A Bibliometric Analysis of the Hotspots and Trends of China Poverty Alleviation Studies on Web of Science 2006-2021

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ABSTRACT

To get an overview of the current studies of poverty alleviation in China on Web of Science, 3311 papers in the WOS core collection from 2006 to 2021 were taken as the research data. CiteSpace is used to facilitate the analysis of the co-occurrence network of keywords, cooperative network and co-citation network. The results show that: First, WOS China's poverty alleviation studies cover a wide range of topics, with rural poverty as the largest one, together with a list of others including energy, land, sustainable development and targeted poverty alleviation. Various approaches are discussed, such as employment, education, finance, health, ecological poverty alleviation and social insurance. A timeline review, combined with the emerging trends since 2020 indicates that more research results can be achieved in relative poverty, e-commerce poverty alleviation, information management, hierarchical governance mechanism and governing efficiency. Second, from the perspective of the cooperative network, there have been some academic community focusing on education, child development, energy and land use. Both the network at institutional and national levels show that Chinese are the dominant researchers and has cooperated in many fields with research institutions such as Stanford University, the World Bank and other international organizations. Third, the relationship of co-citation of reference suggests that some influential and fundamental researches have been obtained, mainly in the fields of land improvement and rural revitalization. Some new concepts and ideas about the theory and practice of China's poverty equality practices are put forward, which are expected to be further verified, applied and developed in domestic as well as international poverty alleviation programs in the future.

Keywords: *China poverty alleviation studies, Web of Science (WOS), Bibliometrics, CiteSpace.*

1. INTRODUCTION

By 2020, China had successfully eliminated absolute poverty, as scheduled in its 13th Five-Year Plan. China has made remarkable achievements in tackling poverty, and has even developed a new research field, "China Poverty Alleviation Studies". This research is intended to do a bibilometric analysis of Chinese poverty reduction research papers published in the core collections Web of Scienc (WOS) from 2006 to 2021. The hotspots, trends and cooperative networks have been analysed and visualized via CiteSpace so as to understand the overall developments in this field.

2. DATA DESCRIPTION

The data used in this paper are from Web of Science core collection, under the search words "China" and "poverty", up to December 2021. 3338 search results were thus obtained and the publication time started in 2006, with a time span of 16 years. Since 2011, the volume of publications has been rising steadily and underwent a significantly rapid growth especially after 2015. (“Figure 1”).

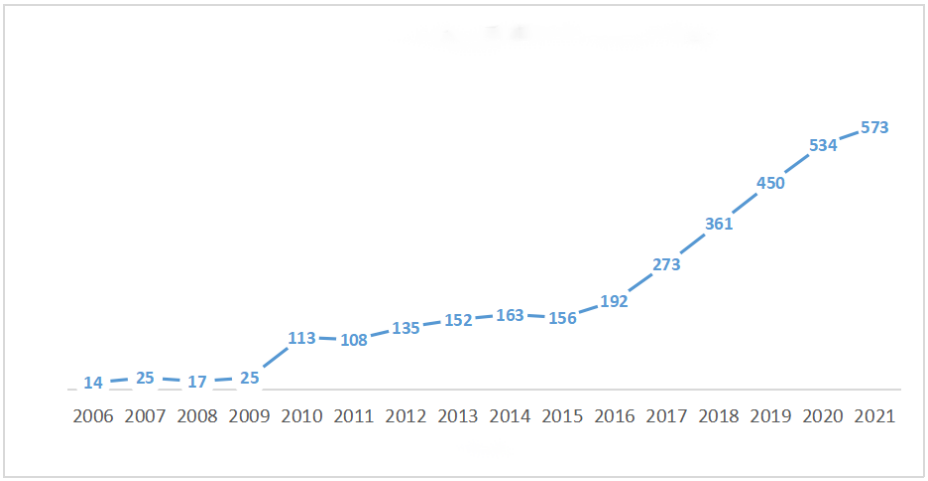

Figure 1 Yearly Numbers of Publications WOS China Poverty Alleviation Studies 2006-2021.

CiteSpace 5.8.R3 is used to preprocess the literature data. After deleting the book review and some irrelevant literature, 3311 valid literature were obtained, including journal papers and conference papers. The top five subjects were economics (653, 19.72 %), environmental science (569, 17.19 %), environmental research (432, 13.05 %), green sustainable science and technology (293, 8.85 %) and development research (214).

3. DATA STATISTICS AND VISUALIZED ANALYSIS

3.1 Network Analysis of Key Words Co-occurrence

CiteSpace co-word analysis is used to analyze the research subjects. Keywords and terms co-occurrence analysis are two commonly used tools, the difference being that the former come from the keywords given by the author, and the latter are the words of high-frequency extracted automatically by natural language processing. This research combines the nodes of keywords and terms, extracting only noun phrases. As a result, the two broad keywords "China" and "poverty" were successfully eliminated. Then, the proper nouns were normalized, and similar expressions, such as "poverty reduction" and "poverty alleviation", were merged. The subject co-word network generated is shown in "Figure 2".

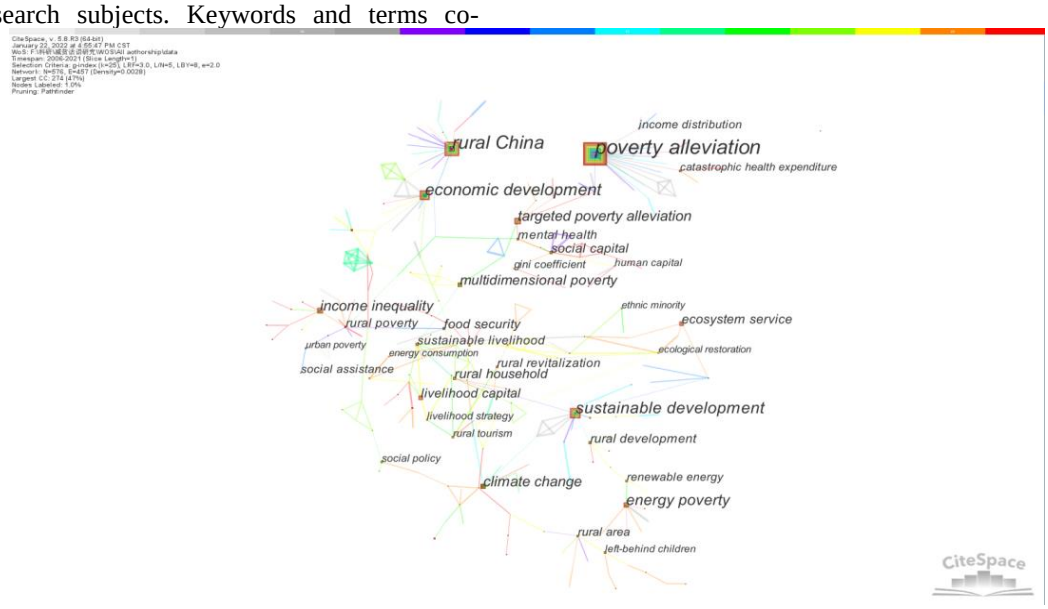

Figure 2 Subject Words Co-occurrence Map of WOS China Poverty Alleviation Studies 2006-2021.

The time slice set in “Figure 2” is every one year, and the number of nodes obtained is 576 with 457 connections. The network density is not high with 0.0028, meaning a scattered distribution of research topics. The node size accordingly reflects areas of high concern. The year chromatography depicts the year of publication and the year of citation via colors of the outer circles of the node and the links respectively. “Table 1” lists the subject words with a total frequency of more than 10 times.

Table 1. Subject Word List of WOS China Poverty Alleviation Studies 2006 - 2021

No.	records	Centrality	Subject words	No.	records	Centrality	Subject words
1	171	0.09	poverty alleviation	18	18	0.12	rural poverty
2	105	0.07	rural China	19	18	0.02	rural revitalization
3	67	0.1	economic development	20	16	0.04	rural area
4	55	0.13	sustainable development	21	15	0.04	renewable energy
5	41	0.03	energy poverty	22	15	0	social assistance
6	35	0.02	income inequality	23	15	0.01	income distribution
7	34	0.11	targeted poverty alleviation	24	13	0	gini coefficient
8	34	0.02	climate change	25	13	0.01	catastrophic health
9	30	0.14	multidimensional poverty	26	12	0.01	social policy
10	23	0.13	rural household	27	12	0	livelihood strategy
11	21	0.04	social capital	28	12	0.06	rural tourism
12	21	0.01	ecosystem service	29	11	0.01	human capital
13	21	0.13	food security	30	11	0.02	left-behind children
14	21	0.01	livelihood capital	31	10	0	urban poverty
15	20	0.05	rural development	32	10	0.06	ecological restoration
16	19	0.18	sustainable livelihood	33	10	0	energy consumption
17	18	0.05	mental health	34	10	0	ethnic minority

The top 10 co-occurences are with poverty alleviation, rural China, economic development, sustainable development, energy poverty, income inequality, targeted poverty alleviation, climate change, multi-dimensional poverty, rural household. The centrality indicates the intermediary role of various topics in the whole topic network, the larger the value, the stronger the centrality. It can be seen that the top subject words are sustainable livelihood (0.18), multidimensional poverty (0.14), sustainable development (0.13) rural population (0.13), food safety (0.13) rural poverty (0.12), etc. "Poverty alleviation" , the highest at the list, has been rising steadily over the 16 years, while the second "rural China" shows obvious burst. The burst detection function of CiteSpace helps detect the change of research hotspots or trends. The top 10 bursts in this study are shown in “Figure 3”

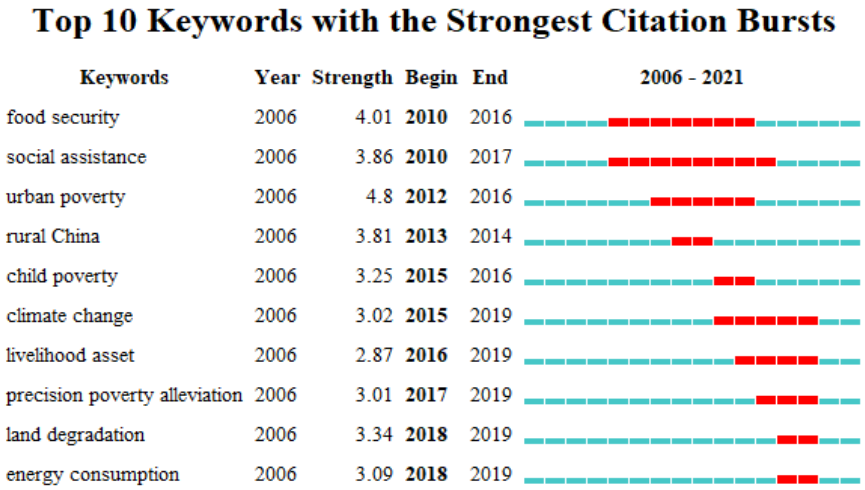

Figure 3 Top 10 Keywords with Citation Bursts in WOS China Poverty Alleviation Studies, 2006-2021.

As shown in “Figure 3”, these subjects show a sudden increase in research intensity. In 2010, there appeared a burst of food security and social assistance and remained issues of high concern for a few years. The bursts in 2012-2017 include urban poverty, rural China, child poverty, and climate change. Livelihoods asset, precision poverty alleviation, land degradation and energy consumption that bursted out since 2018 indicate that these topics have received relatively focused attention in a given period of time.

To have a more visualized understanding of the hotspots, the subject words were further clustered and 229 clusters were hence generated. “Figure 4” shows the top 12 clusters, a reflection of the most concerned topics in these 16 years.

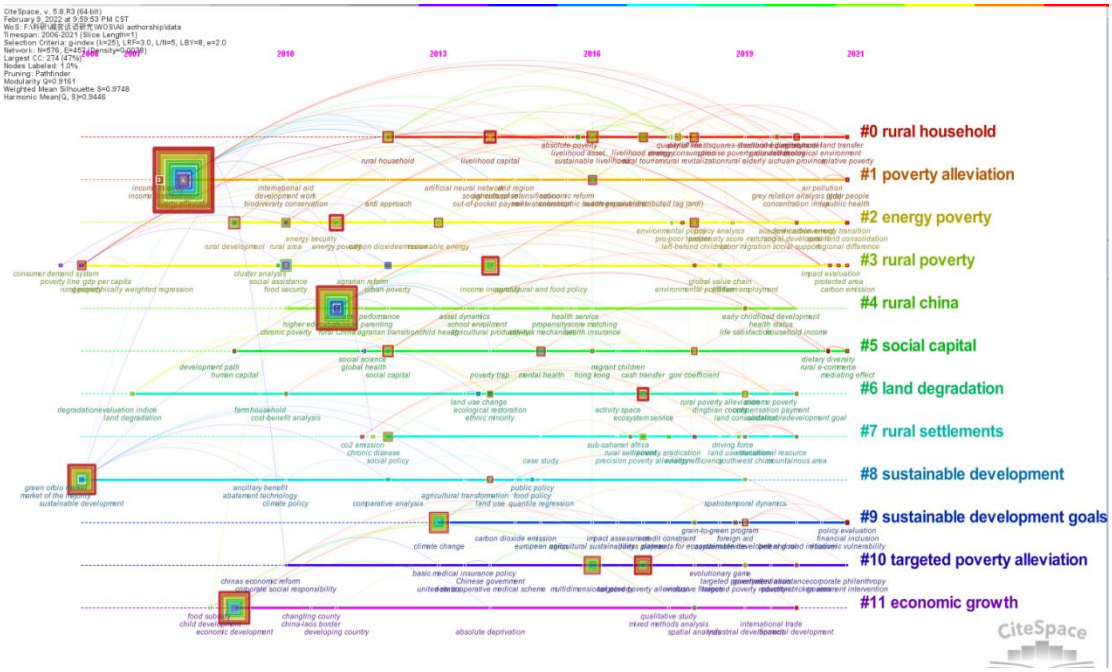

Figure 4 Timeline of the Top 12 Clusters of WOS China Poverty Alleviation Studies, 2006-2021.

The timeline shows the clustering members, year of publication and cocitation frequency in a visual way along a horizontal timeline. As shown in the metadata at the left corner, the Modularity Q value of the clustering class is 0.9161, (Q > 0.3 is generally considered to mean the clustering structure is significant). The weighed mean silhouette (S value) of this cluster is 0.9756, indicating that the clustering structure is reasonable and reliable.

The 12 cluster names on the right show the largest 12 main research topics in China's poverty reduction research in the 16 years. They are named by the subject words of the highest frequency in the cluster. The smaller the number is, the larger the cluster is, that is, the more members the cluster contains. The vertical arrangement is from top to bottom, and they are: 0 # rural household poverty reduction (rural population), 1 # poverty alleviation, 2# energy poverty, 3 # rural poverty, 4 # rural China, 5 # social capital, 6 # land degradation, 7 # rural settlements, 8 # sustainable development, 9 # sustainable development goals, 10 # targeted poverty alleviation 11 # economic growth. The details of each cluster is marked on the horizontal time axis, and the cluster members are arranged as nodes according to the first time relevant papers got published, and the colored lines between nodes indicate the co-citation relationship that appears in the corresponding year. The different colors of the node ring indicate different time of publication. As can be seen from the horizontal axis timeline, the dynamic of different topics vary. Some clustering topics appeared earlier and maintained constant attention, such as clustering 1 poverty reduction and clustering 3 rural poverty, some clustering topics appeared earlier, but cooled down after a certain time, such as cluster 6 land degradation and cluster 8 sustainable development, and some clustering appeared relatively late but remained active in 2021, such as cluster 0 farmers and cluster 9 sustainable development goal. The following is a brief analysis of the main clusters.

- 0# Rural population

This cluster contains the largest number of members in all clusters. The node size and the distribution is relatively even, which indicates that the attention drawn to the subtopics are similar and continuous. The earliest publishing year is 2012 and the average one is 2018, which is relatively new. There are altogether 31 subtopics, including real household, living capital, sustainable living, living strategy, rural tourism, quality of life, rural revitalization, relative poverty and so on. Case studies are common, such as the relationship between livelihood strategies and resettlement plan for residents in the southwest mountainous area and livelihood security in earthquake prone areas. The sustainable livelihood studies first appeared in 2016 and recurred frequently later, such as the prospects of rural tourism, beautiful countryside, leisure farms and other projects in rural revitalization, as well as the multi-functional division of counties and cities with the aim of reducing the gap between urban and rural areas, and the rural industrial development through resettlement.

- 1# Poverty alleviation

The number of cluster members is equal to that of cluster 0, but the cluster structure is relatively simple, concentrated mainly on poverty alleviation. From the rainbow color ring of the outer circle of the node, it can be seen that these issues have been paid constant attention since the first publication in 2007, and the average publication year is 2014. This cluster contains 171 documents, including forest land protection, ecological farming, photovoltaic projects in poverty reduction practices, the role of small businesses in poverty reduction, and the relation between income differences and poverty.

- 2# Energy poverty

The cluster structure is balanced and the cluster members are dispersed, starting from 2012, with an average year of 2017, covering energy poverty, renewable energy, off-grid energy system, rural electrification, energy access, Energy transition and rural development. The largest member “energy poverty” includes 41 documents, of which the most cited is an assessment of energy security and energy poverty in 18 countries including China.[1] The other major research focuses include rural energy poverty assessment, new renewable energy projects assessment, and the measures of using solar energy to solve energy poverty in the northern plateau region of China are also topics of high concern.

- #3 Rural Poverty, #4 Rural China

Cluster 3# rural poverty and cluster 4# rural China are highly correlated, and the average publishing year is 2014. The major subtopics in Cluster 3 include rural development, food safety, and income inequality. The topic "rural China" for cluster 4 # ranks the second in the whole list. It relates to such subtopics as chronic poverty, anti-risk mechanism, health insurance, microfinance, welfare participation, life satisfaction and household income. The cluster also highlights studies on rural education, including topics like migrant children, left-behind children, higher education, school enrollment, Chinese parenting, and early child development.

- 5# Social capital, 6# land degradation, 7# rural housing

Cluster 5 features social capital, including human capital, mental health, and gini coefficient. There also appeared after 2020 rural e-commerce, dietetic diversity, and digital information technology. Land degradation, the biggest node in cluster 6, first appeared in 2006 and received continuous attention, covering mainly land use transformation, ecological restoration, ecosystem service, and land conservation. Social policy is the most frequent subclustering topic of cluster 7, mainly on social welfare policy and leadership. For example, Dorothy Solinger and others(2021) discussed the impact of urban development on rural population in China.[2] Louise Tillin(2012) examined the role of political leaders in China, India and other emerging countries in formulating government measures to solve poverty and other problems.[2] Some other topics include ecological vulnerability, Southwest China, mountainous area etc.

- Other Clusters

Cluster 8 # and 9 # are sustainable development and sustainable development goals, respectively, with the first publication of sustainable development earlier, and the sustainable development goals were published more centrally around 2016, which mainly involve climate policy), agricultural transformation, public policy , impact assessment, grain reversion project, agricultural policy, policy evaluation, etc. Cluster10 has two main themes: multidimensional poverty measure and targeted poverty alleviation, which are distributed after 2017, covering basic medical

insurance policy, corporate social responsibility, poverty-stricken area, corporate charity, government assistance, etc. Cluster 11 “conomic growth” has also received sustained attention from an early stage, involving topics such as developing countries, absolute poverty and international trade.

3.2 Analysis of Cooperative Networks

CiteSpace provides three kinds of cooperative networks, including coauthor cooperation, institutional cooperation, and cooperation between nations (regions).

“Figure 5” depicts the top 50 co-authors. It can be seen that the network is not dense. The most prominent is the network of co-authors in the center of the network, which centers on SCOTT ROZELLE, connecting the upper RENFU LUO and the lower LINXIU ZHANG team. The two teams both are of the Institute of Geography of the Chinese Academy of Sciences. The main concerns of LUO RENFU's team are the quality of rural family nurturing, nutrition and early development of children, as well as schooling of rural children; ZHANG LINXIU's team are mainly concerned with maternal and child health care in rural areas, children dropping out of school, migrant working, rural poverty related human capital and social capital. SCOTT ROZELLE is the director and senior researcher of the Asia Pacific Research Center at Freeman Spogli Institute (FSI) at Stanford University, USA, and has been awarded the Friendship Award by the Chinese government as a foreign expert. He is the most frequent co-author in the network, whose research area covers also the impact of free trade of farm goods on poverty, and the evaluation of land rehabilitation and reforestation projects. Coauthorship over 20 times also includes the team of SHUI CHUANMIN of China University of Geoscience and XU DINGDE of Sichuan Agricultural University. Both teams are concerned with ecological poverty alleviation, with the former focusing on poverty alleviation assessment of photovoltaic projects and the impact of natural disasters, while the latter specializing in the impact of geological disasters, ecological migration and migrant workers employment in Sichuan Province.

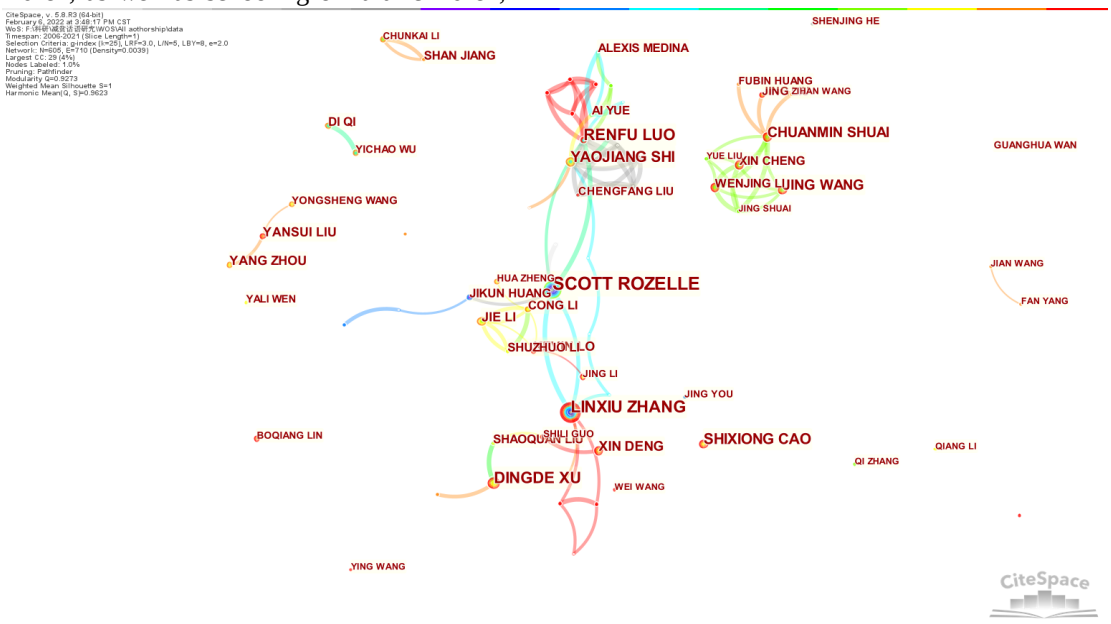

Figure 5 Co-authorship Network of WOS China Poverty Alleviation Studies 2006-2021.

“Figure 6” shows the cooperative network of institutions, with the size of nodes signaling the frequency of publication, and the top ten institutions are: Chinese Academy of Sciences, Peking University, Beijing Normal University, Renmin University China, University of Chinese Academy of Sciences, Stanford University, Sichuan University, Tsinghua University, Xi'an Jiaotong University and China Agricultural University. The variety of colors in the links indicates that these institutions are paying constant attention to poverty reduction. The dense purple network is based on a 2012 survey of social capital levels of AIDS patients in several countries, including China. Similar dense networks also suggest a high degree of collaboration among health and health research institutions.

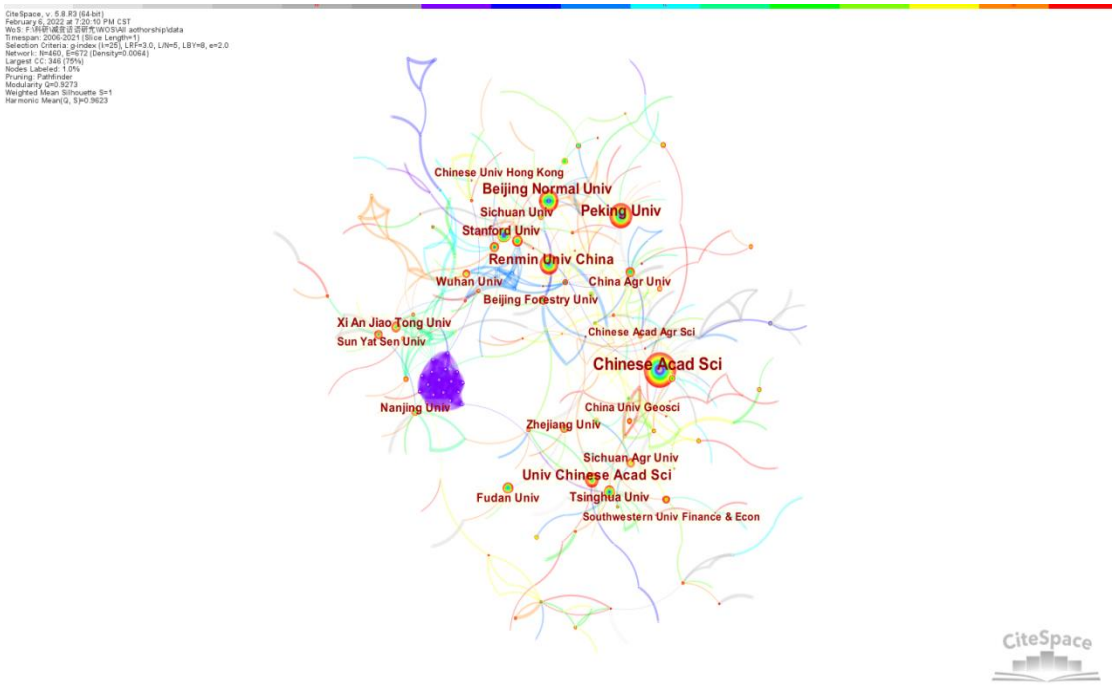

Figure 6 Institutional Collaboration of WOS China Poverty Alleviation Studies 2006-2021.

The cooperation network between nations shows that 124 countries have published papers on the topic, and "Table 2" lists the top 10 countries (regions): China, the United States, England, Australia, Canada, Germany, the Netherlands, India, Japan and South Africa.

Table 2. Top 10 Countries(Regions) of WOS China Poverty Reduction Research 2006-2021

No.	Records	Country (Region)	first publication year
1	2166	PEOPLES R CHINA	2006
2	616	USA	2006
3	213	ENGLAND.	2007
4	197	AUSTRALIA.	2008
5	85	CANADA.	2008
6	83	GERMANY.	2010
7	54	NETHERLANDS.	2009
8	47	INDIA.	2007
9	43	JAPAN.	2007
10	35	SOUTH AFRICA.	2011

3.3 Analysis of Co-citation

Co-citation is a primary function of CiteSpace for detecting the hidden dynamics of a specific research area through analysis of the connections between the papers now that he highly cited literature bridges the relevant studies. The network consists of 109517 references, with a time slice of each 1 year, and the first 5% included in each slice, no more than 50 records, and 22 clusters were found by path finding algorithm. "Figure 7" shows the map of the first 9 clusters.

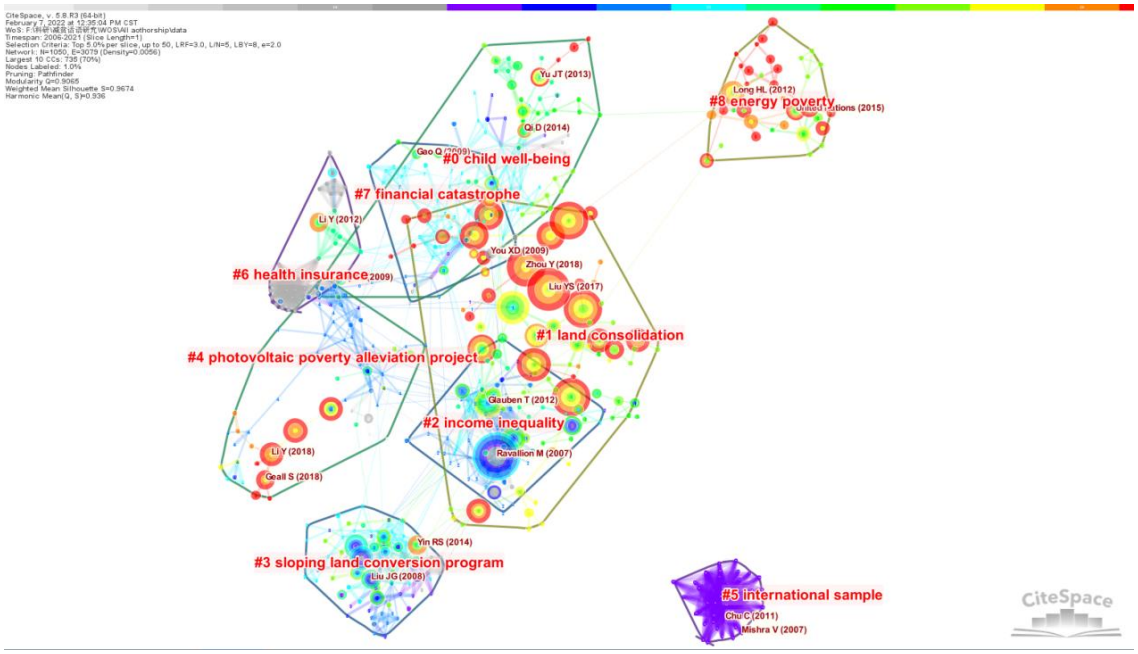

Figure 7 Clusters of Co-citation References of WOS China Poverty Alleviation Studies 2006-2021.

The map visualizes the basic research networks of co-citation relationship, arranged in an order of cluster size: 0# child well-being, 1# land consolidation, 2# income inequality, 3# sloping land conversion program, 4 # Photovoltaic poverty alleviation project, 5 # international sample, 6 # health insurance, 7 # financial catastrophe, 8 # energy poverty. Clusters with larger and diverse members are more representative. Clusters 5 are relatively independent and consistent in years, which may be caused by relatively isolated studies or the citation behavior of a few publications, and a closer investigation of the corresponding literature indicates that these are led by a survey on the transnational AIDS population.[3] Except cluster 5, other clusters have more varied links and are continually updated.

The largest cluster 0 has 87 documents, with an S value of 0.941, and both LLR and LSI label it as Child Welfare. The literature with the highest citation coverage is on urban and rural comparison of China's policy on dibao insurance.[4] The most top cited paper concerns the multidimensional poverty measure, proposing a poverty dimension involving income, living conditions, education, health and social security, and the difference between rural poverty and urban poverty were compared.[5] The second most cited paper compares the multidimensional child poverty data in China chronologically and the degree of poverty between provinces.[5] Both can be traced back to earlier multidimensional poverty measurement, as the basic knowledge structure in this field, and further build up studies on the nutrition, education and development of rural children.

The second largest cluster (1#) has 85 documents. The S value is 0.926, LLR labeled it as "Land Renovation", while LSI labeled it as "rural family". It has a highly frequent co-citation with the average publishing year of 2014, second only to cluster 8 in updating. The most frequently cited literature is a paper published by Liu Yansui in 2017. This paper discusses the spatial and temporal pattern of poverty in rural China and analyzes its objectives. It points out that the main reasons for the persistence of poverty in the poverty-striken areas are lack of natural resources, poor geographical conditions and fragile ecological environment.[6] This paper is also the most cited among all the papers. The second most frequently cited is an paper on China's precision poverty alleviation and land policy published by Zhou Yang (2018) and others in the following year.[7] The paper reveals the mechanism of land policy innovation promoting precision poverty alleviation, and suggests that innovative land policy and sustainable development policy need to guard against potential risks while effectively contributing to poverty reduction. This paper is also the paper with the highest citation coverage in this cluster. “Table 3” lists the top five articles with the highest frequency of citation. It can be seen that the main subjects covered is the relationship between land

improvement and rural population and rural rejuvenation.

Table 3. Top Citations of WOS China Poverty Alleviation Studies 2006-2021

coverage	citation	coverage2	cited
26	Zhou, Yang et al.(2018) Targeted poverty alleviation and land policy innovation: some practice and policy implications from china. LAND USE POLICY, V74.	93	Liu, Y. S et al., (2017)Spatio-temporal patterns of rural poverty in China and targeted poverty alleviation strategies. *J Rural Stud*, *52*, 66-75.
12	Xu, Dingde et al(2019) Relationships between labor migration and cropland abandonment in rural china from the perspective of village types. LAND USE POLICY	78	Zhou, Yang et all.(2018) Targeted poverty alleviation and land policy innovation: some practice and policy implications from china. LAND USE POLICY, V74.
11	Cheng, Xin et al(2021) The impact of rural land consolidation on household poverty alleviation: the moderating effects of human capital endowment. LAND USE POLICY	57	Liu, Y., & Li, Y. (2017). Revitalize the world's countryside. Nature, 548(7667),
11	Qiang, Ren et all(2018) The poverty dynamics in rural china during 2000-2014: a multi-scale analysis based on the poverty gap index. JOURNAL OF GEOGRAPHICAL SCIENCES, V28, P17	47	1. Lo, K.; Xue, L. Y.; Wang, M.,(2016) Spatial restructuring through poverty alleviation resettlement in rural China. J Rural Stud , 47, 496-505.
10	Guo, Yuanzhi (2021) Poverty alleviation through land assetization and its implications for rural revitalization in china. LAND USE POLICY	42	Alkire, S., & Foster, J. (2011). Understandings and misunderstandings of multidimensional poverty measurement. Journal of Economic Inequality, 9(2), 289–314.

The third largest cluster (#2) has 76 articles, and S value is 0.935, with the average publishing year being 2009. LLR labels it as "Income Inequality" and LSI marks it "Economic Reform". The most relevant citation literature examines the poverty dynamics in rural China in terms of agricultural assets, suggesting a more significant role of agricultural assets in the structural change of household income.[8] The most frequently cited literature in this cluster is an early paper by Ravallion & Chen (2007), which assesses China's achievements in poverty reduction at the end of the 20th century and its imbalances.[9]

The fourth largest cluster (#3) contains 74 papers. S is 0.97, and the average publishing year is 2009. LLR labels it as "Sloping Land Conversion Program" and LSI labels it as "Ecosystem Services". The most relevant reference to this cluster is a paper by H J Koenig (2014) of the Leibniz Agricultural Landscape Research Center in Germany and its collaborators, which evaluates the impact of this plan on sustainable poverty reduction and development in rural areas, taking the project for conversion of farmland to forests on mountain slopes in Guyuan, Ningxia, in western China.[10] The most frequently cited papers under this cluster are that of Liu Jianguo and others (2008) on the ecological and socio-economic effects of China's ecosystem services policy.[11]

The fifth largest cluster (#4) has 66 papers. S value is 0.969, and the average publishing year is 2010. The most cited document is an assessment by Geall et al (2018) on China's solar photovoltaic project launched by both the central and local governments, and gives a case evaluation of the project in Guinan County, Qinghai Province.[12]

4. CONCLUSION

The subject word mapping shows a wide range of research topics, with the rural issues being the most prominent. 4 out of the 12 biggest clusters are labeled as “rural”, which can be a sign of the imbalance of urban and rural development and insufficient rural development. The second biggest cluster "poverty alleviation" has been strengthened gradually over the years. The leading clusters basically cover various poverty alleviation measures, involving employment, education, financial support, health services, ecological poverty alleviation and social insurance. Emerging researches after 2020 signal potential researches in e-commerce poverty alleviation, information management, hierarchical governance system and governing efficiency.

The co-authorship network suggests international collaboration on various levels. The largest research teams are mainly concentrated in education, child development, ecology and land use. At the institutional level, 9 of the top 10 institutions are Chinese scientific research institutions and universities, with Chinese Academy of Sciences ranking the first, and the only overseas institution is Stanford University in the United States, which has cooperative relations with many Chinese institutions. At the macro level, China is the largest research power, accounting for about 2/3 of the literature, followed by the United States, England, and Australia and some others.

According to the literature co-citation network, some influential research results have been achieved, mainly in the fields of land improvement, rural revitalization and inclusive economic growth.

And some new concepts and ideas about the theory and practice of poverty reduction have been put forward, which are expected to be further verified, applied and developed in China's as well as international poverty alleviation practices.

AUTHORS' CONTRIBUTIONS

This paper is independently completed by Liyan Zhou.

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