A Summary of Research on the Development of Agricultural Science and Technology Enterprises

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Abstract: First, using the bibliometric software Citespace to conduct a quantitative analysis of the relevant literature reviews of domestic and foreign agricultural science and technology enterprises, and get the current research hotspots in the academic circle. The research on agricultural science and technology enterprises is mainly summarized from the three dimensions of agricultural science and technology business incubators, industrial collaborative innovation and scientific and technological industry achievements. In the end, the current research status is discussed and prospected.

1. Introduction

China is a large agricultural country, and the issue of “agriculture, villages, and farmers” has always been a key issue for national development. In the process of modernization, the development of agricultural industry is even more important. Accelerating the implementation of the rural revitalization strategy and the urban-rural integrated development policy through agricultural technological innovation is an inevitable choice for promoting the high-quality development of China's agriculture and realizing agricultural modernization, and it is also a new opportunity for the development of agricultural enterprises. However, on the whole, the current research lacks a systematic review and metrological analysis of the research results of agricultural technology enterprises, which affects the macro and objective grasp of the research of agricultural technology enterprises. This paper uses Citespace software to analyze the literature related to agricultural enterprises from 1994 to 2020, and selects three popular research perspectives to sort out.

2. Research Hotspots of Agricultural Science and Technology Enterprises

2.1 Quantitative Characterization of Literature

The number of annual publications is an important indicator to measure the development trend of agricultural science and technology enterprises. According to Figure 1, the number of papers published in the three years from 1994 to 1996 approached zero, and then surged to 12 in 1997. There was no significant difference in the number of papers published in the next five years until 2002. The volume of 26 articles was a flashpoint and a turning point, and the number of articles published in the following three years showed a downward trend. However, in 2009, it began to receive more scholars' attention and attention, and it reached a new high in the publication of articles. In the following years, it has ups and downs to 4 articles so far this year.

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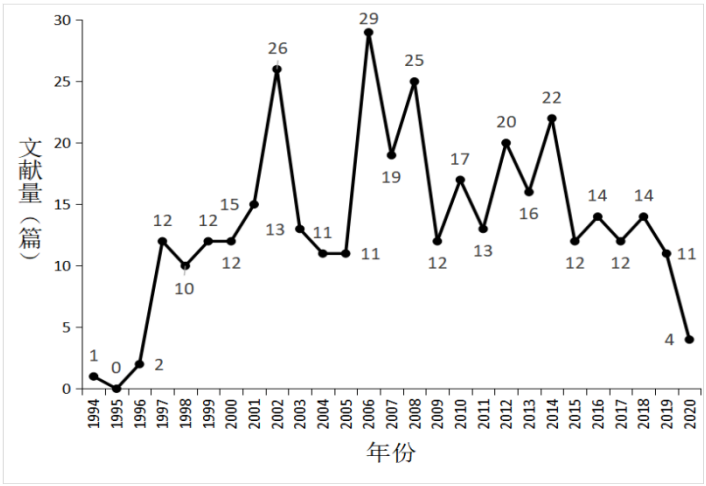

Fig.1 Distribution Map of Research Literature of Agricultural Science and Technology Enterprises by Age

2.2 Research Hotspots of Agricultural Science and Technology Enterprises

It can be seen from the clustering that there are quite a lot researches in the current academic circles in agricultural technology incubators, industrial transformation, collaborative innovation, technological innovation, and financial management. It can be seen from Figure 2 that the order starts from 0. The smaller the number, the more keywords are included in the cluster. Modularity represents the value of the clustering module (Q value). It is generally believed that when Q is greater than 0.3, it means that the cluster structure is significant. From the figure, it can be seen that the modularity Q value is 0.8652, indicating that the analyzed keyword clustering structure is more significant. Silhouette represents the average contour value of the cluster (S value). It is generally believed that when the S value is greater than 0.5, the clustering is reasonable. When the S value is greater than 0.7, the clustering is convincing. It can be found from Figure 2 that the silhouette value is 0.7016, which can indicate that the analyzed cluster has a certain degree of credibility.

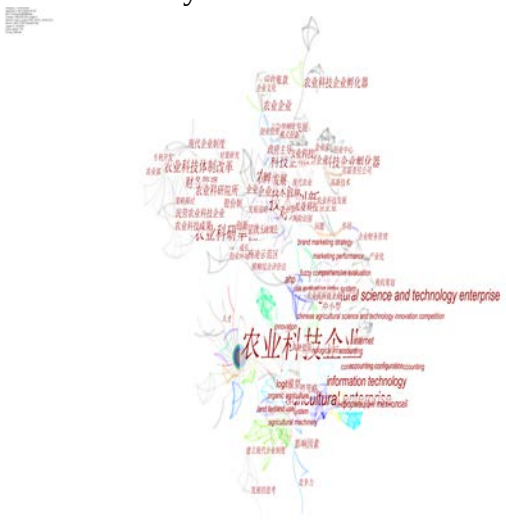

Fig.2 Keyword Clustering Map of Agricultural Technology Enterprises

3. Summary of Research Content

3.1 Summary of Research on Agricultural Technology Business Incubators

3.1.1 Research on the Definition of the Concept of Agricultural Technology Business Incubators

Domestic and foreign research results on business incubators are relatively abundant, but research on agricultural technology business incubators is relatively lacking. Scholars' understanding of the meaning of agricultural technology business incubators can be roughly divided into two categories. One type of scholars holds an organon viewpoint, and the other type of scholars holds a histography viewpoint.

The concept organon believes that agricultural technology business incubators are tools to promote enterprise innovation and development. Zhao Zhuo et al. believe that agricultural technology business incubators can cultivate technology-based enterprises and entrepreneurs in the agricultural field [1]. The view histography believes that agricultural technology business incubators are organizations that provide services for agricultural technology companies. Li Zhi believes that agricultural technology business incubators are different from other business incubators. It is a new higher-level organizational form that has emerged at a certain stage of incubator development [2].

3.1.2 Research on the Function of Agricultural Technology Business Incubators

The role of domestic and foreign governments in agricultural science and technology business incubators is clearly different. In most cases in China, the leading institutions directly under the direct supervision of the government manage the specific work of business incubators at the initial stage and after completion. It has both compatibility and integration. However, in the United States and European countries, the government hardly adopts this method, but after the establishment of the enterprise, the government will withdraw from the previous method and play its role in an indirect way.

Scholars have different views on the function of agricultural technology business incubators in society. In terms of services provided, Li Jun et al. believe that in addition to basic services provided by agricultural technology business incubators, agricultural technology business incubators will focus on providing more comprehensive and professional value-added services. Not only provide external consulting-style management, but also provide services such as market research and development, and corporate management systems.

In terms of the purpose of existence, Wu Wenqing et al. believe that its purpose is to provide assistance to small agricultural science and technology enterprises during their start-up period [3]. Wu Yumin et al. believe that agricultural technology incubators are mainly for accelerating the transformation of agricultural scientific and technological achievements [4].

3.1.3 Research on the Operating Mechanism of Agricultural Technology Business Incubators

In order to fully organically link the many elements that make up the development of agricultural technology business incubators and enable them to coordinate and play their roles, it is particularly important to build an effective operating mechanism.

In terms of operation methods, Zhang Yasheng believe that the operation method of extensive cooperation with other incubator organizations should be adopted, and the resources and markets with local characteristics should be fully utilized to minimize administrative intervention [5].

In terms of operating stage, Hu Linlin et al. divided the growth process of China's incubators into an infancy growth stage, a diversified growth stage, and a global growth stage [6].

3.2 A Review of Research on the Transformation of Agricultural Scientific and Technological Achievements

Agricultural scientific and technological achievements are an important carrier of science and technology. Increasing its conversion rate is of great significance to the strategy of “prospering agriculture with science and technology”. The author classified the relevant literature from 1999 to August 2020 and selected the main subjects and media platforms involved in the internal process of transformation, as well as the government and promotion models involved in the overall transformation, as the review objects according to the publication frequency of relevant documents on each topic.

3.2.1 The Internal Process of Agricultural Scientific and Technological Achievements Transformation

Zhang Yue et al. (2018) believe that the internal process of agricultural technology transformation mainly involves two parties: research institutes, institutions of higher learning and other R&D supply entities, agricultural enterprises, trusteeship organizations, farmers and other application demand entities. The two entities use results to transform services. Media platforms such as platforms and achievement incubators carry out transfer and transformation activities [7].

A large number of scholars have conducted in-depth research on the collaborative innovation model of agricultural industry, university and research, and established this model to guide the marketization of scientific research and development of agricultural colleges and universities, reduce the operational risks of agricultural enterprises, and increase farmers' scientific and technological reserves. At the same time, it is hoped that a more complete media platform can fully play the role of connecting the two ends of supply and demand and promoting the coordinated development of agricultural production, education and research.

3.2.2 The Overall Layout of the Transformation of Agricultural Scientific and Technological Achievements

Focus on the overall level of the transformation of agricultural scientific and technological achievements. It has the characteristics of long cycle, high risk and wide influence. It requires the government to play a protective role to increase the “transparency” of the transformation market. Give full play to leverage and formulate relevant preferential policies to reduce the risk of the transformation process. Play a bridge role to guide close cooperation between industry, university and research, and accelerate the transfer of results [8].

Our country's agricultural science and technology extension model is continuously improved and innovated with the in-depth research. Wang Jimin et al. (2009) divided the existing main promotion models into 4 major types and 14 models [9].

Table 1 the Main Models of Agricultural Science and Technology Promotion in China

Promotion agency-led	Government technology project-led	Market-led	Third-party-led
1.Agricultural technology promotion station model	2.Science & technology 110 model 3.Science & technology demonstration park model 4.Experts courtyard model 5.Scientific special commissioner model 6.Science & technology into home model 7.Bring scientific knowledge to rural areas model 8.Combination of “television, telephone and computer” model 9.farm school model 10.Science & technology coordinator model	11.Enterprise industrialization (company + farmer) model 12.Technical association or professional cooperation organization model	13.Heilongjiang Academy of Agricultural Sciences agricultural science and technology cooperation and co-construction between academies and counties model 14.”Taihang Mountain Road” Model of Hebei Agricultural University

Jie Xiaowen and Cheng Junfeng (2009) proposed four new models: chain promotion model, promotion effectiveness contracting model, “distribution board” promotion model, and park demonstration promotion model on the basis of comparison with several developed countries [29]. Xu Bin et al. (2010) constructed a transformation model based on chain symbiosis organization on the basis of a brief description of the symbiosis environment [10].

How to accelerate the transformation of agricultural scientific and technological achievements has always been the core issue of related research. The existing literature has made many useful

explorations around this core from multiple angles. Based on the characteristics of long transformation cycle, high risk and wide impact of agricultural scientific and technological achievements, the author believes that it is also a topic that needs more attention to deeply research on how to reduce the operational risks of agricultural technology enterprises and give full play to their main role.

3.3 A Review of Collaborative Innovation in Agricultural Science and Technology

In 2014, *State Council's Several Opinions on Improving and Strengthening the Management of Central Financial Research Projects and Funds* (issued by State Council (2014) No. 11) proposed that in the field of agricultural scientific research and technology, it is necessary to better implement collaborative innovation.

Nowadays, domestic academic circles pay more and more attention to collaborative innovation issues. Luo Ying et.al. believe that the agricultural science and technology collaborative innovation system in the national science and technology system is an important part and the driving force for the development of agricultural modernization in China [11].

Throughout the research of various domestic scholars, collaborative innovation in agricultural science and technology involves diversified subjects. It is the key to effective integration of multiple subjects and innovation resources.

3.3.1 Research on the Development Status and Improvement Countermeasures of Agricultural Science and Technology Collaborative Innovation

Based on the current practice, according to the effect of different regions, showing different development status of agricultural science and technology collaborative innovation. In addition, there are many problems in the country's practice. The problems faced by each region are different. It is urgent to consider and improve the results of each region's practice.

From the perspective of various localities, the Academy of Agricultural Sciences in Jiangsu, a large agricultural province, took the lead in launching a five-system project based on local technical requirements. It established a clear and reasonable management system to ensure efficient operation, and finally achieved the initial completion of crop straw collection and storage and transport. It used the technical system to research the effects of new rice varieties with good quality. However, there are still problems such as insufficient integration of scientific and technological resources, insufficient original innovation capabilities, and unreasonable use of funds. In the face of the above situation, Wu Changfu et.al. proposed four improvement measures such as building an innovative team and improving the management system [12].

Starting from the collaborative innovation mechanism itself, there are major issues in the agricultural science and technology collaborative innovation system and mechanism, such as the closed and separated innovation subjects, the low conversion rate of scientific and technological achievements, the difficulty of evaluating the cost-effectiveness of scientific and technological investment, and the lack of resource sharing at the local level. Peng Sixi discussed the construction of the mechanism from the aspects such as integration of resources, the transformation of results and the promotion of services based on the national conditions, which formed a new management strategy [13].

3.3.2 Promote Research on Collaborative Innovation of Agricultural Science and Technology

Various scholars have made a lot of analysis and research to promote the collaborative innovation of agricultural science and technology, combined with the practice of various regions in China and foreign experience, and come to different views. Zhao Lianming believes that the state should increase investment in manpower, material resources, and funds to support the development of agricultural science and technology. Related departments should increase integration and coordinated development [14]. They should combine with the basic national conditions of China's agriculture for reference from outside experience, help the rapid development of China's agriculture with bold innovation and enhance the national economy [15].

From the perspective of comprehensive research scholars, the government's leading position in

the collaborative innovation of agricultural science and technology is obvious. The long-term stable support of the government is the backing of the collaborative innovation of agricultural science and technology. An excellent innovation team is another guarantee. A resource sharing platform is a material carrier for integrating resources. A high-quality management platform enables scientific researchers to obtain resources more efficiently.

4. Conclusion and Expectation

Through the analysis of the above literature review, it is learned that after years of research, the growth of agricultural science and technology enterprises has been discussed in depth both in theory and practice. However, the research on collaborative innovation of agricultural science and technology enterprises in China is not particularly outstanding. Agricultural scientific and technological innovation is an inexhaustible source and driving force for the development of agricultural economy. The historical mission of building a new socialist countryside has given higher requirements of the times for agricultural scientific and technological innovation. This inspires us to a certain extent and can also increase the depth of research. Compared with other types of enterprises, agricultural science and technology enterprises still have a lot of research space, such as equity structure, ecological theory, complex systems and other cutting-edge research concepts, which should be research directions worthy of in-depth exploration.

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