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Review

Exploring Current Status and Evolutionary Trends on the Paid Use of State-Owned Forest Resources in China: A Bibliometric Perspective

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Abstract: State-owned forest resources occupy an important position in China, and the development of their paid use will help to improve the economic benefits of these resources. For this study, 451 journal documents involving the paid use of state-owned forest resources in the CNKI database of China from 2008 to 2021 were selected as samples. Combining qualitative reviews with quantitative analysis, statistical analysis software was used as an analytical tool. The knowledge maps can be visualized by cluster analysis, multidimensional scaling (MDS), and co-occurrence network analysis. The change laws of this research in the time dimension were obtained using developing trend analysis. The results are as follows: 1. The number of research documents on the paid use of state-owned forest resources is increasing. 2. The core authors account for 29.27%; the research impact is relatively scattered. 3. Research institutions are primarily colleges and universities. 4. The support of provincially funded projects accounts for the highest proportion. 5. There is a relatively stable number of journals in this research field. *Forestry Economy*, *Green Science and Technology* and *China Forestry Economy* are the top three journals in terms of citation impact. 6. The existing research topics mainly focus on the development status of paid use, forest tourism and forest health, and the under-forestry economy (under-forestry planting, breeding, and product processing). 7. The intermediary centralities of state-owned forest farms and under-forestry economy are the highest, followed by forest tourism and forest experience, etc. With time and the promulgation of policies, the research focus in this field has gradually shifted from forest assets and forestry economics to ecotourism and forest health, and research on forest carbon sequestration is a technical branch worthy of attention in the future.

Keywords: state-owned forest resources; paid use; bibliometric analysis; co-occurrence network

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1. Introduction

The purpose of the paid use of state-owned forest resources is to carry out research on forest tourism, forest science education, forest experience, the under-forest economy and economic forest, and timber forest construction, utilizing leasing and franchise right transfer, which is performed to ensure that the ownership of state-owned forest resources remains unchanged. In 2017, the United Nations (UN) approved The UN Strategic Plan for Forests 2017–2030 following The UN Forests Instrument [1,2]. It is proposed to enhance the economic, social, and environmental benefits of forests, improve forest-based livelihoods, and contribute to economic development. The implementation of this document is critical to the 2030 Agenda for Sustainable Development [3]. In 2017, China promulgated the Guiding Opinions on the Reform of the System for the Paid Use of Natural Resource Assets Owned by the Whole People, which proposed to establish a system for the paid use of natural resource assets owned by the people with clear property rights, abundant powers, perfect rules, effective supervision, and the implementation of rights and interests [4].

Forest resources provide a series of tangible and intangible services for human beings, such as water conservation, forest recreation, and forest science education [5]. According to the Global Forest Resources Assessment 2020 issued by the Food and Agriculture Organization of the United Nations, the global forest area for paid use is as follows: around 1.15 billion hectares of forests worldwide were mainly used for the production of wood and non-timber forest products, and 186 million hectares of forests were designated for social services, such as recreation, tourism, educational research, and cultural and spiritual heritage protection. Since 2010, forest designated for this purpose has grown by 186,000 hectares per year [6]. The forest resource area in China ranked fifth in the world, with a forest area of 220.446 million hectares, and a forest stock of 17.56 billion cubic meters, in 2020 [6]. The area of state-owned forest resources in China was 84.366 million hectares, accounting for 38.66%, and the stock of these resources was 10.123 billion cubic meters, accounting for 59.34% [7]. It can be seen that state-owned forest resources occupy an important position in China. In 2020, China promulgated the policy documents related to state-owned forest resources. It pointed out that the system for the paid use of forest resources should be improved and the price mechanism of forest resources should be innovated and improved [8]. In 2021, the government of China pointed out that it was important to establish and improve the property rights system of natural resource assets while improving the system for the paid use of forest resources.

This is a critical period for the reform of the paid use of China's state-owned forest resources. A systematic review and a summary of the literature in this field are of practical significance for scientifically inspiring future research and reform practices. The paid use of state-owned forest resources is closely related to sustainable forest management. Sustainable management has different degrees of impact on economic, ecological, and social benefits by aggregating various commodities and services of different natures in forest management [9,10]. Paid use can improve the economic and social benefits of a forest ecosystem, and improve the economic conditions of those who rely on forests for a living. researchers can evaluate the economic benefits of symbiosis in the forestry industry through an optimization model [11]. In addition, the paid use is related to property rights and forest livelihoods. Effective institutional property rights can weaken the "Tragedy of the Commons" [12]. Combined with institutional economics, forest property rights, and the Sustainable Livelihood Framework (SLF), the mechanism of the interaction between forest property rights and forest livelihoods in paid use can be explored [13]. Moreover, a Contract Management Responsibility System (CMR) can be implemented in state-owned forest areas, which can significantly increase the income of forest-based households [14,15].

There are multiple stakeholders in the management of paid forest use: not only the state, forestry-related departments, and residents but also local communities, processing companies, and tourism-related associations. Combining information technology with forest management can better serve the multiple stakeholders of forests [16,17]. Using a balance sheet of natural resources to more clearly understand the general situation of forest resources and the economic benefits they bring, to provide methodological support for government supervision [18]. Forest tourism is a common method employed that involves the paid use of forest resources. Based on natural forest management practices, investigating tourists' preferences for changes in forest resources can evaluate the recreational value of paid use of forest resources [19]. Under the goals of carbon peaking and carbon neutrality, the economic benefits generated by forest carbon sequestration are an indispensable part of paid use [20].

Bibliometric analysis is a new method of evaluating research plans. It analyzes scientific research activities through indicators representing output [21,22] and records human knowledge research in the form of quantitative documents [23,24]. Papers are not only an important carrier of scientific research results but also an important clue providing insight into the development of scientific knowledge [25–27]. Most of the existing review studies are mainly qualitative. For this study, 451 journal documents involving the paid use of state-owned forest resources in the CNKI database of China from 2008 to 2021 were used

as samples. This study combines qualitative reviews with quantitative analysis. Firstly, the basic feature of the general statistics, authors, funding, and other contents were analyzed. Secondly, software was used to analyze cluster analysis, multidimensional scaling (MDS), co-occurrence network analysis, and developing trend analysis. The following software was used: BICOMB (2.02, CHINA MEDICAL UNIVERSITY, Beijing, China), SPSS (23.0, International Business Machines Corporation, New York, NY, USA), UCINET (6.0, University of California, San Francisco, CA, USA), and CiteSpace (5.8.R3, Drexel University, Philadelphia, PA, USA) [28–31]. Thirdly, content analysis was carried out based on documents. The workflow is summarized in Figure 1. This visualizes the scientific knowledge map of the research on the paid use of state-owned forest resources and the changes in the time dimension of related research. Categorizing the research status of the paid use of state-owned forest resources in China could promote the sustainable and efficient use of state-owned forest resources, and guarantee national forest resource ownership. It is important to implement a process of sustainable development.

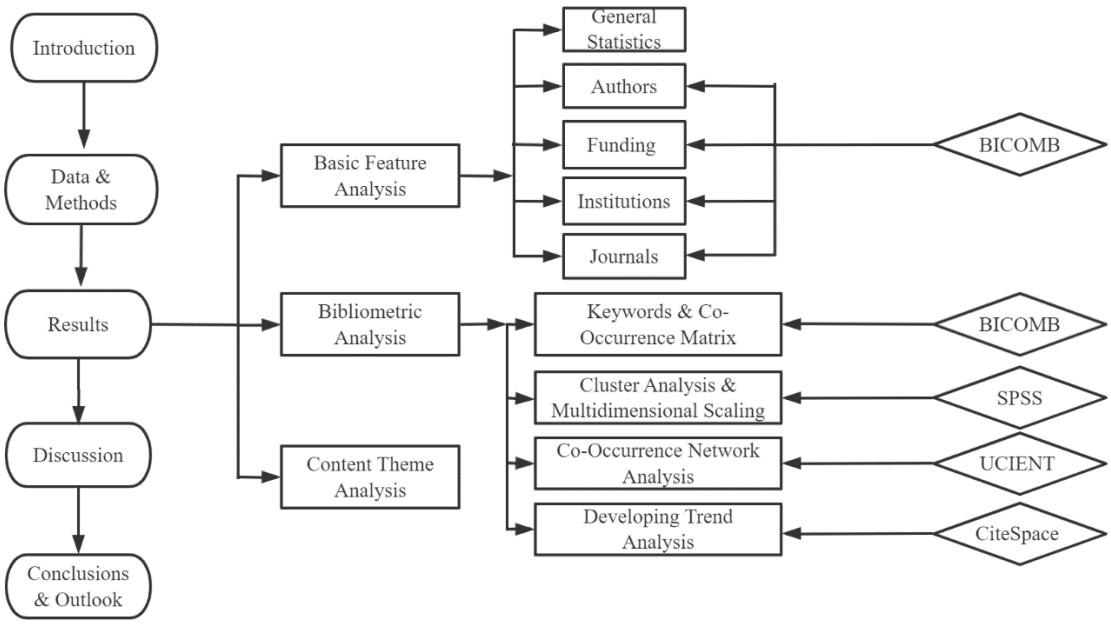

Figure 1. Workflow chart.

2. Data Sources and Methods

2.1. Data Sources

The sample data of this study come from the CNKI database. The 17th National Congress of China, which "comprehensively promoted the reform of forest rights", was taken as the time node. The retrieval time was limited from 1 January 2008 to 31 December 2021. When searching for papers, papers were limited to topics that included "paid use of state-owned forest resources", "state-owned forest capitalization", and "forest health and state-owned forests". A total of 612 papers were retrieved. Considering the problems of parameter setting and paper format inconsistency, when extracting data from different types of papers, to ensure the quality of the sample papers, the papers were limited to journal documents in CNKI during document retrieval. The interviews and conference notice documents were excluded. Papers with low relevance and no keywords were also excluded. Finally, 451 sample documents were obtained.

2.2. Methodology

This study adopts a research method combining review and measurement. Firstly, it analyzes the characteristics of the number of papers, the core authors, the finding, the institutions, and the journals. Secondly, the research status and hot spots of the samples

were visually analyzed. Thirdly, BICOMB was used to conduct word frequency statistics for high-frequency keywords and to construct a co-occurrence matrix and a dissimilarity matrix [28]. SPSS was used for cluster analysis and multidimensional scaling of the matrix. Fourthly, the UCINET visualization tool NetDraw (2.084, University of California, San Francisco, CA, USA) was used to analyze the keyword co-occurrence network [29], and CiteSpace was used to take the time factor into account [30,31]. The internal relationship and frontier prospects of relevant research were explored with the help of keyword timeline visualization and detection of burst words. Finally, according to the statistical results, combined with the actual connotation of the subject words, the sample papers are classified and summarized. The specific data processing is shown in Figure 2. Moreover, typical papers from the search results were selected for in-depth reading, and statistical mining was used to compensate for the lack of sample documents. The research on the paid use of state-owned forest resources in China was thus improved.

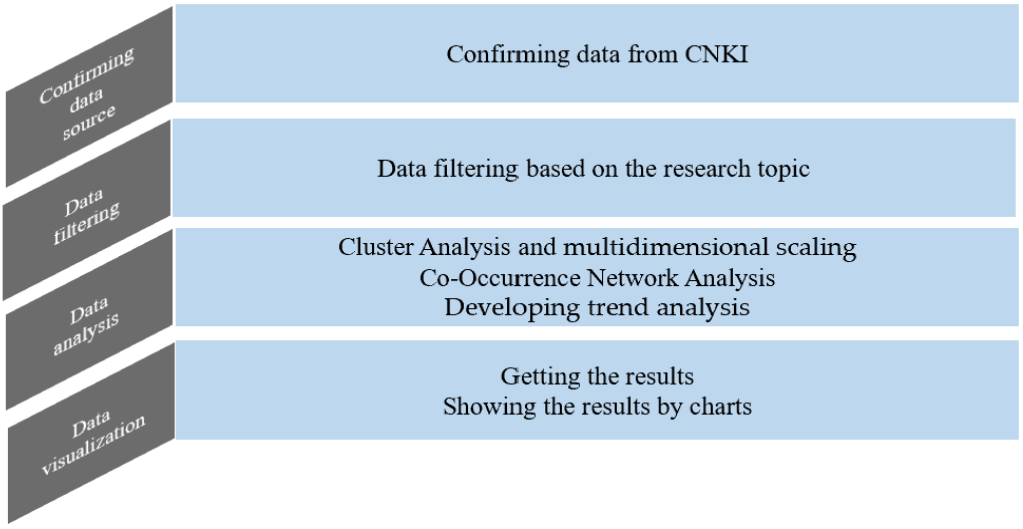

Figure 2. Data processing chart.

3. Results

3.1. Basic Feature Analysis

3.1.1. General Statistics

The number of statistical documents is an important index for measuring research progress, hot spots, and prospects. Through the extraction of 451 documents, it was concluded that the number of published documents has increased year by year from 2008 to 2017, peaking in 2107, beginning to decline in 2018 and 2019, and then beginning to rise steadily, as shown in Figure 3. However, there are only 61 SCI/CSSCI/core journals, which account for only 13.53% of the total, indicating that there are few high-quality studies in this field. The reasons for this situation may be that, since the paid use was put forward, the system and supervision mechanisms are not comprehensive. Specifically, by the end of 2021, there were 4297 state-owned forest farms and 87 forest industry enterprises in key state-owned forest areas in China, so it is difficult to investigate the statistics, and it is difficult to obtain micro-data. The evaluation of the reform effect also suffers from a time lag.

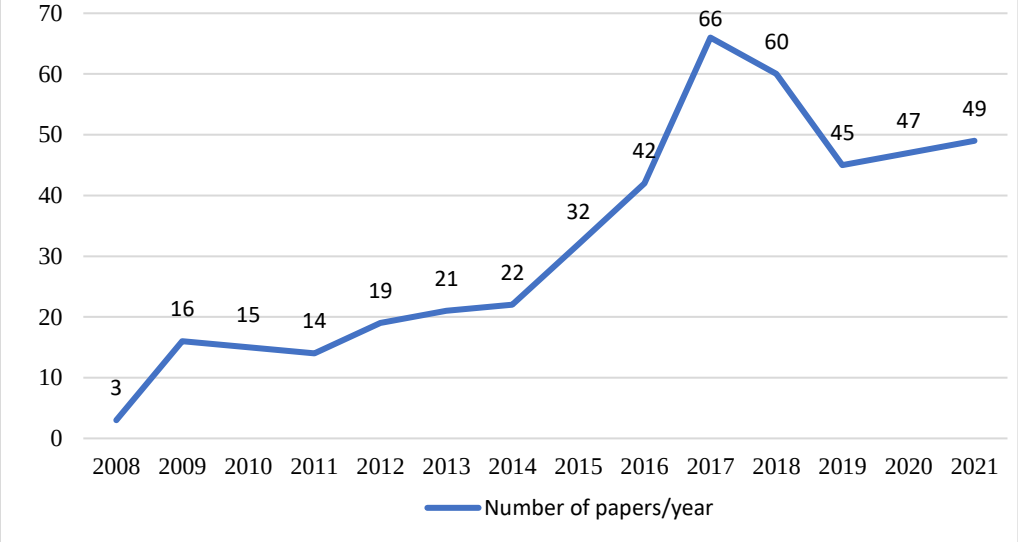

Figure 3. The number of papers on the paid use of state-owned forest resources in CNKI from 2008 to 2021.

3.1.2. Authors

Scholars are the core force that promotes the development of scientific research, and the number of papers published by scholars is the main criterion of their research ability. The author's contribution to a research field can be intuitively shown by the statistics of their publications [32].

BICOMB was used to set the author as the keyword and extracted it. Based on the statistics of 451 sample documents, 816 actual authors were obtained after excluding non-real authors (such as a research group and an editorial department) and combining the authors who published multiple articles. The average number of published articles was 0.56. The core author is defined by Price's law, which is the calculation formula of the minimum number of publications of the core author [33]:

$$n = 0.749 \times \sqrt{max(m)} \quad (1)$$

$max(m)$ represents the publications of the most prolific author in this research field. According to the calculation, $n \approx 1.98$, which means that authors with more than two papers published are high-yield authors. Thus, 55 core authors were screened, accounting for 29.27%, and 70.73% published only one paper, as shown in Table 1. Taking "author" as a node, the graph was obtained by setting the measurement parameters, as shown in Figure 4, to more clearly observe the research teams. The authors of some research teams are shown in Figure 4.

3.1.3. Funding

Supported by fund projects, papers produced under relatively complete conditions have a higher academic quality and greater influence [34]. According to the statistics of the sample documents, there are 140 papers on fund projects, and 61 of them are provincially funded projects, accounting for the highest proportion. After that, 33 of them are funded at the ministerial level, accounting for 23.57%. Sixteen of them are nationally funded projects, accounting for 11.43%, and the rest are funded at the university level, city level, or department level, as shown in Table 2.

Table 1. Statistical table of authors (part).

Number	Author	Frequency	Percentage	Cumulative Percentage
1	Daling Zou	7	1.552	1.552
2	Hong Ma	6	1.330	2.882
3	Yukun Cao	5	1.109	3.991
4	Hongge Zhu	4	0.887	4.878
5	Jianyong He	4	0.887	5.765
6	Xiule Zhang	3	0.665	6.430
7	Lee	3	0.665	7.095
8	Xiangyue Liu	3	0.665	7.760
9	Minyan Zhao	3	0.665	8.425
10	Delin Su	3	0.665	9.091
11	Caixian Zhou	3	0.665	9.756
12	Xinfeng Chen	3	0.665	10.421
13	Xiping Cheng	3	0.665	11.086
14	Aijing Yao	2	0.444	11.530
15	Yongde Zhong	2	0.444	11.974
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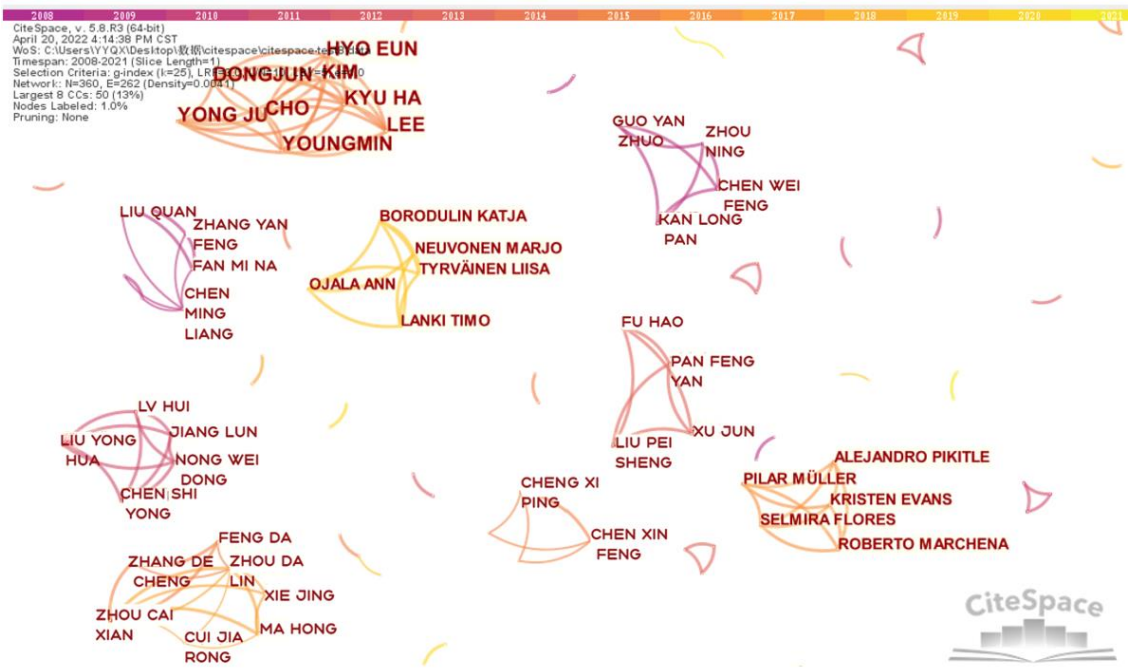

Figure 4. Analysis of co-author network (part).

3.1.4. Institutions

An analysis of the author's institution helps to judge the scientific research strength of the institution. It is also beneficial to understand the distribution of the core group density of research institutions and master the general situation and talent flow at the macro level.

BICOMB was used to make statistics on the author's units. Considering that the names of different departments and units in the same unit may change in different years, the second-level institutions were merged into first-level institutions, and 324 institutions were categorized, with an average publication volume of 1.39. According to Price's law, $n = 3.745$ was obtained [33]; institutions with a publication volume of ≥ 4 can be identified as high-yielding institutions. There was a total of 10 high-yielding institutions, as shown in Table 3 and Figure 5.

Table 2. Statistical table of fund projects.

Fund Level	Fund Type	Number of Papers	Percentage
National level	National Social Science Foundation	7	11.43%
	National Natural Science Foundation of China	8	
	National Science and Technology Support Plan	1	
Ministerial level	Humanities (Philosophy) Social Science Foundation of the Ministry of Education	9	23.57%
	Central University Funding Project	11	
	National Development and Reform Commission Project	2	
	National Forestry and Grassland Administration Project	10	
	National Bureau of Statistics Project	1	
Provincial level	Provincial (Philosophy) Social Science Foundation	39	43.57%
	Provincial Natural Science Foundation	1	
	Scientific Research Fund of Provincial Education Commission	13	
	Provincial Postdoctoral Funding	8	
Department level	Office of Science and Research Fund Project	6	5%
	Department Level Soft Science Project	1	
Municipal level	Municipal Social Science Project	6	5.72%
	Municipal Soft Science Project	2	
School level	University Funding Project	15	10.71%
Total		140	100%

Table 3. Statistical table of institutions (Top 10).

Rank	Research Institutions	Number of Papers	Rank	Research Institutions	Number of Papers
1	Northeast Forestry University	25	6	Fujian Agriculture And Forestry University;	5
2	Beijing Forestry University	13	7	China Inner Mongolia Forest Industry	4
3	National Forestry and Grassland Administration	10	8	Chinese Academy of Forestry	4
4	Central South University of Forestry & Technology	7	9	Heilongjiang Academy of Forestry	4
5	Southwest Forestry University	6	10	State-Owned Gaofeng Forest Farm of Guangxi Zhuang Autonomous Region	4

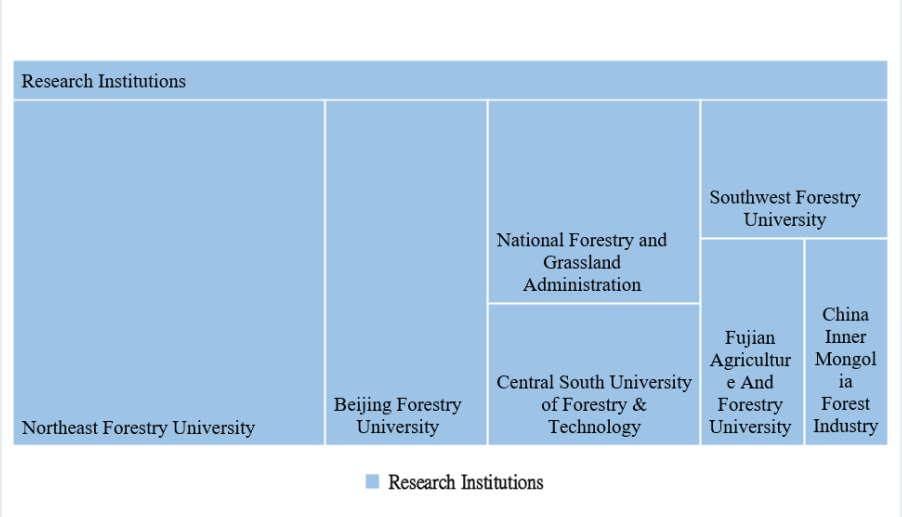

Figure 5. Statistical chart of institutions (Top 10).

3.1.5. Journals

Academic journals are the concentration of documents, and there is a certain correlation between the quality of documents and the grade of the journals included. Further statistical analysis could improve the research status of the relevant documents. According to the statistics, the sample documents are distributed in 182 journals with an average of 2.48 articles. According to Bradford's Law [35],

$$\text{Core zone} : \text{Correlation zone} : \text{Zero correlation zone} = 1 : N : N^2 \quad (2)$$

In this law, N is the number of articles. According to the calculation, the publication density of journals in the core zone is 13.64, which is much higher than that of the correlation zone and zero correlation zone. A total of 150 journals have been published in the core zone, accounting for 33.26%, indicating that there have been relatively stable journals in this field, as shown in Table 4. The top three journals are *Forestry Economy*, *Green Science and Technology*, and *China Forestry Economy*.

Table 4. Statistical table of journal dispersion.

Classification	Standard of Number	Journal Type	Percentage	Number of Papers	Papers Density
Core zone	$N \geq 10$	11	6.05%	150	13.64
Correlation zone	$3 \leq N < 10$	33	18.13%	142	4.30
Zero correlation zone	$N < 3$	138	75.82%	159	1.15
Total		182	100%	451	2.48

3.2. Bibliometric Analysis

3.2.1. Keywords and Co-Occurrence Matrix

Keywords refer to the extraction of professional terms or words representing the subject content of the paper, to reflect the research content and methods of the paper. High-frequency keywords represent highly concentrated research. A visual analysis of high-frequency keywords is helpful to quickly show the general situation of the research field and determine the research path.

The keywords of the sample documents were counted, and 989 keywords were initially extracted. Donohue's high and low-frequency word demarcation formula [36] is as follows:

$$T = -1 + \frac{\sqrt{(1 + 8I_1)}}{2} \quad (3)$$

In the above formula, I_1 is the number of keywords with a frequency of one. The threshold value of high-frequency words was $T \approx 39.08$; however, the only keywords with a word frequency greater than 40 are "state-owned forest farms", the "under-forestry economy", "forest experience", "forest health", and "forest tourism." The paid use of state-owned forest resources is an emerging research topic, the research scope is relatively scattered, and there are many words with a frequency of one. To study this intuitively and comprehensively, after eliminating the high-frequency keywords that are not conducive to this research, the keywords with a word frequency greater than or equal to five were selected for analysis, as shown in Table 5.

Table 5. High-frequency keywords.

Rank	Keywords	Frequency	Rank	Keywords	Frequency	Rank	Keywords	Frequency
1	State-owned forest farms	104	15	Understory economic development	10	29	Forest assets	6
2	Under-forestry economy	94	16	Problem	10	30	Planning and designing	6
3	Forest experience	60	17	Development Strategy	10	31	Forest culture	6
4	Forest tourism	57	18	Paid use	9	32	Forest experience education	6
5	Forest health	53	19	Forest health tourism	8	33	Suggestion	6
6	Forest park	35	20	Development mode	8	34	Key state-owned forest area	5
7	State-owned forest area	26	21	Forest carbon sequestration	8	35	Forestry economics	5
8	Forest resources	16	22	State-owned forest resources	7	36	Management	5
9	Reform of state-owned forest farms	16	23	Development	7	37	Educational tourism of forest	5
10	Countermeasure	15	24	Experience economy	7	38	Ecotourism	5
11	Ecological product value	14	25	Industrial development	7	39	Mode	5
12	National forest park	14	26	National Forestry and Grassland Bureau	7	40	Forest conva-lescence	5
13	Development status	13	27	Understory economic industry	7	41	Experience	5
14	Travel experience	10	28	Status	7	42	Community structure	5

Table 5 shows that the research content in the field is very rich, not only involving forest tourism, forest health, forest experience, and under-forestry economy, but also forest carbon sequestration, ecological product value, and forest park. To meet the data requirements of the following co-occurrence network analysis of the sample documents, BICOMB was further used to carry out pairwise statistics on the above high-frequency keywords, forming a co-occurrence matrix of 42 × 42, as shown in Table 6. To eliminate the influence of the large difference in the co-occurrence frequency on the cluster analysis, the Ochiai coefficient was used to modify the co-occurrence matrix [37], and it was converted into a correlation matrix. The specific conversion formula is

$$\text{Ochiai} = n(A \cap B) / \sqrt{n(A) \times n(B)} \quad (4)$$

In the above formula, $n(A \cap B)$ represents the frequency of any co-occurrence of A and B, $n(A)$ represents the frequency of word A, and $n(B)$ represents the frequency of word B. To avoid the error caused by more "zero" values in the co-occurrence matrix, it was further transformed into a 42 × 42 dissimilarity matrix, as shown in Table 7. The smaller the value, the greater the correlation between keywords.

Table 6. Co-occurrence matrix of high-frequency keywords (part).

	State-Owned Forest Farms	Under-Forestry Economy	Forest Experience	Forest Tourism	Forest Health	Forest Park	State-Owned Forest Area	Forest Resources
State-owned forest farms	104	38	1	15	19	5	0	4
Under-forestry economy	38	94	0	3	1	0	12	1
Forest experience	1	0	60	5	5	11	0	1
Forest tourism	15	3	5	57	5	4	5	2
Forest health	19	1	5	5	53	4	2	3
Forest park	5	0	11	4	4	35	0	1
State-owned forest area	0	12	0	5	2	0	26	3
Forest resources	4	1	1	2	3	1	3	16

Table 7. Dissimilarity matrix of high-frequency keywords (part).

	State-Owned Forest Farms	Under-Forestry Economy	Forest Experience	Forest Tourism	Forest Health	Forest Park	State-Owned Forest Area	Forest Resources
State-owned forest farms	0	0.616	0.987	0.805	0.744	0.917	1.000	0.902
Under-forestry economy	0.616	0	1.000	0.959	0.986	1.000	0.757	0.974
Forest experience	0.987	1.000	0	0.915	0.911	0.760	1.000	0.968
Forest tourism	0.805	0.959	0.915	0	0.909	0.910	0.870	0.934
Forest health	0.744	0.986	0.911	0.909	0	0.907	0.946	0.897
Forest park	0.917	1.000	0.760	0.910	0.907	0	1.000	0.958
State-owned forest area	1.000	0.757	1.000	0.870	0.946	1.000	0	0.853
Forest resources	0.902	0.974	0.968	0.934	0.897	0.958	0.853	0

3.2.2. Cluster Analysis and MDS

Cluster analysis is a statistical analysis method that classifies samples according to their characteristics, to intuitively reflect the relationship between samples [38]. Algorithms were as follows: The high-frequency keyword matrix was imported into SPSS. This study chose "analyze", "classify", and "hierarchical cluster analysis". Hierarchical cluster analysis is a method to determine the distance between new classes and other classes when distance is used as similarity statistics. Then, this study selected "proximity matrix" in the statistics interface, and chose "dendrogram". The sample documents were processed by the between-groups linkage method and squared Euclidean distance. The high-frequency keyword cluster analysis graph is shown in Figure 6, and the case processing summary is shown in Table 8. The high-frequency keywords of numbers 1–42 are shown in Table 5.

Table 8. Case Processing Summary.

Cases					
Valid		Missing		Total	
N	Percent	N	Percent	N	Percent
42	100.0	0	0	42	100.0

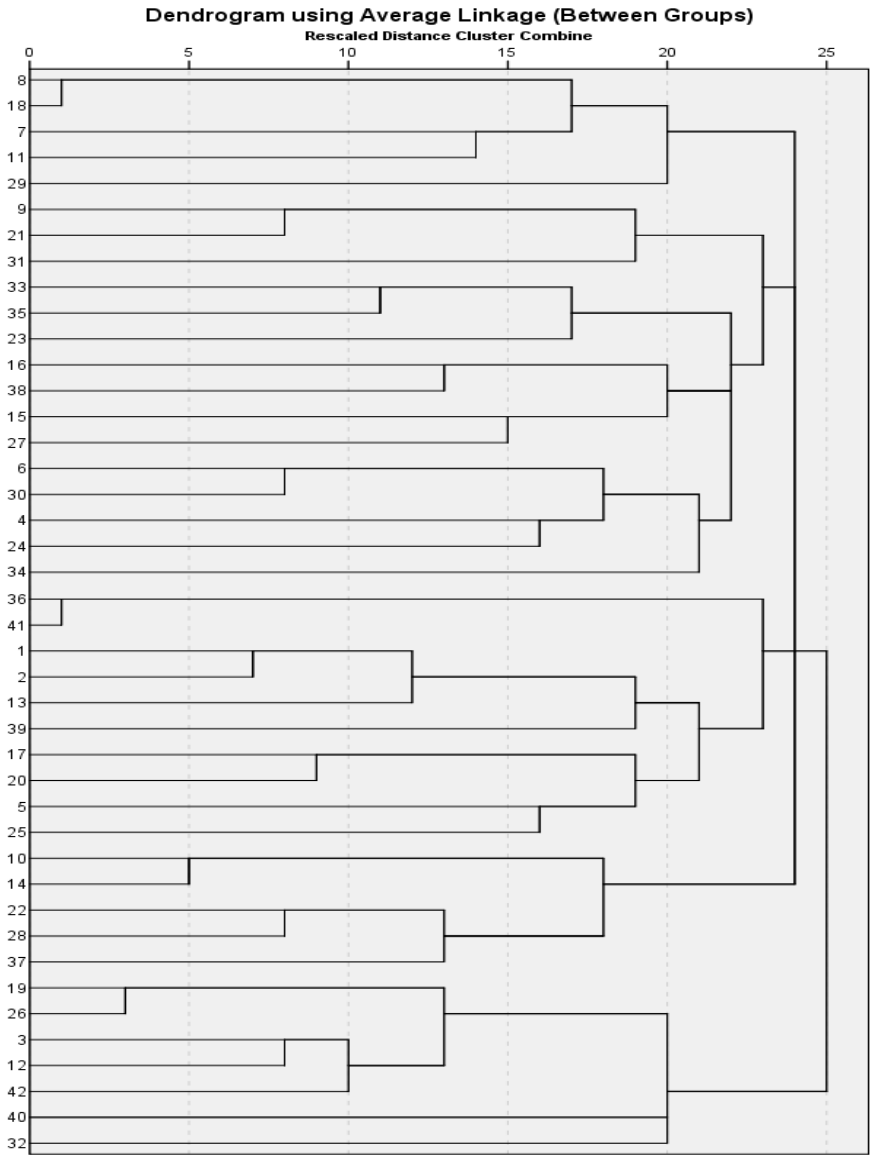

Figure 6. Cluster analysis of the paid use of state-owned forest resources.

To further visualize the clustering results of high-frequency keywords, MDS was used to display the distribution of keywords in this field in a two-dimensional space. MDS is a multivariate statistical method that simplifies high-dimensional spatial data into low-dimensional spatial data through nonlinear transformation and then locates, analyzes, and classifies the data [39]. Similar objects were relatively clustered, and the Euclidean distance model was used to analyze the dissimilarity matrix to obtain a two-dimensional knowledge graph, as shown in Figure 7. The high-frequency keywords of numbers 1–42 are shown in Table 5. It can be seen that high-frequency keywords are clustered in regions, forming three relatively concentrated keyword topics, which are consistent with the results of cluster analysis.

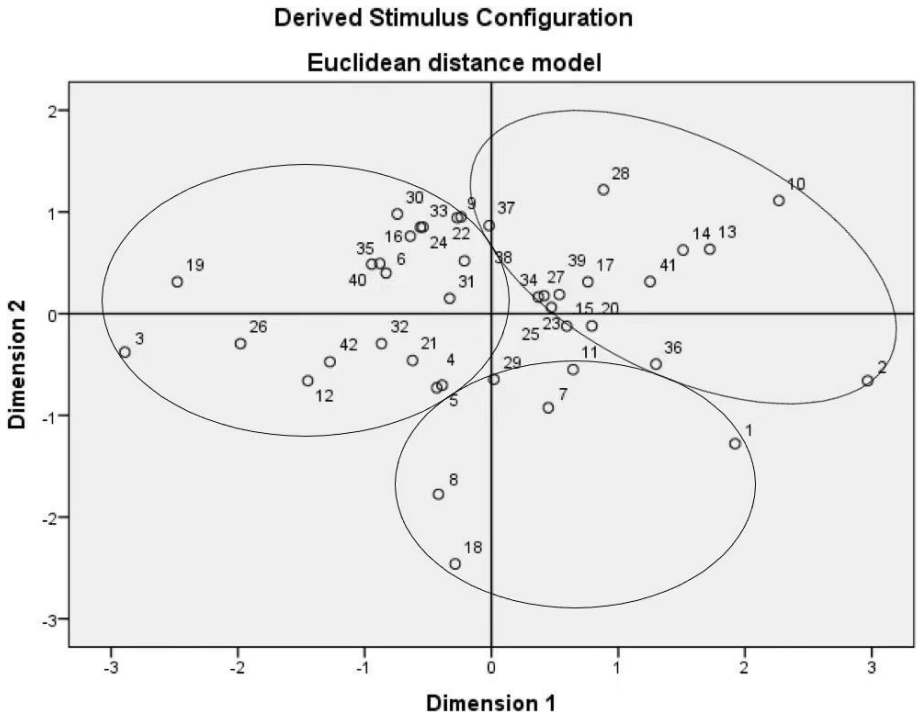

Figure 7. Multidimensional scaling of the paid use of state-owned forest resources.

According to Figures 6 and 7, combined with the actual connotation of each high-frequency keyword, the sample documents divide into three topics. The first is research on the development status of paid use, including "forest resources", "paid use", "state-owned forest area", "forest assets", and "ecological product value". The second is research on forest tourism and forest health, including "forest tourism", "suggestion", "planning and designing", the "experience economy", "state-owned forest resources", "problem", "forest culture", "experience", and "national forest park". The third is research on the development of the under-forestry economy (under-forestry planting, breeding, and product processing), including the "under-forestry economy", "understory economic development", "development status", "community structure", and the "development strategy". From the perspective of the internal and external relationship of high-frequency keywords, the relationships between the internal high-frequency keywords of each hot spot are relatively close, and the clustering results are relatively ideal.

3.2.3. Co-Occurrence Network Analysis

A co-occurrence network refers to an analysis method that interprets the network properties of different objects by analyzing the connections between them [40]. Combined with a knowledge graph, the target object is presented in the form of an image with the help of the position and size of the node and the connection and distance between the nodes. Using UCINET, the co-occurrence matrix of high-frequency keywords constructed above was imported, and NetDraw was used to draw the co-occurrence network graph of high-frequency keywords, as shown in Figure 8.

Each node in the figure represents a high-frequency keyword, and the position of the node shows the position of the word in the network. The closer it is to the center, the higher its importance. The larger the node, the greater its role. The connection between the nodes represents the key. The more connection there is between the nodes, the stronger the relationship between words is. Figure 8 shows that the current research on the paid use of state-owned forest resources mainly focuses on "state-owned forest farms", "paid use", "under-forestry economy", "forest tourism", "ecological product value", "forest health", and other aspects. These keywords are located at the core of the network map, and there

are relatively dense connections that attract a high amount of attention. "Forest experience education", "experience economy", "community structure", and "forest culture" are on the edge, with sparse connections and a low amount of attention. There are few studies on the combination of paid use.

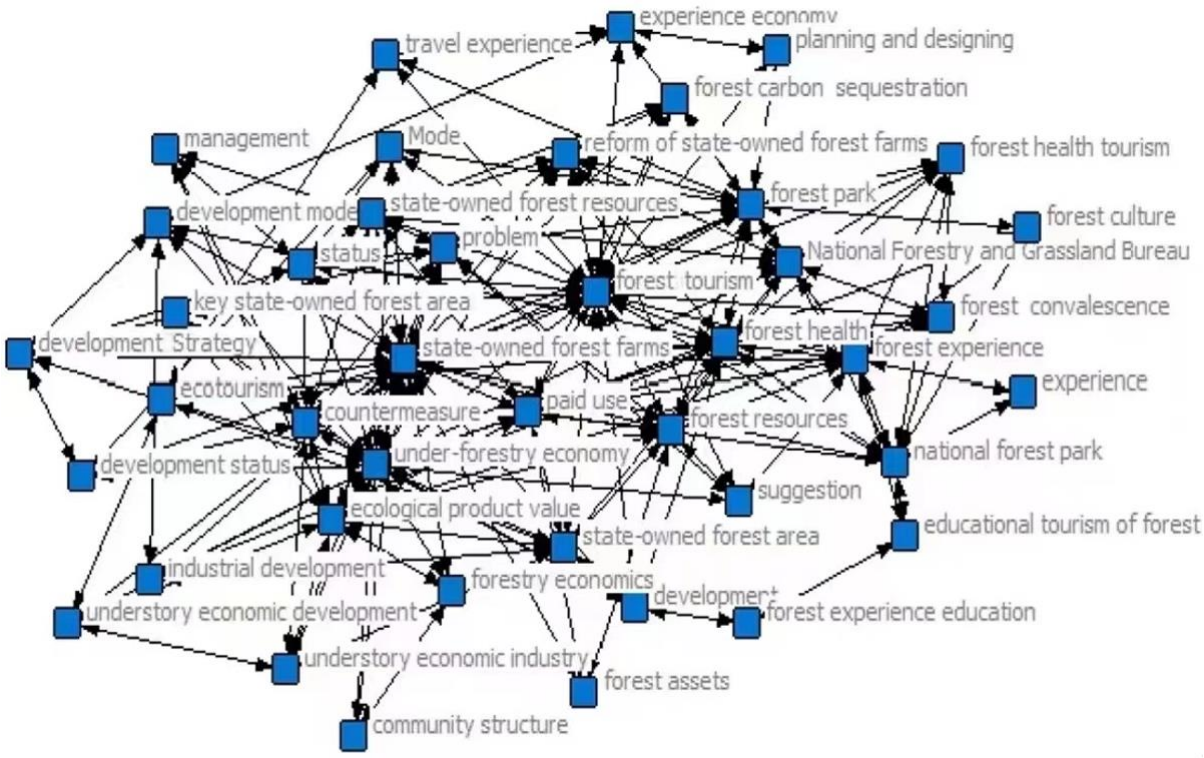

Figure 8. Co-occurrence network of paid use of state-owned forest resources.

3.2.4. Developing Trend Analysis

Combined with the above analysis of the number of papers, institutions, funding, and high-frequency keywords, this study provides a general grasp of the research status of the paid use of state-owned forest resources in China. On this basis, the time dimension was included in the influencing factors of the study, and CiteSpace was used to conduct a longitudinal dynamic analysis of the sample documents, to obtain a timeline map, as shown in Figure 9. Different from cluster analysis, the timeline map shows not only the regularity of the study over time, but also the relationship between different clusters. In addition, as supplementary proof, the sample documents were detected by burst word, which refers to the practice of mining words with high-frequency in a short period. Taking "keyword" as a node, the graph was obtained by setting the measurement parameters, as shown in Figure 10, to more clearly observe the evolution of the related research over time.

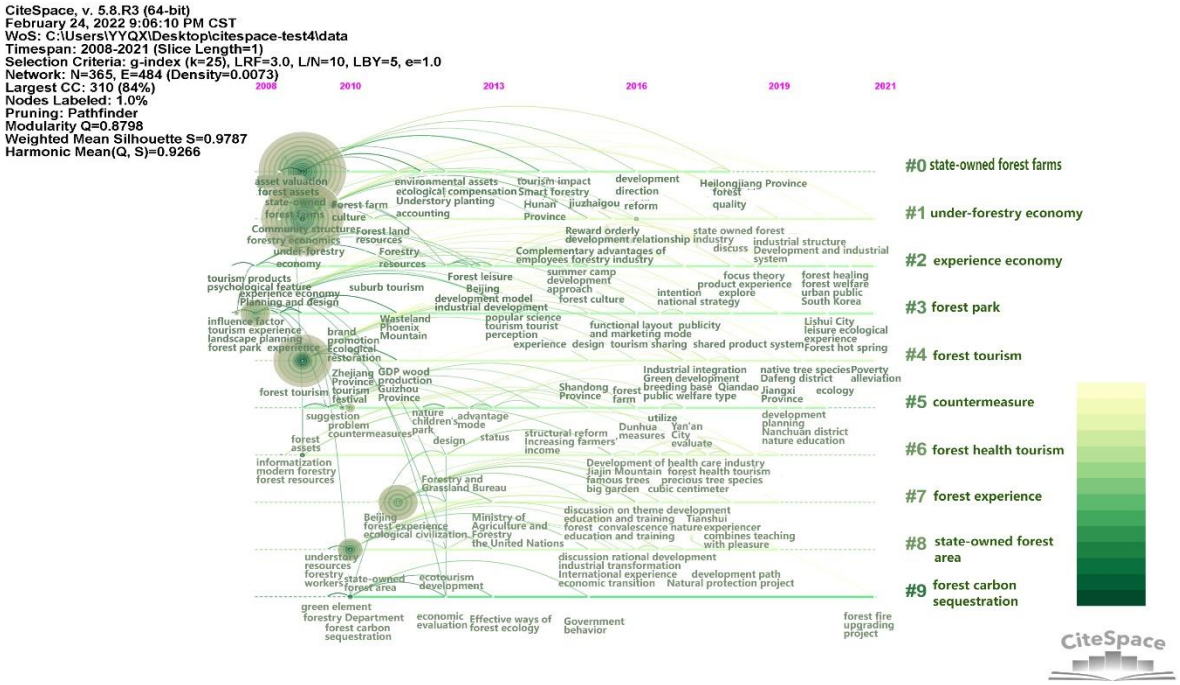

Figure 9. Timeline visualization of the paid use of state-owned forest resources.

Top 12 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2008 - 2021
experience economy	2008	2.03	**2008**	2013	
forest resources	2008	2.03	**2009**	2010	
forest assets	2008	1.99	**2009**	2013	
community structure	2008	1.99	**2009**	2013	
forestry economics	2008	1.79	**2009**	2013	
asset valuation	2008	1.64	**2009**	2012	
ecotourism	2008	1.65	**2012**	2016	
forest experience	2008	2.59	**2015**	2019	
forest health	2008	2.77	**2017**	2019	
forest convalescence	2008	1.65	**2017**	2018	
paid use	2008	1.88	**2018**	2021	
forest carbon sequestration	2008	3.87	**2019**	2021	

Figure 10. Detection of the burst words on the paid use of state-owned forest resources.

According to the timeline visualization and the detection results of the burst words, the intermediary centralities of "state-owned forest farms" and the "under-forestry economy" are the highest, followed by "forest tourism" and "forest experience", etc. In the research from 2008 to 2010, scholars paid more attention to "state-owned forest farms", the "under-forestry economy", "forest park", and "forest tourism." With time, the research on "forest experience", "forest health tourism", and "forest carbon sequestration", one after the other, increased. According to the detection of burst words, the explosion point of the "experience economy" was from 2008 to 2013, and this research lasted the longest. Most of the research on "forest assets" and "asset evaluation" focuses on the period from 2009 to 2013. Over time,

the research topics in this field have gradually become enriched, including "ecotourism", "forest experience", "forest health", and "forest carbon sequestration".

3.3. Content Theme Analysis

Combined with the above statistical analysis results and literature review, this paper focuses on three topics, as shown in Table 9.

Table 9. Research topics of the paid use of state-owned forest resources.

Number	Research Topics
1	Research on the development status of paid use
2	Research on forest tourism and forest health
3	Research on the under-forestry economy

(1) Research on the development status of paid use. Research on this topic focuses on policy analysis and theoretical analysis, with a few empirical studies supported by micro-data, and mainly focuses on the system and supervision of paid use. In terms of research methods, scholars have used institutional economics analysis methods to determine institutional changes and conduct macroscopic qualitative discussions.

According to the document issued by Fujian Province, the paid use of state-owned forest resources involves a state-owned forest resource asset management unit through a paid use contract or agreement, for a certain range of forest resource assets, and allows for the use of units or individuals by paid users. China issued the document in 2017, which proposed the establishment system for the paid use of state-owned natural resources, but the progress of such use is relatively slow [4]. It is necessary to determine the scope, period, conditions, procedures, and methods of this paid use and achieve an adequate top-level design of its system supply [41]. Forest resources related to the paid use of mineral, water, and sea areas, which is relatively backward in terms of natural resources, China has not formed such use in the legal sense. This means that the subject of the property rights is ignored and their value is not fully reflected, among other issues [42].

From the perspective of legislation, there are very few legal norms directly related to the paid use of state-owned forest resources in China, and they lack systematization. From the perspective of system analysis, the subject, object, mode, and price are worth studying [43]. First of all, the ownership exercise mechanism is not independent and unified, leading to the replacement of state-owned forest resource property rights by administrative management, and the control and usufruct are obtained by local governments. Secondly, it is difficult for economic subjects outside state-owned forest farms to participate, and the fair competition rights of potential resource holders are damaged. Accordingly, the establishment of a system for the paid use of state-owned forest resources is imminent [44].

In addition, the supervision mechanisms have not been clarified. Defining dynamic and effective supervision over the process is important to ensure the value preservation and appreciation of state-owned forest resources [45]. The management reform system of state-owned forests in Germany adopts a model of separation of government and enterprise. The forestry administrative agencies do not directly operate state-owned forests and accept the supervision of functional agencies, so the operation, management, and supervision of state-owned forests are separate from each other. However, China's state-owned forest resources adopt a model of government and enterprise integration. The relationship between the government and the market is still not clear. Specifically, asset management and government supervision are confused. Government property rights supervision and management responsibilities are unclear, and supervision and management before, during, and after the fact is often not in place [46].

In conclusion, the research result shows that a paid use system and a supervision system reflecting the market situation and the value of resources have not been established in China. This study suggests that China should clearly define the property rights structure, set up a government supervision agency for forest resources in state-owned forest farms,

clearly supervise law enforcement powers, and perfect the supervision mechanism of paid use price evaluations.

(2) Research on forest tourism and forest health. This kind of research is based on both the empirical research of econometrics and the case analysis of resource endowment differences in different regions. The research contents of forest tourism and forest health are shown in Table 10.

Table 10. Research contents of forest tourism and forest health.

	Forest Tourism		Forest Health
1	Development status of forest tourism in different regions	1	Industrial development of forest recreation
2	Development of the forest tourism industry	2	Exploration of forest recreation models and paths in different areas
3	Impact of forest tourism on the environment	3	Types of consumer demand for forest recreation

Forest tourism is the direct or indirect use of forest landscape resources and takes tourism as the main purpose of various forms of wild travel activities. These activities benefit operators, tourists, and community residents and achieve the sustainable and harmonious development of the environment, society, and economy [47]. Since the 1980s, forest tourism has played the role of invigorating forests and enriching people's lives. Various provinces regard forest tourism as a focus for increasing the income of the tertiary industry, and scholars discuss the development direction of forest tourism in different regions [48,49]. Some scholars have used a comprehensive index method to measure the development level of forest tourism in the ecological environment by constructing a forest tourism evaluation index system [50]. In addition, some scholars have studied the relationship between forest tourism and the ecological environment and have studied the interest coordination mechanism of forest eco-tourism through dynamic game analysis and a coupling degree model [51]. The development of forest tourism should be based on the premise of ecological security and environmental protection to achieve sustainable development more scientifically.

Originating in Germany, forest health refers to all activities that are beneficial to human physical and mental health based on forest ecological products and experienced through the "five senses" of human vision, hearing, smell, taste, and touch. For example, visiting the cultural landscape in the natural environment, carrying out natural science education, and work experience [52]. Scholars have used the Analytic Hierarchy Process (AHP), SWOT analysis, the fuzzy comprehensive evaluation method, and the Carnot model to indicate the necessity of forest health [53]. Government departments should formulate a development plan for the forest recreation industry, carry out pilot demonstrations, issue supportive policies, convert resources into practical benefits, and promote the transformation of forest parks in the direction of recreation [54–56].

(3) Research on the under-forestry economy (under-forestry planting, breeding, and product processing). Research on the under-forestry economy mainly focuses on its development status (development efficiency, development mode, and development countermeasures), benefits, and influence on farmers. According to the Group Standard of the Chinese Forestry Society (T/CSF001-2018), the under-forestry economy refers to an eco-friendly economy based on forests, woodlands, and their ecological environment, following the principle of sustainable management. It includes under-forestry planting, the under-forestry breeding, collection, and processing of various products, and the utilization of forest landscapes.

The research on the development status of the under-forestry economy consists of research on development efficiency, development mode, and countermeasures. In studies of development efficiency, scholars mostly select economic development data, the list index system, and the calculation method through the DEA statistical analysis model and analyze

the development efficiency. Usually, the efficiency of farmers' under-forestry planting and operation is taken as a dependent variable to investigate the influence of input factors, property rights factors, policy factors, and farmer characteristics on efficiency, and to further clarify property rights, promote the development of the under-forestry economy, and promote the rational allocation of input factors [57–59].

In addition, some scholars have used the inductive case analysis method to compare the efficiency performance and found that there is a phenomenon of resource mismatch [60]. Development mode and countermeasure research can be divided into two groups. One discusses development modes of forest planting, breeding, and different ecological tourism [61]. Researchers use a GM (1, 1) grey model to forecast the development of the economy, trade, and industry or expound from the viewpoint of the mechanism [62,63]. The other analyzes the benefit of models according to the natural environment and the economic level of the local area and determines suitable development countermeasures [64,65].

There are three kinds of studies on the economic benefits of under-forestry. The first kind adopts an AHP and a fuzzy comprehensive evaluation method, which constructs an evaluation system model of the comprehensive benefit [66]. After that, different forestry economic models are evaluated in terms of comprehensive benefit, and the best model is determined [67]. The second measures the economic benefits of poultry, bacteria, vegetables, medicines, and other features of the forest and puts forward development modes suitable for local areas as well as suggestions for maximizing the economic benefits [68]. The third analyzes the factors affecting economic benefits, such as the age of the forest, government financial investments, the guaranteed operating area of water and electricity, and the educational level of the operating subjects. The main problems of the under-forestry economy are the low educational level of the operating subjects, a relatively single organizational form, and a shortage of funds [69].

Studies on the under-forestry economy and the influence of farmers could be divided into two categories. One uses microscopic data and either a Logistic model or a structural equation model to study the influencing factors and paths of farmers' willingness to participate in the under-forestry economy. These studies consider education level, forestland area, family capital adequacy, benefit expectations, the age structure of farmers, and the proportion of non-agricultural income [70,71]. The other category consists of studies that combine the forest economy and farmers' livelihood in case analyses, address the poor utilization of resources, and management difficulties. In addition to strengthening the development of science and technology, and a technical approach to sustainable utilization, farmers require sustainable management of the gathering process, standardized understory product management and processing enterprises, and useful services for industrial development [72,73].

4. Discussion

This study summarizes the relevant topics by reviewing the research status of the paid use of state-owned forest resources in China. In addition, this study analyzes the above results from three dimensions: basic feature, bibliometric, and time trend changes.

Firstly, the results from the perspective of the basic feature are analyzed. From the number of papers shown in Figure 3, Throughout the literature review in this field, its quantity generally shows conservative growth. The number of published documents peaked in 2107. This was closely related to the frequent promulgation of policies in 2017. In January 2017, China proposed to establish state-owned natural resource asset management and a natural ecological supervision institution to uniformly exercise the responsibilities of the owner of natural resource assets owned by the people. In October 2017, the State Council of China issued documents to guide the reform of the paid use system of national owned natural resource assets and pointed out that it was necessary to promote laws and regulations governing the paid use of national owned natural resource assets such as land, water, forest, and grassland, to establish a paid use system [4]. The research in 2017 mainly focused on institutional and regulatory systems. Due to the lack of micro-data for paid use

pilots, the number of papers decreased in 2018 and 2019. In 2020, the National Forestry and Grass Administration of China pointed out the suggestions for accelerating paid use of forest resources in state-owned forest areas. It had further promoted the steady rise of research results in relevant fields [74]. It is difficult to quantify the driving force of policy; therefore, qualitative analysis is carried out in combination with the actual situation, and this is the limitation of this study.

From the statistical table of authors shown in Table 1 and Figure 4, the above statistical results show that although core groups of authors with a certain influence have been formed, the core authors account for 29.27%, and the research impact is still scattered and weak. There is a lack of in-depth and sustainable research, which may be related to the fact that paid use is still in the promotion stage and lacks relevant systems and an operational supervision mechanism. From the statistical table of fund projects shown in Table 2, the state, ministries, commissions, provinces, and universities have attached great importance and provided support to the paid use of state-owned forest resources, and the quality of papers has gradually improved. However, some studies have shown that the marginal efficiency of scientific research projects is decreasing [75]. It is necessary to conduct an in-depth review of research results in various fields. From Table 3 and Figure 5, It can be concluded that universities are the main battlefield of this research field. Social departments such as government functional institutions and professional associations are less engaged, indicating that academic research and actual management work in this field are misaligned and disjointed.

Secondly, the results from the perspective of bibliometrics are analyzed. As can be seen from the high-frequency keywords shown in Table 5, research on the paid use of state-owned forest resources is very rich, including listing paid use ways such as forest tourism, and the exploration of paid use modes and system management. According to Figures 6–8, combined with the actual connotation of each high-frequency keyword, the sample documents divide into three topics. One is research on the development status of paid use. The paid use is based on the utility value theory. Although forest resources are not commodities, they have been used by consumers and can provide a measure of economic benefits to the global ecosystem on this basis [9]. A paid use system and a supervision system reflecting the market situation and the value of resources have not been established in China. One is research on forest tourism and forest health. Under effective management, there are multiple stakeholders in the management of paid forest use. Multi-stakeholder benefits should be the goal to achieve sustainable forest development. This is consistent with the research conclusion of Pelyukh et al. and Yao et al. [16,47]. Another is research on the under-forestry economy. Using AHP, DEA, and a fuzzy comprehensive evaluation method constructs an evaluation system model of the comprehensive benefits of the under-forestry economy [66].

Thirdly, the results from the perspective of time trend changes are analyzed. The research on the paid use of state-owned forest resources is based on the reform practices of state-owned forest farms and state-owned forest areas. The relevant theoretical research and policy formulations are derived from the solutions to practical problems. According to Figures 9 and 10, in the research from 2008 to 2010, scholars paid more attention to "state-owned forest farms", "under-forestry economy", "forest park", and "forest tourism". The explosion point of the "experience economy" was from 2008 to 2013. This means that this field received continuous attention. Forest experience, forest tourism, and forest health are different development methods based on the experience economy. Most of the research on "forest assets" and "asset evaluation" focused on the period from 2009 to 2013. The research topics in this field have gradually become enriched, including "ecotourism", "forest experience", "forest health", and "forest carbon sequestration" from 2016 till now. According to the asset management theory, forest resources are a kind of resource asset. The paid use of forest resources requires bringing them into a state-owned asset management system and managing property rights by scientific principles and economic laws. Considering forest resources as assets, clarifying property rights,

and forming a pricing mechanism can truly reflect the ownership of forest resources by the state and the people economically, and ensure the preservation and appreciation of state-owned forest resource assets. The economic benefits generated by forest carbon sequestration are an indispensable part of paid use. Forest ecosystems can achieve the effect of carbon sequestration while reserving energy [20]. Given the continuity of burst words, the research on paid use and "forest carbon sequestration" are still technical branches worthy of attention in the future.

5. Conclusions and Outlook

5.1. Conclusions

In this study, 451 documents on the paid use of state-owned forest resources in the CNKI database from 2008 to 2021 were selected as samples, and statistical analysis software, such as BICOMB, SPSS, UCINET, and CiteSpace, was used to analyze the experiment. This study first identified the general statistics, the authors, the funding, the institutions, and the journals and then constructed a co-occurrence matrix and a dissimilarity matrix of high-frequency keywords. In addition, cluster analysis, MDS, and co-occurrence network analysis were carried out. In addition, time was also taken into account. A timeline visualization map was combined with the detection of burst words, and the following conclusions were drawn:

(1) In terms of the basic feature analysis, this study finds that the number of papers is rising, and high-yield authors account for 29.27% of the total documents. Core author groups with a certain influence have been formed, but the research force is relatively scattered. In addition, the support of provincially funded projects accounts for the highest proportion, reaching 43.57%. Northeast Forestry University and Beijing Forestry University pay more attention to this field, and the distribution density of journals in the core zone is 13.64. Moreover, there is a relatively stable number of journals in this research field.

(2) According to the results of keyword cluster analysis and MDS, the research can be divided into three topics: The development status of paid use, forest tourism and forest health, and the under-forestry economy (under-forestry planting, breeding, and product processing). At present, state-owned forest resources in China have not established a paid-use system or a supervision mechanism reflecting market supply and demand and resource value. Therefore, the property rights structure of state-owned forest resources needs to be clearly defined. A scientifically based paid-use system and ex-post supervision mechanism should be established, to promote reform. The government should actively develop forest tourism and forest health projects that meet the needs of different consumers and promote the transformation of resources into benefits. Furthermore, according to the differences in resource endowments in different regions, targeted strategies should be implemented to improve the efficiency of understory economic development and the comprehensive benefits to the economy, society, and ecology.

(3) According to the analysis results of the co-occurrence network, keywords such as "state-owned forest farms", the "under-forestry economy", "forest tourism", "ecological product value", and "forest health" are in the core position, and they are considered important in this field. According to the timeline visualization map and the detection of burst words, the intermediary centralities of "state-owned forest farms" and the "under-forestry economy" are the highest, followed by "forest tourism" and "forest experience", etc. With time and the promulgation of policies, the research focus in this field has gradually shifted from "forest assets" and "forestry economics" to "ecotourism" and "forest health". The research on the development status of paid use and "forest carbon sequestration" is a technical branch worthy of attention.

5.2. Outlook

With the increasing attention of academia to the reform of the paid use of state-owned forest resources, relevant research is also gradually increasing. The research not only

enriches the existing theoretical basis, but also promotes the development of practice. Some results have been found, but there is still much room for future research.

In terms of research methods, the research on the development status of the paid use of state-owned forest resources in China mainly focuses on the review of relevant literature, the theoretical analysis of the system and regulatory mechanism, and the empirical analysis of single approaches to paid use. There is a lack of micro-level empirical research on the paid use of forest resources in state-owned forest areas and state-owned forest farms. It is necessary to combine theory with practice to promote the reform of state-owned forest resources.

Research contents can be divided into the following five points. Firstly, the research of state-owned forest resources is not limited to forest tourism, forest health, and the under-forestry economy. Moreover, whether the value conversion of ecological products, carbon sink trading, and ecological security can be achieved through quantification is worth discussing in future research. Secondly, the lack of an efficiency evaluation system for the paid use of state-owned forest resources makes it impossible to compare and evaluate its reform effect, so it is difficult to produce a more efficient model. The construction of an efficient evaluation system should have more attention paid to it in the future. Thirdly, an evaluation system of state-owned forest resources assets needs to be established, and a fair evaluation of the paid use of forest resources is required. How a pricing model of forest resource assets can be constructed to fairly evaluate the right to use forest land is a practical problem that needs to be solved. Fourthly, property rights about state-owned forest resources are not clearly defined. There are multiple leaders in the management system, and the hierarchy of power and responsibility is not clear. The departments in charge of state-owned forests are burdened with administrative functions. Simultaneously, they are responsible for ownership management and supervision. Furthermore, how ownership and use rights can be separated is worthy of investigation. Finally, the state-owned forest resource market is not mature, and a developed market system has not been fully formed. Thus, the role of the market and policies in promoting the development of the paid use of forest resources, as well as how the economic, social, and ecological benefits of the state-owned forest resource management in both government and the market can be maximized, will remain areas of research focus for a considerable amount of time. In conclusion, research on the paid use of state-owned forest resources in China is an important research field.

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