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Analysis of Agricultural Product Quality in China

--Based on measurement information software

Wang Xinping
School of Management
Xi'an University of Science And Technology,
Shaanxi Silk Road Quality Research Institute
Xi'an, 710054, China
e-mail: 34443679@qq.com

Ding Manli, Zhao Shuang
School of Management
Xi'an University of Science And Technology,
Shaanxi Silk Road Quality Research Institute
Xi'an, 710054, China
e-mail: 34443679@qq.com

***Abstract*—The quality of agricultural products is significant to the national economy and the people's livelihood. In this paper, a scientific knowledge map analysis was conducted on 723 articles from SCI, EI, CSSCI and Chinese core journals which are closely related to the quality of agricultural products, from aspects of keywords, institutions and authors. In order to study the hot spot, frontier and development trend of China's agricultural product quality, this paper uses literature research, qualitative analysis, the methods of information research and descriptive research and explores the number of articles, rules and their cooperation between experts and scholars who are currently studying this issue. This research founds that China paid more attention to this issue after 2002, the number of literature increased significantly and the research content became more in-depth. And they also used modern means of information technology. However, these colleges and universities which research this issue do not have the close cooperation relationship. Besides, research subjects they researched are generally concentrated on two points which are "agricultural products" and "agricultural quality". Therefore, with regard to this problem, the research subject can be extended to other directions and scholars can make a more in-depth and comprehensive research.**

Keywords-Quality of Agricultural Products; Quantitative Informationization; Scientific Knowledge Map

Looking back on the issues of agricultural product safety in China, the Melamine incident in 2008, the "poisonous leek" and the "poisonous cowpea" in Shandong and Hainan Province related to the excessive pesticide residues in 2010, have threatened the safety of consumers and caused serious negative impact. Chinese scholars have focused on the quality and safety of agricultural products and obtained a lot of valuable research results and conclusions. Li Peiwu initiated a research topic of agricultural product quality and food safety. Zheng Shaofeng from Northwest A & F University focused on the attributes and causes of agricultural product quality and safety issues. Some scholars have tried to establish a traceability system and explored food safety issues from different research aspects. However, few researchers have analysed the progress of agricultural product quality from the overall perspective by using the method of bibliometric. In this thesis, Cite Space III, a quantitative information visualization software developed by Dr. Chen Chaomei, was used to analyse the relevant literatures on the research of agricultural product quality in SCI, EI, core journals and CSSCI journals. Moreover, the hotspots, prepositions and development trends from major research institutions and mainstream researchers were discussed in this paper.

I. DATA ACQUISITION

In this thesis, SCI, EI, core journals and CSSCI journals were used as data sources for "agricultural products & quality". The time span included all the years. The search date was October 10, 2017, and 3582 documents were retrieved. The literatures with weak correlation

in the search results were excluded. Finally 723 literatures were selected as the sample, including brief information such as title, author, institution, keywords and etc.

II. RESULTS ANALYSIS

A. *Annual analysis of the literature*

As can be seen from Figure 1, Chinese scholars began to analyze the quality of agricultural products as early as in 1992, but not on a large scale. From 1992 to 2001, the number of documents published on the quality of agricultural products was basically 1 to 3 per year. China's March 15 consumer day was first celebrated in 1991, which indicated a period of China's rapid economy development. But the number of documents published between 1992 and 2001 was still rather small, at least in the field of agricultural products research. As the Ministry of Agriculture began to implement the pollution-free food program in 2002, the number of literature on the quality of agricultural products started to increase significantly. From 2002 to 2007, the annual amount of literature was about 20 to 30, which was 10 to 20 times as previous periods. Since 2008, there have been more and more literature on the quality of agricultural products. The number was as high as 60 per year from 2009 to 2012, which showed that both the scholars and the people paid great attention to the issue. The number of literature published in 2017 was less due to the search date.

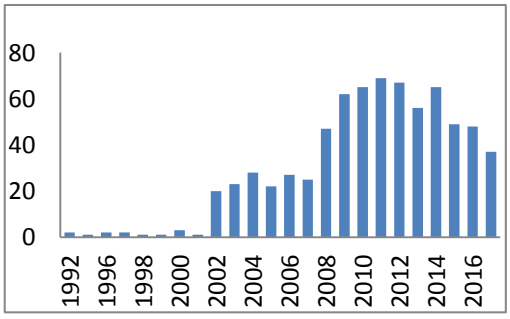

Figure 1. The annual published paper amount of the research on agricultural product quality

B. *Keywords co-occurrence evolution analysis*

As quality was mentioned several times in the report of nineteenth CPC national congress, scholars in economics and management should pay more attention to this issue, especially the quality of agricultural products. A keywords co-occurrence evolution analysis of the quality of agricultural products is helpful in reflecting the research hotspots of domestic scholars. The keywords evolution diagram shown in Figure 2, it was obtained by using the information metering software. Keywords which occurred greater than 14 times were shown in Table 1.

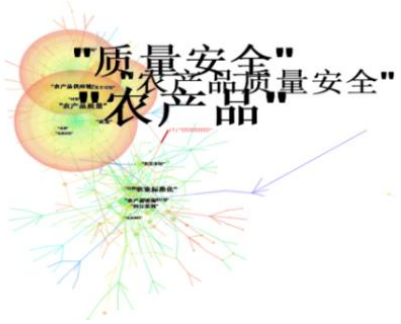

Figure 2. Co-occurrence Analysis of Key Words

TABLE I. FREQUENCY GREATER THAN 14KEYWORDS

Keywords	Central	frequency
Agricultural products	0.29	218
Quality and Safety	0.25	183
Quality and safety of agricultural products	0.45	141
Quality of agricultural products	0.15	32
Agricultural Standardization	0.34	30
Agricultural supply chain	0.07	24
Agricultural products market	0.18	22
quality	0.08	21
Routine monitoring	0.13	21
Wholesale market	0.34	19
Information asymmetry	0.05	18
Food Action Plan	0.06	17
Countermeasure	0.04	17
supply chain	0.06	17
admission to market	0.2	16
Traceability system	0.04	14
Retrospective	0.01	14
Agricultural sector	0.06	14

There were 583 keywords in the 723 articles. "Agricultural quality and safety" and "quality and safety" were the main research points which formed a larger cluster. Other keywords of lower frequency were of lager degree of dispersion from the main points. From table 1, keyword "agricultural products" is of the highest frequency and the central was higher, indicating that "agricultural products" and other keywords are in close contact. Keyword

"agricultural product quality supply chain" had second highest frequency and highest central parameter which means it has the highest contacting intensity with other keywords. Scholars pay more attention in the supply chain, information symmetry, security system, traceability system and other applications, and it is helpful to solve the actual production quality problems.

The keywords evolution was shown in the form of TIMEZONE in the visualize software as Figure 2. The research frontier and development trends of Chinese agricultural product quality research could be easily and directly observed. The main keywords of the research are changing constantly as time goes. The " quality and safety of agricultural products", "information asymmetry", "fresh product", "traceability system" "Influencing factors" and other annual research hotspots evolves constantly. The low-frequency keywords mainly consist of model, methods, including dematel method, heckman two-stage model, SD model and etc. Quantitative research methods are used more widely in the field of agricultural product quality and safety.

Years in which the high-frequency keywords first appeared were shown in Table 2.

TABLE II. YEARS IN WHICH THE KEYWORDS WITH A FREQUENCY OF MORE THAN 8 TIMES FIRST APPEARED

years	Key words
1996	Agricultural products
1998	Agricultural products market
2000	admission to market
2002	Agricultural standardization, wholesale markets, food action plans, and agricultural sectors
2003	Quality and safety, agricultural product quality and safety, agricultural product quality
2004	Information asymmetry, quality, routine monitoring
2006	Countermeasure
2007	Agricultural supply chain, supply chain
2009	Retrospective
2011	Traceability system

The research and the keywords of the quality and safety of agricultural products were relatively rare before 2002. The Ministry of Agriculture began to implement pollution-free food plan in 2002; more scholars began to pay attention to the research of agricultural products quality. Under the influence of social environment and policy impact, 2002 to 2004 was the first time period during which the high-frequency words appeared on a large scale. Since 2009, scholars have been trying to establish a traceability system to improve the quality of agricultural products.

C. Analysis of institutional cooperation network

In order to understand the contribution of the relevant institutions in the field of agricultural products quality and the cooperation between them, a scientific knowledge map analysis was conducted, and the results were presented in a table. The analytical results from the software demonstrate that there are 487 research institutions, and 156 institution-institution connections. School of Economics and Management in South China Agricultural University has published 15 articles, which is the most among other universities. China Agricultural University is behind it, having published a total of 13 articles, and it also has cooperation with Beijing Institute of Materials and other institutions. The Agricultural Product Quality and Safety Center in Ministry of Agriculture has published 9 articles, as a result from close cooperation with Beijing Academy of Agriculture and Forestry, Beijing Agricultural Information Technology Research Center and the National Agricultural Information Technology Research Center. In addition, School of Agriculture and Rural Development in Renmin University of China has published 10 articles, with the Rural Development Institute of the Chinese Academy of Social Sciences as its co-worker. From the nine organizations with more than 5 published articles, it can be seen that there are 4 universities and 5 research institutes with a maximum of 15 articles and a minimum of 6 articles.

D. Collaborative network analysis

The analytical results of relevant scholars from the software which there are 684 authors in the field. 317 of them have cooperated with each other, and 53 of them have published more than 3 articles. Qian Yongzhong from the Chinese Academy of Agricultural Sciences has the most publications of 10 articles on the quality of agricultural products. Zhang Pei has published 9 articles on the supply chain and quality and safety of agricultural products based on the National Philosophy and Social Science Fund. Yang

Xinting, Qian Jianping, Wang Fang and others are right behind them.

TABLE III. INSTITUTIONS WITH MORE THAN 5 PUBLICATIONS

mechanism	number of articles	The first publication year
South China Agricultural University	15	2011
China Agricultural University	13	2007
National Agricultural Informatization Engineering Technology Research Center	12	2007
Institute of Agricultural Quality Standards and Detection Technology, Chinese Academy of Agricultural Sciences	11	2011
Renmin University of China	10	2015
Ministry of Agriculture, Agricultural Product Quality and Safety Center	9	2006
Nanjing Agricultural College	9	2006
Institute of Agricultural Information, Chinese Academy of Agricultural Sciences	7	2009
Institute of Agricultural Economics and Development, Chinese Academy of Agricultural Sciences	6	2005

TABLE IV. AUTHORS WITH MORE THAN 5 PUBLICATIONS

Author	number of articles	The first publication year
Qianyongzhong	10	2010
Zhangbei	9	2012
Yangxinting	9	2006
Qianjianping	8	2006
Liqingjiang	7	2007
Wangfang	7	2008
Wangkeshan	6	2005
Suxin	6	2005
Chentong	6	2007
Liuyande	6	2009
Pengjianfang	5	2003
Wangmin	5	2011
Zhanglijian	5	2010
Huxinliang	5	2011
Feiwei	5	2010

Qian Yongzhong and Wang Fang have formed a simple cluster through their cooperation; Yang Xinting and Qian Jianping have worked on a retrospective system, leading to the formation of another cluster. Li Qingjiang, who has published 7 articles, is in close cooperation with Feng Zhongze.

III. CONCLUSIONS

Before 2002, there were few literatures on the quality of agricultural products in China, and the relevant research direction was also scattered. Since 2002, the number of published literature has increased, reaching the highest of 69 in 2011. In recent years, the research topics tend to focus more on current social issues and humane care, which in a way reflects that research on agricultural products has great practical significance. The fact that there are more and more documents can be a result of emergence of high-level talents into the industry, and the increasing R & D funds in recent years, which will help solve the quality of agricultural products problems better in China.

The use of information technology to improve the quality of agricultural products, the use of structural equations and other quantitative methods to carry out research has become a hot

Among the institutions which study on agricultural product quality, South China Agricultural University and China Agricultural University have published the most articles, with the national agricultural informatization engineering technology research center following them. Companies have published less articles. Industry is the actual organization which produces agricultural products.

Productive authors such as Qian Yongzhong, Zhang Pei, Yang Xinting and et al have a certain research direction. Although there are interactions between other authors, butthey are far from enough. More cooperation is highly recommended so as to improve the quality of agricultural products in China.

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