 and 97 percent separately, and the percentage decreased rapidly by more than 10 percent per year from 2008 to 2012. During recent four years (from 2012 to 2015), none of the paper was cited more than 66 times. As the same as the pattern appeared in the sample papers from CNKI, the sample papers from SSCI with Chinese lead authors were cited more between 2006 and 2009. From 2012 to 2015, the citation rate per paper fell lower than the average level. In addition, the average citation frequency decreased rapidly during past decade from 28.8 to 2.4. However, unlike the distribution of highly cited journal papers from CNKI published in early three years (2006-2008), cited SSCI journal papers were mainly published in the latter three years (i.e. 2013-2015).

3.3 Distribution of journal sources

A sample of 2,203 agricultural economics papers in CNKI were collected from 478 periodicals, of which 12 journals published more than 30 highly cited papers (see Table III). In other words, at least three highly cited papers were published annually by these 12 Chinese journals between 2006 and 2015. Apart from the journals listed in Table III,

Journals from CNKI	Number (piece)	Proportion (%)	Journals of SSCI	Number (piece)	Proportion (%)
Issues in Agricultural Economy	198	8.99	*China Agricultural Economic Review*	82	43.39
Chinese Rural Economy	130	5.90	*Food Policy*	27	14.29
China Land Science	109	4.95	*Agricultural Economics*	16	8.47
Resources Science	55	2.50	*Agricultural Economics-Zemedelska Ekonomika*	14	7.41
Management World	53	2.41	*American Journal of Agricultural Economics*	12	6.35
Acta Geographical Sinica	52	2.36	*Canadian Journal of Agricultural Economics – Revue Canadienne D Agroeconomie*	11	5.82
China Population Resources and Environment	45	2.04	*Agribusiness*	7	3.70
Transactions of the Chinese Society of Agricultural Engineering	44	2.00	*Journal of Agricultural And Resource Economics*	6	3.17
Rural Economy	40	1.82	*Australian Journal of Agricultural And Resource Economics*	3	1.59
Journal of Natural Resources	39	1.77	*Review of Agricultural Economics*	3	1.59
Journal of Agrotechnical Economics	39	1.77	*Journal of Agricultural Economics*	2	1.06
China Rural Survey	31	1.41	*European Review of Agricultural Economics*	2	1.6
Other Journals (446)	1,368	62.10	*Custos E Agronegocio*	2	1.06
			Other Journals (2)	2	1.06
Total (478)	2,203	100	Total (15)	189	100

Source: Statistical results of data from CNKI and SSCI

Table III. The distribution of journal resources of sample papers

19 other Chinese journals including *Economic Research Journal*, *Progress in Geography*, *Economic Geography*, *Geographical Research*, *The Economist*, *Geographical Science* and *Chinese Agricultural Science Bulletin* published 999 highly cited papers in agricultural economics during this period, representing 45.35 percent of sample papers from CNKI[7]. In other words, the outstanding journals, which represent 6.48 percent of the sample, published about 48 percent of the influential achievements in Chinese agricultural economics research. In addition, considering the top 20 percent of the sample, there are 96 journals which published 1,621 highly cited papers, accounting for 74 percent of the sample. We also sampled 189 cited papers from 15 high-level international SSCI journals from seven countries with Chinese lead authors. Of these, eight journals, each of which has published more than five cited papers during the period, have published 174 papers with Chinese lead authors, totaling 92.06 percent of the sample (see Table III). Considering the distribution, *China Agricultural Economic Review*, *Food Policy*, and *Agricultural Economics* have not only published many more papers in agricultural economics, totaling 139 papers and accounting for 66.14 percent of the total, but also are the main sources of the more cited papers. Among papers cited more than five times, 21 papers are from *Food Policy*, 15 papers are from *China Agricultural Economic Review*, 12 papers are from *Agricultural Economics,* together accounting for 25.4 percent of the total. As shown in Table III, these three periodicals are the main platforms for disseminating Chinese scholars' views on agricultural economics to the international community.

4. Analysis of authors

4.1 Distribution of authors and analysis of core authors

For the period under review, there were 1,720 first authors of Chinese highly cited journal papers from CNKI in the field of agricultural economics. Of these, 1,466 (66.55 percent) of the first authors published one paper; 159 (14.43 percent) published two papers; 53 (7.22 percent) published three papers; 17 (3.09 percent) published four papers; 10 (2.27 percent) published five papers, and 6 (1.63 percent) published six papers. The highest number of papers published by first authors were eight and seven, respectively, published by 6 (4.18 percent) and 2 (0.64 percent) of the first authors. During this period, there were 144 different Chinese first authors of cited papers from SSCI. In total, 115 or 76.19 percent of these first authors published one paper; 20 (10.58 percent) published two papers; 6 (3.17 percent) published three papers; 2 (1.06 percent) published four papers, and 1 author published ten papers. From the above, we can see that papers with high social impact are concentrated in a small number of core authors who are both productive and influential in their research area, and their views play an anchoring role in the related fields.

Core authors refer to the collection of authors who published a certain number of papers (M) with the identity of first authors. According to Pryse's calculation formula[8] of core authors' number, the M of highly cited journal papers of agricultural economics from CNKI is 2.9, and the M of cited papers of agricultural economics from SSCI is 2.4. In our context, the core authors are authors who have published no less than 3 high social impact papers in the field of agricultural economics from 2006 to 2015.There are 96 core authors with 419 sample papers from CNKI in all, accounting for 19.2 percent of the total. The core authors of sample papers from SSCI published 36 papers, which accounts for 19.05 percent of the total. These authors include Jikun Huang with ten papers, LinHai Wu and Junfei Bai with four papers, Xian Xin, Jinxia Wang, Zhihao Zheng, Xiangping Jia and Yulian Ding with three papers. Comparing the core authors from the two kinds of sources, we found that, except for Jikun Huang, Linhai Wu and Xian Xin who have published highly cited journal papers in CNKI as the first author from 2006 to 2015, none of other core authors of cited papers from SSCI published highly cited papers in Chinese journals. To some extent, there are few Chinese scholars in agricultural economics that have had great impact at home and abroad in the recent ten years, mostly due to a lack of foreign awareness and international perspective in research for scholars at home, and language barriers. Developing agricultural economics in China would therefore require addressing these issues.

Some core authors listed in Table IV are the leaders of relevant government agencies, and the vast majorities are well-known experts in China who have made research in the field of agricultural economics for many years. They are important to the development of Chinese agricultural economics, and their research achievements play a guiding role in the field. There are 26 core authors who have published more than five highly cited papers. They belong to 12 different institutes which are as follows 8 universities (Renmin University of China, China Agricultural University, Zhejiang University, Nanjing Agricultural University, Huazhong Agricultural University, South China Agricultural University, Huazhong University of Science and Technology, and Yangzhou University), 2 research institutes (Rural Development Institute of Chinese Academy of Social Sciences, and Institute of Geographic Sciences and Natural Resources Research of Chinese Academy of Sciences), and 2 relevant government agencies (Central Rural Work Leading Group Office, and Central Finance Leading Group Office).

4.2 Analysis of authors' cooperation

In this paper, the author uses two indexes, namely, the authors' cooperation degree[9] and cooperation rate[10] to analyze author's cooperation situation. It can be seen from Tables V and VI that the sample papers show a high degree and rate of authors' cooperation.

No. less than 8 papers	7 papers	6 papers	5 papers	4 papers
Jikun Huang (8+10[a]), Yansui Liu (15), Xiangzhi Kong (15), Zuhui Huang (14), Xiwen Chen (13), Biliang Luo (10), Gucheng Li (9), Tiejun Wen (8)	Zongzhi Huang, Funing Zhong	Hongdong Guo, Jun Han, Zhonghao Qian, Hualou Long, Wei Song, Xuchu Xu	Hailin Wu (1 + 4[a]), Fang Cai, Peng Yuan, Guoqiang Cheng, Dasong Deng, Xuefeng He, Ying Zhang, Guanghui Jiang, Liyang Zhang, Zhengfeng Zhang, Fengtian Zheng	Xian Xin (1 + 3[a]), Junfei Bai (4[a]), Baiming Chen, Xiaohua Chen, Baoyu Cui, Donghang He, Dinghuan Hu, Jian Lin, Tang Yun, Jiyuan Liu, Futian Qu, Shukui Tan, Jun Hua Tang, Hengzhou Xu, Huiyuan Xue, Chengjie Yin, Wenju Yun, Rongqin Zhao, Xiaofei Zhao, Jiehong Zhou

Notes: The combination of numbers and [a] in parentheses are the number of highly cited papers from CNKI and cited papers from SSCI by the identity of the first authors. Owing to the limitation of space, 57 authors with 3 papers are not listed in the table one by one
Source: Statistical results of data from CNKI and SSCI

Table IV. Core authors of sample papers

Year	An author	Two authors	Three authors	Four authors	Five authors	No. less than six authors	Cooperation rate (%)	Cooperation degree	Total number of papers (piece)
2006	72	81	41	21	6	4	68.00	2.20	225
2007	69	94	53	17	4	4	71.37	2.20	241
2008	73	81	53	22	17	8	71.26	2.44	254
2009	60	108	58	25	15	7	78.02	2.48	273
2010	74	102	58	20	13	9	73.19	2.38	276
2011	69	82	63	30	13	15	74.63	2.60	272
2012	63	79	60	20	18	16	75.39	2.66	256
2013	62	81	31	24	16	12	72.57	2.55	226
2014	47	48	29	13	7	8	69.08	2.55	152
2015	13	9	4	0	0	2	53.57	2.32	28
合计	602	765	450	192	109	85	72.67	2.45	2,203
Highest citation frequency (times)	302	510	584	206	245	292	–	–	–
Average citation frequency (times)	63.50	67.15	66.98	61.64	56.01	51.56	–	–	–

Notes: To reflect the social impact of papers more rigorously and objectively, the average citation frequency in this table is calculated based on citation frequency which has been deducted from the self-cited frequency
Source: Statistical results of data from CNKI

Table V. Distribution of sample papers from CNKI with different quantity of authors

Table V shows that the annual author's cooperation degree of the sample papers from CNKI for the period under consideration has been above 2.2 with a small change, while the average cooperation degree in the past ten years is 2.45. The average cooperation rate of the sample is 72.67 percent. Table VI shows that the cooperation degree and rate of the sample papers from SSCI is higher in the past ten years. The average degree of cooperation is up to 3.34 and the lowest degree of cooperation is 2.75, which is still higher than the highest degree of cooperation of sample papers from CNKI during the period. The average cooperation rate is 93.12 percent, which is about 20 percentage points higher than that of sample papers from CNKI for the period; the lowest rate of cooperation is 75 percent, which is comparable with the highest level of sample papers from CNKI. In most of the sample years, the author cooperation rate is more than 90 percent, and the cooperation rate is up to

Table VI.
Distribution of sample papers with different quantity of authors

Year	1	2	3	4	5	⩾6	Cooperation rate	Cooperation degree (%)	Number and proportion of papers with foreign scholars' cooperation (pieces, %)	Total number of papers
2006	0	0	2	2	1	0	3.80	100.00	4 (80.00)	5
2007	0	0	1	1	0	0	3.50	100.00	1 (50.00)	2
2008	0	2	3	2	3	0	3.60	100.00	9 (90.00)	10
2009	4	4	3	3	1	1	2.75	75.00	8 (50.00)	16
2010	2	6	6	1	2	1	2.89	88.89	9 (50.00)	18
2011	2	7	5	4	3	2	3.30	91.30	13 (56.52)	23
2012	3	6	12	10	2	1	3.15	91.18	18 (52.94)	34
2013	1	6	11	7	8	1	3.56	97.06	16 (47.06)	34
2014	1	7	7	6	1	3	3.56	96.00	10 (40.00)	25
2015	0	2	11	6	2	2	3.48	100.00	11 (47.83)	23
Total	13	40	61	42	23	11	3.34	93.12	99 (52.38)	189
Highest cited frequency (times)	22	43	57	43	37	52	–	–	–	–
Average cited frequency(times)	5.62	5.38	5.30	7.52	8.26	11.45	–	–	–	–

Note: The number in first line is the number of authors in a paper
Source: Statistical results of data from SSCI

100 percent in 25 percent of sample years. Compared with the related studies, it can be roughly predicted that the two indexes of the sample papers are higher than those of papers from a single journal[11]. This reflects that, these characteristics – complex knowledge structure, diverse topics, interdisciplinary perspective, multidisciplinary theoretical models and research methods formed by cooperation, are conducive for improving the quality of cooperative papers, which predicts a wider social impact.

After a close analysis of the data, we found that Chinese scholars of agricultural economics attach great importance to cooperation with foreign scholars when they publish their research paper internationally. Among the 189 cited papers from SSCI, there are 99 cited papers that involve the participation of foreign scholars, accounting for 52.38 percent of the total. Scholars from 19 different countries and 94 foreign universities, colleges, and research institutes have participated 144 times, with cooperation with scholars from the US dominating (90 times), followed by Germany (10 times), the Netherlands (10 times), Canada (8 times) and Belgium (5 times). Scott Rozelle participated in cooperation as many as 30 times and Michele M. Veeman, Shida Rastegari Henneberry, Thomas Glauben, Fred Gale and Wiktor L. Adamowicz participated in more than 3 partnerships. Ten organizations participated in five or more research works, including Stanford University (24 times), The Ministry of Agriculture and Cooperatives (8 times), International Food Policy Research Institute (8 times), University of California Davis (6 times), Cornell University (6 times), Wageningen University (5 times), University of Illinois (5 times), Michigan State University (5 times), Iowa State University (5 times) and Georg-August-University of Göttingen (5 times).This reflects that international cooperation is an important method for promoting research results at home and abroad, and foreign researchers have played significant roles in promoting the development of Chinese agricultural economics research.

4.3 Analysis of authors' institutes

Analysis of authors' institutes of the sample papers can help, at the macro level, to further understand the research institutes of Chinese agricultural economics, their research strength, and their social influence to a certain degree. Based on the results of statistical analysis, we found the followings.

First, the institutes of the sample papers' authors have a certain degree of concentration; colleges, universities and relevant specialized research institutes have been the main bodies of agricultural economics research institutes. From the distribution of the first institute of the sample papers from CNKI (see Table VII), the authors of 2,203 highly cited journal papers from CNKI belong to 510 institutes, about 10 percent of them (42 institutes) published about 50 percent of the highly cited papers in CNKI. These institutes are the main research force of agricultural economics in China. Among them, 12 institutes including Renmin University of China and Nanjing Agricultural University which have published more than three highly cited journal papers from CNKI each year are considered as the high-yield institutes. In addition, the concentration characteristic of first institute is more obvious in high-level international papers (see Table VIII); first authors of the 189 cited papers from SSCI were involved with 49 institutes, all of them being universities and related research institutes. And 4 institutes with more than 10 cited papers from SSCI publish 47.09 percent of cited papers in the ten years. Among them, China Agricultural University published the most papers in SSCI journals.

Second, highly cited papers from CNKI and cited papers from SSCI usually came from universities during the past decade, and "project 985" and "project 211" schools[12] were the ones most productive. During the past decade, among sample papers from CNKI, colleges listed as first institute collectively have 1,643 papers, accounting for 74.58 percent; research institutes and other types of organizations[13] listed as first institute have 454 (20.61 percent) and 106 (4.81 percent) papers, respectively. Among all colleges, "Project 985 universities"

Number of highly cited papers	Number of first institute	Institutes (except for the second and third rows, the results of other rows are partial examples)	Proportion of institutes (%)	Subtotal of highly cited papers	Proportion of papers (%)
100 or more	3	Chinese Academy of Sciences (135), Renmin University of China (113), Nanjing Agricultural University (102)	0.59	215	9.76
30-100 (including 100)	9	Zhejiang University (81), Huazhong Agricultural University (77), China Agricultural University (72), Nanjing University (46), Chinese Academy of Social Sciences (39), Southwest University (37), Chinese Academy of Agricultural Sciences (37), South China Agricultural University	1.76	557	25.28
10-30 (including 30)	30	Zhongnan University of Economics and Law (24), Beijing Normal University (23), The State Council Development Research Center (23), Huazhong University of Science and Technology (21), Wuhan University (21), Sichuan University (20), etc.	5.88	487	22.11
1-10 (including 10)	171	State Forestry Bureau (10), Jilin Agricultural University (10), Yangzhou University (10), Xian Jiaotong University (10), CPC Central Rural Work Leading Group Office (10), Tsinghua University (9), etc.	33.53	646	29.32
1	298	Wuhan University of Technology, Xinjiang Agricultural University, Yunnan Normal University, etc.	58.43	298	13.53

Table VII.
Classification results of the first institute of highly cited journal papers from CNKI

Notes: Column 4 is the result of dividing the data in the second column by the total number of related institutes (510); the last column is the result of the fifth column of data divided by the total number of highly cited papers (2,203)
Source: Statistical results of data from CNKI

or "Project 211 colleges and universities" have been the backbones of Chinese agricultural economics research. The first authors who come from universities supported by Project 985 or Project 211 have published 1,097 highly cited papers in CNKI, accounting for 49.79 percent of the total. During the past decade, among the 49 first institutes of cited papers from SSCI whose first authors are Chinese scholars, there are 30 "Project 211 colleges and universities" (of which 15 are both supported by Project 985 and Project 211) that published a total of 122 cited papers in SSCI journals, accounting for 65 percent; 10 ordinary colleges and universities published a total of 12 cited papers in SSCI journals, only accounting for 6.3 percent. Comparing Tables VII and VIII, it can be found that the leading institutes also attach importance to the international publication of research results. To some extent, the publication in international journals promotes leading institutes to progress in the research of agricultural economics.

4.4 The regional distribution of authors[14]

From Table IX, authors of sample papers are well represented in provinces of China, except for Tibet and Hainan. Yet, those authors are mainly concentrated in the eastern and central provinces, where authors in Beijing, Jiangsu, and Zhejiang provinces produced more than half of the total publication during the period. This phenomenon is not by incident: most of Chinese research institutes of agricultural economics are located in the three provinces.

Number of cited papers	Number of first institute	Institutes (the results in last row are partial examples)	Proportion of institutes (%)	Subtotal of cited papers	Proportion of paper (%)
More than 10 (including 10)	4	Chinese Academy of Sciences (38), China Agricultural University (24), Renmin University of China (16), Nanjing Agricultural University (11)	8.16	89	47.09
5-10 (including 5)	5	Zhejiang University (8), Huazhong Agricultural University (8), Chinese Academy of Agricultural Sciences (7), Southwest University(6), Southwest University of Finance and Economics(5)	10.2	34	17.99
3-5 (including 3)	6	Beijing University (4), Shanghai Jiao tong University (4), Central University of Finance Economics (4), Jiangnan University (4), Nanjing University (3), Northwest Agriculture and Forestry University (3)	12.24	22	11.64
2	8	University of Hong Kong, Fudan University, South China Agricultural University, Northwest University, Shanghai University, Anhui University, Henan Agricultural University, Zhongkai University of Agriculture and Engineering	16.33	16	8.47
1 (partial example)	26	Tsinghua University, Wuhan University, Beijing Normal University, Sichuan University, Lanzhou University, Inner Mongolia Agricultural University, Shenyang Agricultural University, etc.	53.06	26	13.76

Notes: Column 4 is the result of dividing the data in the second column by the total number of related institutes (49); the last column is the result of the fifth column of data divided by the total number of cited papers (189)
Source: Statistical results of data from SSCI

Table VIII.
Classification results of the first institute of cited papers from SSCI

Region	Papers (piece)	Proportion (%)	Region	Papers (piece)	Proportion (%)	Region	Papers (piece)	Proportion (%)
Beijing	778 (99)	35.32 (52.38)	Liaoning	49 (2)	2.22 (1.06)	Abroad	10 (0)	0.45 (0)
Jiangsu	204 (19)	9.26 (10.05)	Jiangxi	40 (1)	1.82 (0.53)	Xinjiang	9 (1)	0.41 (0.53)
Hubei	203 (9)	9.21 (4.76)	Anhui	39 (3)	1.77 (1.59)	Guizhou	5 (0)	0.23 (0)
Zhejiang	147 (10)	6.67 (5.29)	Jilin	31 (0)	1.41 (0)	Mongolia	3 (1)	0.14 (0.53)
Guangdong	81 (5)	3.68 (2.65)	Fujian	30 (1)	1.36 (0.53)	Qinghai	3 (0)	0.14 (0)
Chongqing	77 (6)	3.5 (3.17)	Gansu	23 (1)	1.04 (0.53)	Hong Kong	2 (2)	0.09 (1.06)
Shanghai	72 (10)	3.27 (5.29)	Tianjin	22 (1)	1 (0.53)	Ningxia	1 (0)	0.05 (0)
Sichuan	67 (7)	3.04 (3.70)	Hebei	20 (0)	0.91 (0)	Macao	0 (1)	0 (0.53)
Hunan	62 (0)	2.81 (0)	Yunnan	18 (0)	0.82 (0)	Taiwan	0 (1)	0 (0.54)
Henan	60 (3)	2.72 (1.59)	Heilongjiang	12 (1)	0.54 (0.53)	Hainan	0 (0)	0 (0)
Shandong	59 (0)	2.68 (0)	Shanxi	11 (0)	0.5 (0)	Tibet	0 (0)	0 (0)
Shanxi	54 (5)	2.45 (2.65)	Guangxi	11 (0)	0.5 (0)	Total	2203 (189)	100 (100)

Note: The numbers in parentheses are the regional distribution of the first authors of cited papers from SSCI
Source: Statistical results of data from CNKI and SSCI

Table IX.
Regional distributions of sample papers' first authors

5. Analysis of scientific funds received by sample papers

A high level of research project is the foundation of high-quality academic papers (Wang and Wu, 2012). Most of the sample papers received scientific funds. Among the sample papers with fund projects from CNKI (the results are shown in Tables X and XI), these funded papers share the following characteristics.

First, both the number and the proportion of papers[15] supported by scientific funds show a rapid upward trend. Overall, 1,507 (68 percent) of the 2,203 highly cited papers received funds of different types (from a total of 2,896 funds), and, on average, each highly cited paper was funded by 1.31 different funds. The two indexes are also far higher than that of any single important journals in the field of agricultural economics[16]. So, although the relationship between highly cited papers and funding is complex, highly cited papers were funded at significantly higher rate and received more funds per paper, which still reflects the fact that funding promotes higher quality of scientific research. As the same as

Table X.
The fund sponsored condition of sample papers with fund from CNKI

Year	Highly cited papers (article)	Paper with fund (article)	Paper with fund ratio (%)	Number of funds (item)	Fund number of average paper (item)	Distribution of paper with funds (%) 1 item	2 items	3 items	4 items and above
2006	225	109	48.44	184	0.82	55.96	26.61	12.84	4.59
2007	241	132	54.77	213	0.88	56.06	30.30	9.85	3.79
2008	254	162	63.77	267	1.05	47.53	41.98	8.64	1.85
2009	273	192	70.33	370	1.36	42.19	35.42	13.54	8.85
2010	276	201	72.81	366	1.33	42.29	38.81	13.43	5.47
2011	272	206	75.74	423	1.56	38.83	30.10	22.33	8.74
2012	256	204	79.69	431	1.68	40.20	25.49	21.57	12.75
2013	226	163	72.12	355	1.57	31.29	36.20	20.25	12.27
2014	152	121	79.61	256	1.68	40.50	23.97	24.79	10.74
2015	28	17	60.71	31	1.11	52.94	17.65	23.53	5.88
Total	2,203	1,507	68.41	2,896	1.31	43.07	32.38	16.66	7.90

Source: Statistical results of data from CNKI

Table XI.
The distribution of the top ten funds which sponsored sample papers from CNKI and fund level

Fund name	Fund quantity	Ratio (%)	Fund name	Fund quantity	Ratio (%)
National Natural Science Foundation of China	513	17.72	11th Five-Year, 12th Five-Year National Science and technology support program	55	1.9
National Social Science Foundation	353	12.19	Special funds for the construction of modern agricultural industry technology system	48	1.66
The humanities and social sciences research project of Ministry of Education	153	5.28	National Science and technology support project	39	1.35
Project of knowledge innovation project of Chinese Academy of Sciences	64	2.21	Ministry of agriculture, Ministry of public welfare industry research projects, Ministry of agriculture 948 project, the Ministry of agriculture industry special projects	38	1.31
Key projects of philosophy and social sciences of the Ministry of Education	62	2.14	Ministry of land and resources for the public welfare industry research projects, Ministry of land and resources science and technology projects	38	1.31

Source: Statistical results of data from CNKI

change pattern of the number of highly cited papers, the number of papers that received funding also shows the regular pattern of rising at first, and then falling with its peak appearing in 2011. The fact that high proportion of highly cited papers received funding basically continued to rise, increasing from 48 percent in 2006 to 80 percent in 2014 with the exception of 2015, reflecting the increasing amount of scientific funds available for the promotion of agricultural economics research. The amount of funded papers in 2015 is less than those in 2006 and 2007, but the proportion of papers receiving scientific funds is higher.

Second, the number of funds increased as a whole[17]. The number of funds showed a trend of sustained growth from 2006 to 2012, which has increased from 184 in 2006 to 431 in 2012 (increasing 2.34 times); however, during the latest three years, it has declined, with the number in 2014 only about 39.13 percent higher than that in 2006. This reflects the growth of the nationally relevant scientific research expenditure and projects in recent years.

Third, funded papers mainly received one fund, but the proportion of highly cited papers from CNKI that received multiple funds slightly increased overall. In general, majority of the highly cited papers received at least one fund. They totaled 649 and accounted for 43.07 percent. As for the changing trend, the proportion of highly cited papers receiving one fund has been on a decline until 2012, while the proportion of highly cited papers that received three or more funds showed a slight rise in fluctuation overall. This phenomenon indirectly reflects the growth of relevant scientific research projects in recent years.

Fourth, funding sources are relatively concentrated. Statistical results in Table XI show that 1,363 of the 2,896 (47.1 percent) of funds from top TEN funding projects were given to highly cited papers from CNKI. Among them, there were 960 national funding projects, accounting for 70.43 percent; 339 provincial funding projects, accounting for 24.87 percent; and 64 university and research institutes-based funding projects, accounting for 0.05 percent. The top two kinds of project are the National Nature Science Foundation of China and the National Social Science Foundation of China; these two funds account for about 30 percent of the total number of the funding received by highly cited papers from CNKI. It shows that these two funds have played a leading role in the process of promoting the development of Chinese agricultural economics research.

In total, 189 sample papers from SSCI received 220 different funds, a total of 323 times. Each paper was funded by 1.7 funds on average. And National Nature Science Foundation of China and the National Social Science Foundation of China are also the main sources of funding. The numbers of cited papers from SSCI supported by these two sources were 36 and 9, respectively. Different from the high-concentration character of funding support of highly cited papers from CNKI, cited papers from SSCI display a more dispersed pattern in sources of funding received. The number of funds that sponsored more than 5 cited papers from SSCI was only 4, accounting for 1.82 percent; and 182 funds sponsored only one cited paper from SSCI, accounting for 82.73 percent. Among 220 funds, quite a few funds were from abroad, which further shows that Chinese agricultural economics scholars are more willing to work collaboratively with international scholars.

6. Analysis of research topics

Statistical analysis of the research topics of papers is helpful in grasping the major issues and direction of research. According to each paper's elements such as title, abstract, key words and research methods, we identified each sample paper's topic and category. For either highly cited journal papers from CNKI or cited papers from SSCI, empirical research papers are still dominant, outweighing the theory and discussion papers. Overall, the research subjects of sample papers have the following features (for specific distribution condition see Table XII).

First, the research topics are expanding and most of them are related to rural land, development of agricultural industry, the market and trade of agricultural products, rural

Research topic	Highly cited papers from CNKI	Cited papers from SSCI	Research topic	Highly cited papers from CNKI	Cited papers from SSCI
Rural land	*696*	7	Farmer income	39	7
Agricultural transformation and new types of agricultural development	*195*	3	Agricultural socialization service	33	0
Rural organization and system	*179*	8	Foreign economy and agriculture	28	0
Development of agricultural industry	*133*	8	Rural social problems	25	0
Market and trade of agricultural products	*115*	*25*	Rural area, agricultural economy development and structure	21	3
Rural (agricultural) labor force	*115*	*14*	Theoretical analysis and discussion	21	0
Rural industrialization and urbanization	83	2	Rural credit	19	0
Food problem	77	7	Research summary	17	1
Agricultural technology and economy, technology promotion, agricultural scientific research, etc.	57	*11*	Consumer behavior	16	*14*
Rural finance and taxation problem	57	9	Food safety	13	*23*
Sustainable development, resources and environment economy, ecological economy	50	9	Poverty problem, farmers' welfare	12	3
Rural situation and dynamic	46	10	Regional economy	7	0
Rural reform, rural development and construction	45	3	Rural politics	7	0
Rural social security	45	3	Township enterprises, rural enterprises	6	0
Farmers' cognition, willingness and behavior	42	*11*	Rural education and culture	4	6

Source: Statistical results of data from CNKI and SSCI

Table XII.
The distribution of research topics of sample papers

(agricultural) labor, consumer behavior, and food safety. And the highly cited papers from CNKI contain 30 main topics while cited papers from SSCI involve 22 main topics. Each research topic covers multiple secondary themes. The topic of rural land (including farmland and homestead), for example, covers the secondary themes of land circulation, land management, land utilization and protection, land systems, the contracted management right of rural land, land management, land finance and other. Among the top ten research topics of highly cited journal papers from CNKI, the topics of agricultural transformation and new types of agricultural development were the most secondary topics. Thus, it can be seen that sample papers from all two sources are certainly extensive in breadth and depth of research, and instructive in expanding the category of agricultural economics research.

Second, the research topics are focused. During the recent ten years, achievements in Chinese agricultural economics research at home and abroad have all focused either on agricultural product market and trade or rural (agricultural) labor, but the subfield of research topic differs in CNKI and SSCI, as highly cited papers from CNKI are more macro-oriented, while cited papers from SSCI are more micro-oriented. Table XII indicates that the six most focused upon topics of highly cited papers from CNKI are rural land,

agricultural transformation and new agricultural development, rural organization and systems, development of agricultural industry, agricultural product market and trade, and rural (agricultural) labor, all of which focus on macroscopic research and policy analysis. In SSCI, however, the six most dominant topics of cited papers are agricultural product market and trade, food security, rural (agricultural) labor, consumer behavior, farmers' cognition, willingness and behavior, agrotechnical economics, and technology promotion, which are primarily based on micro-investigation. This demonstrates the difference of major journals of agricultural economics in selecting topics, and reflects different focuses of agricultural economics research at home and abroad.

Third, the topics of highly cited papers published in Chinese journals are more macroscopic and their contents are more theoretical, while the research perspective of cited paper from SSCI is wider, focusing on application and practicality. The formation of focus topics of highly cited papers from CNKI is closely related to the practice of the three issues of agriculture, the countryside and farmers, and the implementation and advancement of relevant national policy. From 2006 to 2015, the "No. 1 Central Document"[18] has emphasized developing modern agriculture from different angles, raising farmers' income, encouraging the development of new types of agricultural management bodies, promoting urban-rural integration and innovating rural collective land system. At this stage, highly cited papers from CNKI were also mainly focused on these research issues: first, the rural land problem is a basic issue related to agricultural development and farmers' interests and rural stability, and there are many relevant conflicts and disputes in land management. China introduced many relevant legal systems to strengthen the management of rural land, and land system reforms of various forms were also carried out throughout the country. Correspondingly, the rural land problem has also been a popular but yet difficult problem; there were many related studies, and highly cited papers with a larger social influence published in all the above topics. Second, related research works on agricultural transformation and new type of agricultural development have been developed with the advancement of relevant national policies. In 2013, the "No.1 Central Document" stressed the goal to "speed up the development of modern agriculture," with one specific goal being to construct new agricultural management subjects. The concept of "family farm"[19] was first proposed in this document. And just in 2013, the number of highly cited papers about agricultural transformation and new agricultural development got to the peak with 31 articles. In CNKI, papers whose titles included "family farm" have seen rapid increase from 21 in 2012 to 577 in 2013. Third, rural organizations and systems developed steadily with the promotion of relevant national policies and practices. Farmers' Professional Cooperatives Law was formally promulgated in October 2006, and later, cooperatives developed rapidly in China under the support of this policy. Therefore, during this period, research on rural organizations and systems developed fast, with 179 related highly cited papers, and the change of annual number was small.

Cited papers from SSCI, by contrast, focus more on solving practical problems in topic selection. For example, on the topic of rural (agricultural) labors, cited papers from SSCI mainly focused on the impact of farmers' non-farm employment on crop (fruit) production, the aging degree of agricultural labors and its impact on agricultural production, and agricultural trade's influence on family farms to solve the problem of employment of agricultural labors. And highly cited papers from CNKI on this topic mainly focused on following two aspects: one aspect includes the motivation, obstacles and regional differences of China's rural labor transfer and labor surplus; the other aspect includes the employment characteristics, the influential factors of employment stability, evaluation index of employability, difficulties and countermeasure in employment of new generation migrant workers.

Fourth, from 2006 to 2015, the topic of "rural land" has always been the key issue of Chinese domestic agricultural economics research. Rural organizations and institutes and rural industrial development have already been domestically studied in depth, while the domestic research of agricultural transformation and new agricultural development, agricultural product market and trade, rural (agricultural) labor force, and food safety still need to be strengthened. In the recent ten years, however, there have emerged both commonalities and differences between the popular topics of domestic agricultural economics research and the focused topics of highly cited papers. The topic of rural land is not only a hot research topic in agricultural economics (the number of related papers summed up to 26,685 in recent ten years), but also a key issue that many scholars focused on (the highly cited papers accounting for 2.61 percent). In contrast, from 2006 to 2015, the number of papers related to rural organizations and institutes as well as agricultural industrial development has been limited, the highly cited papers of the two themes account separately for 9.44 and 6.99 percent. It shows that these two themes though were not the most popular research topics, they relatively produced high proportion of research achievements with great social influence; this explains that the academia has done a deep research in terms of the two themes. Agricultural transformation and new type of agricultural development, agricultural products market and trade, and rural (agricultural) labor force have also emerged as popular research areas in agricultural economics in recent ten years. While the number of related journals and papers in CNKI was large, the highly cited papers had a lower proportion, indicating limited achievements and social influence in these areas, and the urgent need for high-quality research works. Also, though food safety has been a hot international research topic in agricultural economics, it has not received the same attention domestically. Few papers receive great social influence and the citation rate was also the lowest among the first eight subjects listed in Table XII. It is therefore important and beneficial for Chinese scholars to do more research on the subject.

7. Conclusion and discussion

Employing the method of bibliometric analysis based on highly cited papers from CNKI and cited papers from SSCI in the area of agricultural economics research from 2006 to 2015, this paper analyzes the distributional characteristics and laws of evolution in terms of the source journals, authors, scientific funds, and research topics, to reveal the developmental trends of Chinese agricultural economics research in the recent ten years. The conclusions are as follows.

First, in the recent ten years, Chinese agricultural economics research has developed rapidly. In the process, the core authors of highly cited papers, 103 scholars, including Jikun Huang, Yansui Liu, Xiangzhi Kong, Zuhui Huang, Xiwen Chen, and Biliang Luo, published 20 percent of the highly cited papers, playing a supporting role in the development of agricultural economics research. Beijing and provinces of Hubei, Jiangsu and Zhejiang collectively form the majority of academic force of agricultural economics research. Renmin University of China, Nanjing Agricultural University and 50 other organizations (listed in Tables VII and VIII), being the high-producing units of highly cited papers from CNKI and cited papers from SSCI, are the backbone organizations in promoting the development of Chinese agricultural economics research. In total, 12 Chinese journals, such as *China Rural Survey*, *Issues in Agricultural Economy*, *Chinese Rural Economy*, and 3 international journals – *China Agricultural Economic Review*, *Food Policy*, and *Agricultural Economics*, are the main platforms of research achievements with great social influence in the area of Chinese agricultural economics research.

Second, the subjects of Chinese agricultural economics research during the recent ten years are extensive. Related Chinese and English achievements focus on researching

agricultural products market and trade as well as rural (agricultural) labor force, but there are many differences in the focuses of these two kinds of achievements. While the themes of highly cited domestic papers from CNKI are more macroscopic, the themes of cited papers from SSCI are more microscopic and focus on application and practicality. Besides the above two themes, other themes included rural land, agricultural transformation and new type of agricultural development, rural organizations and institutes, agricultural industrial development, food safety, consumer behavior, farmers' cognition, willingness and behaviors, agricultural technology economy, as well as technology promotion and scientific agricultural research. Among these themes, some traditional themes follow the pace of development. For example, the theme of rural land is a key issue and hot topic. Research on rural organizations and institutes and agricultural industrial development have already been thoroughly done. But some traditional themes fail to follow this trend. For example, research works on agricultural products market and trade as well as rural (agricultural) labor force still need to be strengthened, while some research themes, such as agricultural transformation, new type of agricultural development and food safety, are new topic formed under new situation and need to be developed. The research extrapolation of papers on these new themes is more extensive, research perspectives are more multidimensional, research boundaries are more indistinct, and the characteristics of disciplinary crossing and integration are more obvious. The domestic research works on these new themes therefore need to be strengthened urgently.

Third, the development of policies on agriculture, countryside and farmers, increase of related funding projects, and reinforcement of cooperation are the driving forces of the development of Chinese agricultural economics research in the recent ten years. Among highly cited papers from CNKI, not only have the number and percentage of funded papers rapidly increased, but also the number of funding for each paper and the total funds increased in a certain range. The National Natural Science Foundation of China and National Planning Office of Philosophy and Social Sciences both play a leading role in the process of using scientific research projects to promote the development of agricultural economics research. In addition, cooperative research has developed to a certain degree, and the rate and degree of authors' cooperation both rose as a whole; cooperation with foreign-related research institutes and scholars has also been strengthened. The international research force has had a certain role in promoting the development of Chinese agricultural economics research. Development of policies of agriculture, countryside and farmers plays an obviously guiding role in Chinese agricultural economics research. Many research achievements of agricultural economics follow the trends of policies, explaining and evaluating related policies and institutes.

Fourth, Chinese agricultural economics research should focus more on the micro level, and pay more attention to promoting international influence of related achievements. Paying more attention to the macro issues is still an important characteristic of Chinese agricultural economics research. However, based on the situation of cited papers from SSCI, it can be expected that, with the promotion of practice and depth of related research works, research and achievements with greater social influence at the micro level will increase annually. In the recent ten years, the papers published by Chinese agricultural economics scholars in journals of SSCI are not many and rare paper has a great international influence. Although the research subjects have focused on food safety and consumer behavior, there is still a long way to go in terms of catching up with the development trend of international agricultural economics research. Research at the micro level, such as farmers and consumers, should be encouraged. Research papers appearing in international journals need to be more supported so that the influence of Chinese agricultural research can be presented at the international stage to promote the overall development of the field.

Notes

1. CNKI is the leading database service provider in the domestic academic periodical fields.
2. Data for bibliography of related documents (including title, author, source journal, publishing time, funding condition, first author affiliation, keywords, self-citation frequency, citation frequency) were provided by Quantitative Evaluation of scientific literature research center of China, CNKI.
3. From Common Problems in ESI FAQ (www.thomsonscientific.com.cn/faq/esi/).
4. Time for abstracting data is February 26, 2016, and data in this paper were abstracted at the same time.
5. Considering difference in academic ecology between the Mainland China and TAIWAN of China, papers from district of "TAIWAN" have not been included for analysis.
6. Counting source for citing condition for CNKI documents includes the Full-text Database of Chinese Journals, Chinese Doctoral Dissertation Full-text Database, Chinese Master Dissertation Full-text Database, Full-text Databases of Chinese Important Conference Papers Series, Full-text Database of Chinese Academic Journal; while counting source for citing condition for SSCI documents only contains three main databases of SCI, SSCI and A&HCI, and documents from database of CCR and IC, and the countable subjects are far different from that of CNKI.
7. In the 19 journals, *China Rural Survey* is published bimonthly, *Agricultural Engineering Journal* is published semimonthly, and *Chinese Agricultural Science Bulletin* is published once every ten days, the other 16 journals are published monthly. In addition, there are four journals whose proportion of the highly cited papers is around 5 percent or more than 5 percent of the total papers published in past ten years. They and the paper proportions are as follows: *Chinese Rural Economy* (8.84 percent), *Issues in Agricultural Economy* (8.49 percent), *China Land Science* (6.8 percent) and *China Rural Survey* (4.89 percent).
8. $M = 0.749 \times \sqrt{N_{\max}}$, where $N_{\max}$ is the number of papers published by the author who has published the largest number of papers in the statistical period. Taking into account the difference between the database of CNKI and SSCI, it is more scientific to separately calculate the core authors of highly cited papers of agricultural economics from CNKI and cited papers of agricultural economics from SSCI.
9. Author cooperation degree refers to the average number of authors in each paper during a certain period.
10. Author cooperation rate is the ratio of the cooperative papers to the total papers.
11. The two indexes of *China Rural Survey* from 1995 to 2013 are 1.56 and 46.91 percent (Chen, 2014). The two indexes of Agricultural Economic Problems from 1996 to 2000 and from 2000 to 2014 are 1.58 and 35.09 percent (Yue *et al.*, 2001) and 1.82 and 53.94 percent (Duan and Chen, 2015), respectively. The two indexes of China's Rural Economy from 1995 to 1999 are 1.42 and 34.9 percent.
12. There are three basic classification nomenclatures for Chinese higher education system: Project 985, Project 211 and C-9. This is similar to the US university classification system of Tier 1 to Tier 3. 39 universities are supported by Project 985 and 117 institutions of higher education (about 6 percent) are designated as Project 211 institutions, and the 39 universities supported by Project 985 are also supported by Project 211.
13. They mainly refer to the organizations and government institutions, such as the Ministry of Agriculture and related institutions, the CPC Central Committee Leading Group Office of Rural Work and other agriculture-related administrative departments. In addition, in order to facilitate to statistics, foreign universities also were included in the "other" ranks, such as Stanford University in the USA.
14. The regions refer to areas of the first authors' first institution.

15. Ratio of papers with funds equals the number of highly cited papers sponsored by funds in a year divide the total number of highly cited papers in the same year.
16. The ratio of papers receiving funding and average number of funds per article of *China Rural Survey* were 37.19 percent and 0.59 from 1995 to 2013 (Chen, 2014); The two indexes of *Problems of Agricultural Economy* were 40.82 percent and 0.72 from 2000 to 2014 (Duan and Chen, 2015).
17. Due to newly published, the citation of papers published in 2015 were limited. Hence, the situation in 2015 can be treated as a special case.
18. The policy document is issued by the Central Committee of the Communist Party of China and the State Council every year. This is the 14th consecutive year (from 2004 to 2017) in which the document has focused on rural issues.
19. The family farm is usually defined as a type of new agricultural management subjects in which family members are the main labor force, engaging in large-scale, intensive and commercial agriculture management, with agricultural income as the main source of income for the family.

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