

A Review of Research on Planting Agriculture Insurance Based on Bibliometrics and Visualization Analysis

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Received: 11 March 2024; **Accepted:** 11 April 2024; **Published:** 15 May 2024

Abstract:

In order to further understand the research evolution of planting agriculture insurance, bibliometrics was used to visualize and statistically analyze the literature related to planting agriculture insurance in the Web of Science core database from 2015 to 2024. The results show that: (1) from the overall development, the research field mainly focuses on business and ecological environment and other related disciplines. The central contributing countries are the United States and China. (2) From the point of view of research hotspots, the early research mainly focuses on the design of agricultural insurance and the improvement and development of agricultural insurance subsidy policies. In recent years, with the further promotion of plantation insurance, the study of plantation insurance consumer behavior has become a new research hotspot in this field. Through the above research, we have systematically identified the development trend of agricultural insurance for planting, revealed the research frontiers and hotspots in this field, and provided references for the further application and development of energy-value theory in the future.

Keywords:

Agriculture Insurance, Bibliometrics, Citespace, Research Trends

1. Introduction

Agriculture is the foundation of economic and social development. However, because of its weakness and the specificity of the production process, it faces many risks, such as nature, market, technology, and policy, and the sustainable development of agriculture is seriously constrained. Agricultural insurance, with the function of risk dispersion and loss compensation, is an effective tool for agricultural risk management. Governments increasingly value it, and it has gradually become an important policy tool to support agricultural development in various countries.

At the same time, with the outbreak of the new crown epidemic in 2020, all walks of life have been affected by the impact of the epidemic, resulting in substantial economic losses. However, crops planted in agriculture, due to their unique

characteristics, are mainly affected by climate, compared with other industries, which are relatively less affected by the epidemic. In recent years, the development of planting agriculture has received more and more attention from scholars. As an effective means of dispersing agricultural risks and safeguarding agricultural production, it is crucial for governments to understand the research overview of agricultural insurance and grasp the mainstream development trend of agricultural insurance to formulate relevant policies for developing the agricultural economy.

At present, scholars' research on agricultural insurance has been expanding from the theoretical analysis of agricultural insurance function and market failure to the practical discussion of agricultural insurance policy and business model to the empirical research of agricultural insurance product innovation, insurance policy micro-responses, and economic environment effects, etc., the research theories and methodologies are becoming more and more in-depth, and a large number of theoretical and empirical results have been achieved. In this paper, based on the research papers related to the field of planting agriculture insurance in the core collection database of Web of Science, with the help of the professional bibliometric tool Citespace, we visualize and analyze the number of articles, authors, institutions, countries, keywords, and construct the knowledge map of planting agriculture insurance, and explore the research hotspots and frontiers in the field of international agricultural insurance, to provide the best solution for the future agricultural insurance. The knowledge map of planting agriculture insurance was constructed to explore the hotspots and frontiers of international agricultural insurance and to provide knowledge support for the in-depth study of agricultural insurance in the future.

2. Data and Methodology

Bibliometrics is an econometric research methodology that statistically analyzes existing literature and is usually used to analyze publications in a specific field quantitatively [1]. The main categories of information analyzed in bibliometrics are authors, keywords, references, journals, countries, institutions, and trends in specific fields [2]. Bibliometrics originates in the quantitative study of literature that emerged at the beginning of the 20th century, and since then, bibliometric-based literature analysis has been widely used in academic research [3]. Bibliometric graphical and visual studies can be managed with the help of computer technology. Chen (2006) emphasized that graphical visual studies based on co-citation analysis can provide more information and make the data more comprehensive [4]. In addition, this approach can help researchers identify the latest developments in a particular field and predict the possible direction of the field[5]. Co-citation analysis suggests that any new theory comes from an existing theory, and two articles are defined as having a co-citation relationship if they are cited in one or more articles at the same time; their proximity to each other is called the degree of co-citation, which is calculated by the number of citations [4].

Based on the above theory, this paper adopts a bibliometric approach to study the literature related to planting agriculture insurance published from 2015 to 2024.

2.1. Data sources

In this study, we used the Web of Science as a database. It provides access to the most critical scientific and technological research areas and is often considered an

ideal data source for bibliometric investigations. The data used in this study was retrieved on February 1, 2024, with the following search strategy:

with TI=(agriculture insurance)) OR TI=(crop insurance)) OR TI=(breeding insurance)) OR TI=(forest insurance)) OR TI=(yield insurance), language as English. The type of literature is Article, and the period is from January 1, 2015, to February 1, 2024. SCI-EXPANDED and SSCI databases were selected for searching. A total of 411 pieces of literature were retrieved. After filtering and eliminating those with low relevance to agricultural insurance of the same cultivation type, 271 representative pieces of literature were finally selected as the data source of this study.

2.2. Research methods

First, the time allocation and country allocation of agricultural insurance research papers are analyzed through the “analysis results” in WOS; second, the scientific knowledge graph method based on citation analysis, co-word analysis, and information visualization technology is used. The downloaded data was visually analyzed using CiteSpace 6.3.R1 software, and countries, institutions, authors, and keywords were sorted and analyzed to generate co-occurrence maps and keyword mutation maps to transform the research hot spots and development trends of planting agricultural insurance. Among them, research Hot spots are represented at the bottom of the keyword collinear map, and research and development trends are represented at the bottom of the keyword mutation map.

3. Research Findings and Analysis

3.1. Analysis of the number of published articles

The number of published articles is the most basic literature measurement indicator. By analyzing the annual number of published articles, the change in research popularity in a field can be judged. The higher the annual number of published articles, the higher the popularity of research in the field. As shown in Figure 1, the overall number of published articles showed an upward trend from 2015 to 2020. The number of published articles increased from 25 in 2015 to 41 in 2020. Among them, 2020 showed a rapid growth trend, with the number of literature publications being 41, which is the highest value of annual publication volume from 2015 to 2024. Notably, the ratio of published articles in the past five years is as high as 54.6% (148/271), indicating that agricultural insurance for planting has been a relatively hot research topic in recent years, and research has developed rapidly.

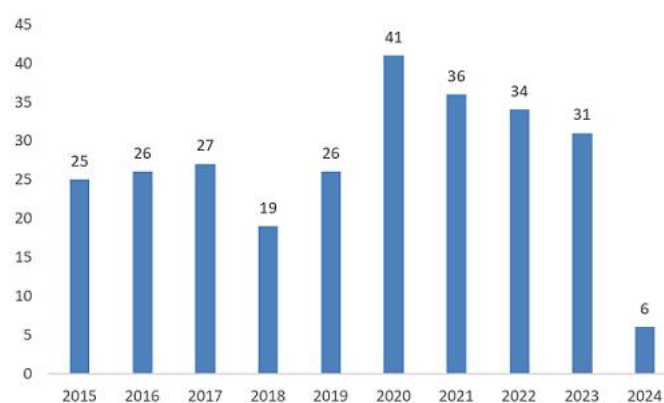


Figure 1. Annual number of communications, 2015-2024.

3.2. Authors' analysis

Based on the database analysis results from 2012 to 2024, a total of 186 authors published 271 articles, and Table 1 lists the top 10 authors with more publications, each with more than 5 articles.

Table 1. Top 10 authors in terms of publications, 2015-2024.

Author	Number	Author	Number
Goodwin BK	11	Wang K	7
Rejesus RM	9	Feng HL	6
Liu Y	8	Porth L	5
Yu JS	8	Ye T	5
Hennessy DA	7	Zheng XY	5

The number of publications by the top 10 authors totaled 71, accounting for 26.2% of the 271 articles, which is a high degree of share. The distribution of the collaboration network shows that research groups have emerged in this area of research, and some patterns of collaboration between these top authors can also be seen in Figure 2, where four collaborative groups can be found, represented by nodes linked by lines. The size of the nodes indicates the number of articles, while the lines indicate the collaborative relationships. One of the more prominent ones is Goodwin BK, which has 11 articles. This team is also the largest collaborative network in this author's collaboration network analysis.



Figure 2. Author co-citation network mapping.

3.3. Country analysis

In terms of country distribution, from 2015 to February 2024, a total of 67 countries worldwide have published influential literature in the field of planting agriculture insurance. Among them, the top 10 countries in terms of the number of publications and their share of publications are shown in Figure 3. It can be seen that the United States has the most publications, 120 articles, accounting for 44% of the total, much higher than other countries, showing that the United States has a much higher degree of research in this field than other countries; followed by China, 66 articles, accounting for 24% of the total, indicating that China attaches great importance to the research related to agricultural insurance; in which the United States and China published 68% (186/271) of the total number of articles, indicating that the two countries are very concerned about the development of planting agriculture insurance. Development is very concerning.

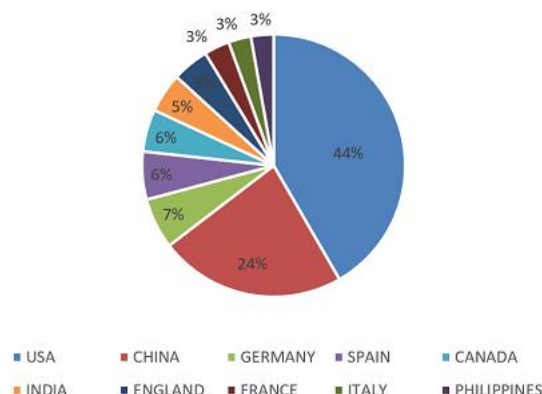


Figure 3. Country distribution of published literature.

3.4. Keyword Analysis

Keywords can provide information about the core content of an article, while emergent keywords (frequently quoted over time) can indicate cutting-edge topics. Keyword co-occurrence and clustering of the data through CiteSpace yielded the results shown in Figure 4, where the top 10 high-frequency and high-centrality keywords are extracted from the keyword co-occurrence graph. There are 278 nodes in the keyword mapping, 762 connecting lines, the network density is 0.0198, the clustering module value $Q=0.5729>0.3$, and the clustering average profile value $S=0.805>0.7$. The network is closely connected, the clustering structure is significant, and the clustering results are convincing, indicating that although the research topics in planting agriculture insurance are closely connected, the research of different topics is distinctive and has a relatively clear distinction. Table 2 lists the top 10 high-frequency and high-centrality keywords, and the selected keywords were modified twice to ensure the comprehensiveness of keyword information. First, keywords with the same meaning, such as crop and agricultural insurance, were combined. Second, keywords not related to the research direction, as seen in Table 2, the top three keywords that ranked high frequency and high centrality are crop insurance, risk, and climate change.

Observing the knowledge map of keyword co-occurrence clustering, it is found that the 10 clusters are roughly divided into the following five areas: agricultural insurance protection research, agricultural insurance policy research, agricultural insurance risk management research, agricultural insurance impact on sustainable development research, and agricultural insurance consumer object consumption behavior research.

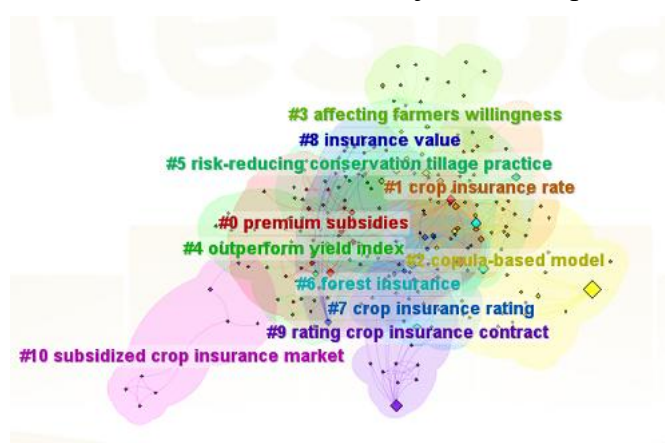


Figure 4. Keyword clustering network map.

Table 2. Top 10 high-frequency and high-centrality keywords in planting agriculture insurance research.

NO.	High frequency keywords		High centrality keywords	
	Keyword	Frequency	Keyword	Centrality
1	crop insurance	121	risk	0.22
2	risk	56	climate change	0.21
3	climate change	42	demand	0.2
4	moral hazard	42	crop insurance	0.18
5	demand	36	moral hazard	0.12
6	index insurance	28	agriculture	0.12
7	agriculture	27	model	0.11
8	impacts	22	management	0.11
9	agriculture insurance	20	adaptation	0.11
10	risk management	20	basis risk	0.11

As an essential tool for literature content mining, “Citation Burst” refers to a keyword (node) with a sudden increase in frequency of use during a specific period, indicating that researchers highly valued the keyword then. Citation Burst is used to detect the emergence of dynamic concepts and potential research questions in a field, which is suitable for examining the emerging trends and sudden changes in the development of a discipline and reflecting the active or cutting-edge research nodes. In order to further explore the preface hotspots in the field of planting agriculture insurance, Citespace was used to conduct keyword emergence analysis based on keyword co-occurrence, and the results are shown in Figure 5; the keyword with the highest emergence intensity in history is “management,” with an emergence intensity of 2.46, and the start emergence time was in 2015 and the end time in 2015 and ended in 2016.

In addition, through the emergence analysis, we can also find the mainstream research direction in planting agriculture insurance in different periods. 2015-2016, keywords such as “management” and “derivatives” maintain high emergence intensity because, since 2014, developing countries have been using the keywords “management” and “derivatives” in the field of agricultural insurance. Intensity: As developing countries began establishing agricultural insurance subsidy policies in 2014, the feasibility analysis and policy recommendations of agricultural insurance subsidy policies were the hot research topics. From 2016 to 2020, the keywords “reinsurance,” “agriculture risk,” and “asymmetric information” attracted a new round of attention. Many theoretical and empirical studies have found that agricultural insurance is characterized by high risk, high payout, and high cost, and it faces the threat of systematic risk and possible catastrophe risk. With the increase in the frequency of extreme weather due to global warming, the stability of planting agricultural insurance has been threatened to a great extent, so how to reduce agricultural insurance risk so that the long-term stability of agricultural insurance has become a key research direction in the academic community. During this period, academics have put forward a variety of mechanisms for dispersing and transferring the risk of agricultural insurance operations, such as through the construction of reinsurance, the discovery of risk bonds, and the establishment of catastrophe risk funds, to guarantee the stability of agricultural insurance operation and promote its development towards a virtuous cycle. Finally, as can be seen from the figure, since 2022, agricultural insurance consumer behavior has gradually become a new research hotspot, and “farmers” and “heteroscedasticity” have become a new research direction in academia.

Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2015 - 2024
management	2015	2.46	2015	2016	
derivatives	2015	1.65	2015	2016	
reinsurance	2016	1.81	2016	2017	
agricultural risk	2015	1.85	2017	2018	
risk	2015	1.8	2017	2018	
asymmetric information	2018	1.82	2018	2020	
agricultural insurance	2015	2.41	2022	2024	
farmers	2020	1.98	2022	2024	
heteroscedasticity	2022	1.73	2022	2024	
temperature	2022	1.73	2022	2024	

Figure 5. Keywords for planting agriculture insurance with the Strongest Citation Bursts.

4. Discussion

4.1. Agricultural insurance research on planting is getting more and more attention from the academia

The number of academic research papers can reflect the development status of a specific research field and its trend. From the point of view of the annual number of papers issued, the number of papers issued from 2015 to 2020 continued to rise and reached its peak in 2020; this trend may be related to the further expansion of the world's population in recent years, the governments of various countries are increasingly emphasizing the increase in the demand for food, and agriculture. In addition, the emergence of the new crown epidemic in 2020 has had a great impact on all walks of life; due to the new crown virus's strong ability to spread, strong pathogenicity, and rapid progression of the disease, governments have taken the management of closure and control of the residents home office, factories shut down, which is a great impediment to the development of the manufacturing industry and the service industry, and at the same time, due to the increasing means of prevention and control, import and export commodities have increased the number of sterilization, the import and export commodities have been sterilized and tested, which has slowed down the speed of customs clearance and caused a decline in the volume of international import and export trade, which has caused significant damage to the economies of various countries. While agricultural production is mainly affected by climate change, the impact of market and social factors is relatively small, and compared with other industries, it is less affected by the epidemic. Moreover, at the same time, the sealing and control means adopted by the governments of various countries after the outbreak of the New Crown Epidemic have further enhanced the residents' awareness of and demand for the purchase of stored food so that agriculture has been given great importance since the outbreak of the New Crown Epidemic at the end of 2019. As an essential part of agriculture, planting agricultural insurance has also received more and more attention and research from scholars. Therefore, from 2020 to 2024, the number of relevant articles published in this field remains high, although it is lower than in 2020.

4.2. Consumer behavior research has gradually become a new research hotspot in the field of planting agricultural insurance

From the keyword emergence, it can be seen that the research hotspots in 2015-2017 were mainly centered on empirical research on some specific issues in

agricultural insurance practice, while from 2018 to the present, the research issues about agricultural insurance are gradually associated with climate change. At the same time, the frequency of the appearance of the willingness to pay, claims, claims preparation, and risk control is also increasingly high. This changing trend may be because, in recent years, there have been more and more catastrophe-type climates caused by global warming, which have caused significant damage to agricultural development. The claim expenses of agricultural insurance have become bigger and bigger, so the claim expenses and risk control have been paid attention to. At the same time, with the increase in farmers' education and insurance awareness, coupled with the fact that since 2014, the topic of agricultural insurance subsidy policy has been highly concern by academics, and a large number of excellent research results have emerged, which has provided a significant boost to the promotion of planting agricultural insurance, and the willingness of farmers to purchase agricultural insurance for risk transfer is increasing, so the research on the consumer behavior of planting agricultural insurance has attracted the attention of scholars..

4.3. The relationship between planting agricultural insurance and sustainable development has been emphasized

In recent years, the number of extreme weather caused by climate change has been increasing, which has caused significant damage to the world's nature, economy, and society, which has made the concept of sustainable development accepted and emphasized by more and more people, so scholars have also introduced sustainable development into the study of planting agricultural insurance.

From the ranking of high-frequency keywords, it can be seen that “crop insurance,” “risk,” and “climate change” are in the top three, which indicates that the relationship between climate change and crop insurance research has always been a hot topic in the field of planting agriculture insurance. This shows that the research relationship between climate change and crop insurance has always been a hot topic in plantation insurance. From the analysis of keyword emergence in Chapter 3 of this paper, it can be seen that in the research on the relationship between climate change and crop insurance, how to transfer the risk generated by climate change through agricultural insurance so that the long-term stable operation of agricultural insurance is the focus of the research direction of the academic community. Therefore, risk management is a crucial research topic for the sustainable development of agricultural insurance, and effective risk management measures are conducive to promoting the sustainable development of agricultural insurance.

In the keyword cluster analysis, the keywords in cluster 5 are crop insurance, farm heterogeneity, conservation practice adoption, leveraging federal crop insurance, agricultural green total factor productivity, risk-reducing conservation tillage practice, index-based crop insurance, environmental externalities, and actual production history. As "agricultural green total factor productivity" is an essential indicator of sustainable development, what are the ways crop insurance affects agricultural green total factor productivity, and what are the implications of its impact on agricultural green total factor productivity for sustainable development? What are the implications for sustainable development? These questions may become new research topics.

5. Conclusions

A total of 271 research literature on planting agriculture insurance published between 2015 and 2024 were analyzed in this study, and the main findings are as follows.

First, the overall trend of the number of articles published in the research literature on plantation-based agricultural insurance from 2015 to 2020 is upward, reaching the highest annual number of articles in 2020.

Second, the United States and China contribute the most to this field, with a 68% (186/271) share of the articles issued by the two countries.

Third, through keyword clustering analysis, it is found that the research hotspots in the related field are mainly divided into five parts, which are agricultural insurance protection research, agricultural insurance policy research, agricultural insurance risk management research, agricultural insurance impact on sustainable development research, and agricultural insurance consumer target consumption behavior research.

Fourth, through keyword clustering analysis and emergence analysis, it is found that agricultural insurance consumer behavior has gradually become a new research hotspot, and “farmers,” “willingness to pay,” and “determinants” have become new research directions in academia.

In addition, predicting the relationship between agricultural insurance and sustainable development will become a new research trend in the future. As mentioned in section 4.3 of this paper, the sustainability issues in agricultural insurance in the early days were often focused on the sustainable operation of agricultural insurance. However, now scholars have combined the study of planting agriculture insurance with essential indicators in the field of sustainable development, so it is speculated that in the future, what are how will agricultural insurance affect the world’s sustainable development and what will the favorable or unfavorable impacts on sustainable development? These questions may become new research topics.

This study has the following limitations. First, CiteSpace’s ability to predict future research trends is limited, and it can only speculate on future research trends through basic analytical methods at present, so the use of big data analytics and other more accurate statistical software may be considered in future research to predict research trends in plantation-based agricultural insurance. Secondly, the information provided by Web of Science and CiteSpace is only the abstract rather than the whole article, so this may lead to the loss of some critical details. Finally, the current study is still in the initial stage, and there is still a need to adopt a variety of analytical methods and analytical perspectives to analyze the relationship between the nodes in more depth. All of these limitations can be addressed in further research in the future.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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