



# Research Progress and Trends of Feed Business Management in China—Based Bibliometric Study

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**Abstract.** Feed industry in China's national economy occupies a very important position. Since the reform and opening up, the rapid development of China's feed industry, into the new century, due to the rapid growth in the number of feed enterprises in China, causing excess capacity and vicious competition, and a series of environmental protection, safety, and product quality issues continue to emerge. At the same time, research on organizational change, refinement management, and cost reduction and efficiency improvement of feed enterprises has attracted academic attention. This paper adopts bibliometric and visual mapping methods to collect literature data about feed enterprise management from CNKI literature base from 2000 to 2022, and analyze them from various aspects such as distribution of authors and research institutions, categorization of literature disciplines, research hotspots, and research frontiers. The conclusions are: the research development on feed enterprise management is highly related to the development history of feed enterprises in China; the research hotspots in this field have different focuses at different stages, showing a transition from macro to micro, from overall strategy to process optimization; the future research mainly focuses on human resources, internal control and other refined management models of feed enterprises.

**Keywords:** feed companies · research advances · trends · bibliometrics

## 1 Introduction

People's food is the sky, all along, the feed industry has played an important role in promoting the development of breeding industry, prosperous rural economy, improving people's life and building a new socialist countryside, and the feed industry occupies a very important position in China's national economy. Before the reform and opening up, China's feed industry was still in a fragmented and chaotic state, feed production was mostly self-sufficient, and the professional quality of employees was low. 1979, along with the spring breeze of reform, Zhengda Kangdi Group was formally established in China, which is a large enterprise specializing in feed production, whether in terms of production scale, technical equipment, or personnel quality, the enterprise is the leader in the industry, which It also marks the modern development stage of China's feed industry.

With the deepening of reform and the continuous improvement of people's living standards, the Party Central Committee and the State Council attached great importance to the development of the feed industry, Comrade Deng Xiaoping proposed to vigorously develop the feed industry, and the "1984–2000 National Feed Industry Development Program" was officially promulgated in 1984, which very clearly incorporated the feed industry into the national economic development plan. After this, under the support and guidance of national policies, China's feed industry has achieved an impressive development rate. In 2000, the output value of China's feed processing industry was 185.5 billion yuan, ranking 16th among 38 industrial industries in the national statistics, with the second largest production scale in the world, and basically built a complete feed industry system [1].

Entering the new century, China's feed industry has entered a new stage of development. After the early high-speed development, China's feed industry began to face new development problems, the rapid growth in the number of enterprises in the industry led to overcapacity and vicious competition, rising costs, falling profits, small and medium-sized enterprises face survival bottlenecks, in addition, a series of environmental protection, safety, and product quality issues continue to emerge. In this context, the state has increased the feed industry rectification efforts, and gradually establish a complete feed quality monitoring system, China's feed industry has also begun to enter the structure optimization, quality improvement, steady development of integration and upgrading stage. According to the Feed Industry Association, the number of feed enterprises in China in 2019 was 5016, which has been reduced by more than 2/3 compared to the historical maximum of 15518 in 2005 [2]. In this development process, China has formed a more complete standardization system of China's feed industry, including national, industry and local standards, and China's feed enterprises have entered a benign development track. At the same time, research on organizational changes, refinement of management, and cost reduction and efficiency of feed enterprises has attracted academic attention.

In general, the majority of the research on the feed industry is on technology applications, but there is a lack of literature on the management of feed enterprises, and there is a gap in the research on the management of feed enterprises using the bibliometric analysis method. The literature research method refers to the method of collecting, identifying and organizing the literature, and forming a scientific understanding of the facts through the study of the literature. This research method is used mainly by searching, organizing and researching the literature after the research topic has been identified, culminating in a literature review to state one's opinion in order to support the subsequent overall research work - it helps the researcher to gain a systematic and comprehensive understanding of the field of study in order to explain the research content and form the findings. By conducting an econometric analysis of the literature on feed business management, this paper aims to answer the following questions: (1) What are the overall research dynamics in this research area? (2) What are the research hotspots in feed business management in China at different stages of development? (3) Where are the future research themes and directions? (4) What are the shortcomings in the research area? Combing the research literature on feed enterprise management through bibliometric analysis method helps to grasp the typical experiences and key issues in the

management and innovation development of feed enterprises in China, provides important knowledge maps about core authors, research hotspots and research frontiers, and provides valuable literature knowledge guidelines for the transformation and upgrading of feed enterprises and the formulation of development strategies.

## 2 Literature Review

In this paper, we use Citespace software to measure and visualize the relevant literature, which is an information visualization software developed by Chaomei Chen based on the theory of citation analysis, combining citation analysis theory and pathfinder network scaling (PF-NET), and extending the application of author co-citation analysis by using Java language. The data of this study were obtained from the CNKI journal literature database of China Knowledge Network, and a literature search was conducted with the subject term “feed enterprises & management” from 2000 to 2022. 899 pieces of literature data were obtained after the search, and through sorting and screening, irrelevant literature, non-research literature and duplicate literature were removed. A total of 852 valid documents were obtained.

The period of this paper for the selected research literature is from the beginning of 2000 to the present. From the analysis of the literature published in each year, the research on the management of feed enterprises can be divided into 3 stages. The first stage is from 2000 to 2008, which can be called the beginning and development stage, from 8 articles in 2000 to 53 articles in 2008, with a general upward trend of related research literature. The second stage is 2009 - 2019, with a decreasing trend of research on feed business management, with 24 articles in 2009 and only 19 articles in 2019. The third phase is from 2020 to the present, with the number of literature jumping to 93 in 2020, 87 in 2021, and 36 from January to July 2022. The third stage is the period before and after the development of China’s 14th Five-Year Plan, and it is also a critical period for the transformation and upgrading of China’s livestock industry, and it is during this period that the management research of feed enterprises is heating up significantly and becoming a hot spot for research.

## 3 Distribution of Authors and Research Institutions

The results generated by the software to analyze the issuing institutions, Network presents the results:  $N = 560$ ,  $E = 78$  i.e. the number of nodes is 560, while the number of connections is 78, the number of connections is much lower than the number of nodes, and the graph density is 0.005. It can be seen that the connection and distribution of research institutions are not close enough, the cross-institutional cooperation is relatively small, and no long-term stable cooperative research team is formed.

As show in Table 1, it can be seen that the overall geographical distribution of research institutions shows a balanced distribution of north and south. By 2020, there will be a total of 10 provinces with feed production exceeding 10 million tons in China, namely Shandong, Guangdong, Liaoning, Guangxi, Jiangsu, Hebei, Henan, Sichuan, Hubei, and Hunan, and the corresponding geographic locations of research institutions are mostly in the above regions. The top-ranking institutions are mainly located in Henan, Jiangxi,

Hunan, Xinjiang, Yunnan and other places, which are also important markets for the consumption of feed products in China. From the attribute of research institutions, the issuing institutions are mostly industry authorities and enterprises, and relatively few universities and research institutes. This reflects that the research on feed enterprise management is mainly applied, such as marketing strategy, quality management, safety management and cost control, which mostly starts from the practical problems in the production and operation of feed enterprises and lacks theoretical generalization and sublimation.

According to the contribution ranking of the number of publications within the search, Yang Hui and team from the Bureau of Quality and Technical Supervision in Xinyang City, Henan Province, published the largest number of literature with a total of 36 articles, and the authors of this team mainly studied the improvement of production management mode and optimization of operational processes of feed enterprises from the perspective of quality management [3–5]. Hu Wenhui and members of the team published 18 articles, and the authors of this team mainly studied the market behavior and marketing strategies of feed enterprises from the perspective of the industry market [6, 7]. The peak period of publications by Yang Liujiang's team from Beijing Kego Dabe Nong Feed Co., Ltd. Was concentrated in 2007 and 2008, and the team mainly researched on the fine management and cost control methods of feed enterprises from the perspective of production management [8, 9]. As a representative of university research institutions, Wu Zhonghua's team from Jiangxi University of Finance and Economics has published a total of 12 papers on a wide range of topics, including financial management, marketing, and human resource management in feed enterprises and many other topics [10, 11]. Jiang Faquan's team from Azure Biological Group in Qingdao, Shandong Province,

**Table 1.** The volume of articles issued by research institutions

Research institution	Number of articles/unit	Percentage of articles issued
Xinyang City, Henan Province, Quality and Technical Supervision Bureau	27	2.71%
Jiangxi University of Finance and Economics	6	0.60%
Hunan Provincial Feed Industry Office	6	0.60%
Ninth Agricultural Division, Tacheng, Xinjiang	5	0.50%
Wenshan State Animal Husbandry Bureau, Yunnan Province	5	0.50%
China Feed Industry Association Information Center	5	0.50%
Beijing Fuying Agricultural Science Information Center	5	0.50%
Tongwei Group	5	0.50%
Beijing KeGao DabeNong Feed Co.	5	0.50%

has studied the competitive strategy of feed enterprises mainly from the perspective of market innovation and technological innovation [12, 13].

## 4 Literature Subject Distribution

As show in Table 2, a disciplinary classification of the retrieved literature revealed that the field of agricultural economics accounted for 84.98% of the total. The 2nd and 3rd ranked disciplines are enterprise economics and accounting, accounting for 15.61% and 15.26%, respectively, with research topics focusing on the refined management methods and tools of feed enterprises. With the development of information technology and the transformation and upgrading of feed enterprises, the scope of related research has been expanded, showing the trend of multidisciplinary cross-fertilization, especially the application of information technology in the management of feed enterprises, there are 17 related literature, among which the majority of financial management applications, a total of 8, and other literature mainly related to law, trade economy, industrial economy, and safety science and disaster Other literature is mainly related to law, trade economy, industrial economy, and safety science and disaster prevention and control, etc. Recent representative literature has involved cutting-edge information technologies such as cloud computing, big data and block chain, for example, Chen Chen and Zhang Yao Yin proposed the role and application methods of block chain technology in the financial management of feed enterprises [14], Wang Jing believed that feed enterprises should consider the full application of big data in the construction of information technology platform and use big data to guide the scientific development of feed enterprises [15], Zhao Shuang and Li Ping proposed to fully integrate cloud computing technology fully into the accounting management of feed enterprises to achieve financial information sharing among various departments in the enterprise operation and management [16]. It can be seen that with the development of information technology, the organization and operation management mode of feed enterprises are changing accordingly, and the research of feed enterprises in information management is gaining attention from the academic community.

## 5 Research Hot Spots

A research hot spot refers to a specific academic field topic that has attracted the attention of many scholars at a certain period of time. Research hot spots about feed management can be obtained by cluster analysis and high-frequency keyword analysis, and the identification of research hot spots helps subsequent researchers to grasp the key research content of this academic field [17].

The research hot spots were analyzed using keyword clustering of the schizophrenic literature. According to the results of the run, as show in Table 3, the clustering centers mainly include: ①feed enterprises, important keywords include feed enterprises, financial management, human resource management and quality management, etc.; ②feed safety, important keywords include compound feed, feed management, feed ingredients and quality management, etc.; ③feed processing, important keywords include feed products, management systems, sales channels and production sites, etc.; ④animal husbandry

**Table 2.** Distribution of literature disciplines

Subject Area	Number of articles issued	Percentage of
Agricultural Economics	724	84.98%
Business Economics	133	15.61%
Accounting	130	15.26%
Animal Husbandry and Animal Medicine	82	9.62%
Macroeconomic Management and Sustainable Development	33	3.87%
Computer Software and Computer Applications	17	2.00%
Administrative Law and Local Legal System	17	2.00%
Trade Economics	12	1.41%
Industrial Economics	12	1.41%
Safety Science and Disaster Prevention	7	0.82%

and veterinary medicine, important keywords include keywords include feed industry, animal special nutrition, veterinary products and livestock products, etc.; ⑤ pig enterprises, important keywords include cost management, small and medium-sized enterprises, pig enterprises and pig farm management, etc.; ⑥ management strategy, important keywords include family business, management strategy, early stage of business and market competition, etc.; ⑦ management level, important keywords include internal control, inventory management, performance management and talent fault, etc.; ⑧ cleanliness and hygiene, and important keywords include concentrated feed, raw material procurement, cleanliness and hygiene and sensory inspection. Other clustering keywords include cost control and quality control, etc.

Since 2000, China's feed industry has gradually moved from the traditional operation mode to the path of high-quality development, and a number of large enterprises have emerged to lead the development of the industry. With the increasing attention to food quality and safety issues, as well as environmental protection and safety problems, the state has also increased its efforts to rectify the feed industry, and the Chinese feed industry has entered the stage of integration and upgrading. Through the analysis of clustering keywords, it can be seen that the research perspective of feed enterprise management fits the development process of feed industry, and the research selection is rich, but it mainly involves the research of enterprise micro-management level, such as enterprise organization, production process, cost and quality control and other refinement management methods and modes, but there is a lack of theoretical guidance with universality.

In order to better study the trend of hot spot evolution of feed enterprise management, the software was used to analyze the whole research history by 3 stages, and to obtain the frequency of keyword co-occurrence and intermediary centrality metric for each stage.

(1) In the initial stage, from 2000 to 2008, the research focused on the internal management and market development of feed enterprises. 2000 to 2008 was a period of

rapid development of China's feed industry, and a large number of feed enterprises grew up rapidly, but in general, it was still in a rough development stage, and more problems were exposed. Problems related to the internal refinement of feed enterprises, management, customer and market channel development, etc. have attracted more academic attention.

- (2) In the intermediate stage, from 2009 to 2019, new problems have emerged after the rapid development of feed enterprises in China in the early stage. With the increasing attention of the state to food safety issues as well as environmental protection and safety problems, especially from the end of 2013, the state increased its efforts to investigate and rectify the agriculture and animal husbandry industry, and a large number of feed enterprises were ordered to rectify and shut down because of environmental substandard and safety potential problems. This phase of research focuses on the financial management of feed enterprises, feed product safety and related model benchmarking enterprises.

In the near-term stage, from 2020 to the present, under the influence of factors such as rising prices of upstream feed raw materials, fluctuating demand in the downstream breeding industry, and rising competitive pressure in the industry, more and more capable enterprises are shifting to feed production on a larger scale, and small and medium-sized feed producers are gradually withdrawing from the market. Large feed enterprises are continuously carrying out technological innovation and model innovation, while extending to the upstream raw material cultivation and trade link, as well as to the downstream breeding link, slaughtering and deep processing link, to enhance the whole industry chain service capability [18]. Research at this stage has focused on human resource management, cost control, and innovative models such as sharing economy in feed enterprises. Pig enterprises (26) Management strategy (23) Management level (22) Cleanliness and hygiene (20).

**Table 3.** Keyword clustering analysis table of cited literature

Feed enterprises (75)		Feed safety (50)		Feed processing (32)		Animal husbandry and veterinary medicine (31)	
Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords
85	Feed Business	16	Matching feed	23	Feed Products	14	Feed Industry
19	Financial Management	10	Feed Safety	4	Feed Processing	5	Animal nutrition
11	Human Resources	9	Feed Management	3	Management System	4	Veterinary Animal Husbandry
4	Feed Quality	8	Feed ingredients	3	Sales Channel	3	Veterinary Products
4	Quality Management	4	Raw Material Quality	2	Production site	2	People's Government
4	Incentive mechanism	4	Quality Management	2	Communication Channels	2	Livestock and poultry products
3	Pelleting Equipment	3	Special rectification	2	Channel Management	2	Application Software
3	Management Model	3	Production License	2	Tariff Quota	2	Five in One
2	Business Status	2	Rural revitalization	1	Cross-pollution	1	Monitoring Management
2	Quantitative Management	2	Inspection and quarantine	1	Foreign contamination	1	Failure rate
Pig enterprises (26)		Management strategy(23)		Management level(22)		Cleanliness and hygiene(20)	
Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords
8	Cost Management	13	Feed Industry	10	Business Management	9	Feed concentrate
6	Small and medium-sized enterprises	5	Family Business	6	Internal Control	9	Raw material sourcing
4	Pig farming enterprises	4	Management Strategy	3	Inventory Management	4	Single feed
3	New situation	3	Early stage of business	3	Management Level	3	Cleanliness and hygiene

*(continued)*



**Table 3.** (continued)

Feed enterprises (75)		Feed safety (50)		Feed processing (32)		Animal husbandry and veterinary medicine (31)	
Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords	Frequency of co-occurrence	Keywords
3	Pig farm management	2	Market Competition	2	Management System	3	Sensory inspection
2	Business Model	2	Private Business	2	Operating Activities	2	Raw material inventory
2	Wen's Group	2	Business Philosophy	2	Performance Management	2	Online procurement
2	Control System	2	E-commerce	2	Talent Disruption	2	Monitoring records
2	Pig production	2	Private Economy	2	Communication Costs	2	Joint procurement
2	Warehouse Management	1	Outward appearance	2	Growth Process	2	Health indicators

## 6 Conclusion

This paper adopts biometric research method to comb through the journal literature of CNKI database from 2000–2022, and conducts econometric analysis research in terms of the distribution of literature quantity in chronological order, distribution of authors and research institutions, distribution of literature disciplines, research hot spots and their dynamic evolutionary trends, and co-citation burst intensity of research frontiers, etc. The following conclusions are obtained:

- (1) Research development on feed enterprise management is highly related to the development history of feed enterprises in China. 1979, when Zhengda Kangdi Group was founded in China, China's modern feed industry started its development journey, and then developed rapidly, forming a more complete feed industry system by 2000. After 2000, China's feed enterprises began to move towards the road of high-quality development with optimized structure and fine management, and research on the focus of research on feed enterprise management has also undergone a transition from macro to micro and from overall strategy to process optimization [19].
- (2) Research on the management of feed enterprises. The research directions of core authors and teams have their own focus, but in general, the topics are scattered, the literature with research depth is lacking, the absolute academic influence in the field of feed enterprise management research has not been formed, the connection and distribution of research institutions are not close enough, the cross-institutional cooperation is relatively small, and no long-term stable cooperative research team has been formed. From the viewpoint of the attributes of research institutions, most of the issuing institutions are industry departments and enterprises, while universities and research institutes are relatively few.

- (3) The research hot spots in this field have their own focus at different stages. 2000, when China's feed industry system was initially established, more problems were exposed, and more academic attention was drawn to issues related to the internal refinement of feed enterprises' management, customers and market channel development, etc. After 2009, with the increasing national attention to food safety issues and the emergence of environmental protection and safety issues, feed enterprises began to pay attention to food safety and product quality. Feed enterprises began to pay attention to food safety and product quality issues, relevant research hot spots also changed. By 2020, the uncertainty of upstream raw material prices and demand markets will intensify, and research will focus on human resource management, cost control, and innovation models such as the sharing economy in feed enterprises.

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