Ciência Rural, Santa Maria, v.53:2, e20201107, 2023 http://doi.org/10.1590/0103-8478cr20201107
ISSNe 1678-4596
RURAL SOCIOLOGY

# Visualizing the knowledge domain of anti-poverty research between 2011 and 2020: a bibliometric analysi in CiteSpace

**Yexing Yin** [1*] **Abbas Ali Chandio**[2] **Yun Shen**[2]

[1]Institute of Rural Development, Sichuan Academy of Social Sciences, Chengdu, China. E-mail: yinyx@smail.swufe.edu.cn.*Corresponding author.
[2]College of Economics, Sichuan Agricultural University (SAU), Chengdu, China.

**ABSTRACT**: *The elimination of poverty and hunger in all its forms and dimensions is one of the key objective of global sustainable development (GSD). This paper analyzed the characteristics of literature release, research progress and frontier trends in the field of anti-poverty in the past ten years by means of bibliometrics, and information visualization. Using CiteSpace to analyze the literature on anti-poverty in the core journals of Web of Science and Scopus (W&S), and China National Knowledge Infrastructure (CNKI). The results showed that:(1) The heat of anti-poverty research is on the rise in both W&S and CNKI, the growth rate of Chinese literature published is significantly higher than that of English literature after 2015, but the international influence is not enough. (2) Researchers and institutions in W&S are more independent than in CNKI. The Chinese research team is more stable and larger, but it needs to be further strengthened in cross-institutional and interdisciplinary research. (3)The research content in W&S mainly focuses on influencing factors and poverty reduction mechanisms, ecosystem services, maternal health and sustainable development. According to the China National Knowledge Infrastructure (CNKI), China paid more attention to concrete ways to reduce poverty, and after completing the fight against absolute poverty by 2020, China will pay more attention to reducing relative poverty and solve multi-dimensional poverty problems by improving the security of medical care, education and housing conditions.*
**Key words**: *bibliometrics, knowledge system, anti-poverty, research hotspots, CiteSpace.*

# Visualizando o domínio do conhecimento da pesquisa anti-pobreza entre 2011 e 2020: uma análise bibliométrica no CiteSpace

**RESUMO**: *A eliminação da pobreza e da fome em todas as suas formas e dimensões é um dos principais objetivos do desenvolvimento sustentável global (GSD). Este artigo analisa as características da divulgação da literatura, o progresso da pesquisa e as tendências de fronteira no campo do combate à pobreza nos últimos dez anos por meio de bibliometria e visualização de informações. Uso do CiteSpace para analisar a literatura sobre combate à pobreza nas principais revistas da Web of Science e Scopus (W&S) e da China National Knowledge Infrastructure (CNKI). Os resultados mostram que: (1) O calor da pesquisa anti-pobreza está aumentando tanto na W&S quanto na CNKI, a taxa de crescimento da literatura chinesa publicada é significativamente maior do que a da literatura inglesa após 2015, mas a influência internacional não é suficiente; (2) Pesquisadores e instituições em W&S são mais independentes do que na CNKI; a equipe de pesquisa chinesa é mais estável e maior, mas precisa ser fortalecida ainda mais na pesquisa interinstitucional e interdisciplinar; (3) O conteúdo da pesquisa em W&S concentra-se principalmente nos fatores que influenciam e nos mecanismos de redução da pobreza, serviços ecossistêmicos, saúde materna e desenvolvimento sustentável. De acordo com a China National Knowledge Infrastructure (CNKI), a China prestou mais atenção a formas concretas de reduzir a pobreza e, após completar a luta contra a pobreza absoluta até 2020, a China prestará mais atenção à redução da pobreza relativa e resolverá os problemas de pobreza multidimensional em melhorar a segurança dos cuidados médicos, educação e condições de habitação.*
**Palavras-chave**: *bibliometria, sistema de conhecimento, combate à pobreza, hotspots de pesquisa, CiteSpace.*

## INTRODUCTION

With the adoption and formal launch of the 2030 agenda for sustainable development at the United Nations General Assembly, the elimination of poverty in all its forms throughout the world has become the first objective to advance sustainable development. In recent years; although, great progress has been made in the fight against poverty all over the world, the progress is uneven in different regions. Serious poverty and health problems still exist in some regions, such as central Africa, South Asia

Received 12.22.20 Approved 01.06.22 Returned by the author 05.24.22
CR-2020-1107.R1
Editors: Rudi Weiblen Silviu Beciu

and many small island countries. The increasingly uncertain world politics and economy, the conflict between industrial development and environmental issues have brought new challenges to global poverty management and aroused the international community's thinking on world poverty reduction and development. According to the World Bank, there were 632 million peoples have been living in absolute poverty worldwide in 2019, with a poverty rate of 8.2 percent. As a result of the new crown virus pandemic, the world probably have added 40 to 60 million people to the poverty line by the end of 2020, it will be the first global increase in poverty since 1998. The year 2020 is the end of China's strategy for overcoming poverty. China will also face a series of problems such as preventing social risks, adjusting policies and changing national strategies.

Looking back on the past few decades, governments and international organizations have made anti-poverty a focus of their attention and a long-term challenge. They have taken a series of measures to promote the global anti-poverty work and accumulated a lot of successful policy and practical experience. China has also made anti-poverty a major national strategy and has achieved remarkable results in the past decade, making a significant contribution to global anti-poverty efforts (LIU et al., 2020). During this period, anti-poverty issues have also received great attention from research institutions and scholars in various countries. The research results have played an important role in the process of public policy designing and government decision-making. The impact of academic research on politics has gradually become more comprehensive, direct and powerful. Literature review is considered to be an effective way to deeply understand the research field (ZUO & ZHAO, 2014), and a systematic review of the existing literature will help scholars and governments to seek deeper solutions to the problem of anti-poverty.

Since Web of Science (WOS) is an important database of global academic resources, containing the most influential core academic journals in various fields of research, it has a relatively high authority for scholars in most countries. Scopus, currently the largest abstract and index database in the world, contains a larger number of journals and papers, is an important supplement to WOS. Although, many papers by Chinese are included in WOS and Scopus (W&S), CNKI (the largest database of academic documents in China) still contains a large number of excellent research and important discussions in the field of anti-poverty. The main reason may be due to the limited English writing skills of many Chinese top scholars and the call of the Chinese government to publish important papers in domestic journals since 2016. Therefore, the combination of the three can comprehensively reflect the research situation in the field of anti-poverty in Chinese and English literature.

In view of this, the current study uses CiteSpace (JIE & CHEN, 2016) as a bibliometric tool to carry out quantitative statistical analysis and qualitative description of the literature of anti-poverty research in the past ten years. It provides a comparative analysis of publishing trends, cooperative networks, knowledge base, and research hotspots based on W&S and CNKI databases. With a sample of 7081 English studies in W&S and 5635 Chinese studies in CNKI, this study explored the research status, development course, and potential trends of anti-poverty research. It presents the knowledge structure of the global anti-poverty field from 2011 to 2020, which can be used as a useful reference for other scholars, and provide experience for the government to promote the sustainable development of urban and rural areas.

## MATERIALS AND METHODS

*Data source and search strategy*

WOS's core database is considered to be an appropriate source of data for scientometric analysis (ARCHAMBAULT et al., 2009), which can effectively guarantee the authority of data selection (YAO et al., 2014). The retrieval formula is as follows: TS = (poverty alleviation) OR (TS = anti-poverty) OR (TS = poverty reduction), literature type is research article, the time span is set from 2011 to 2020, the source journal is set to Social Sciences Citation Index (SSCI), and 3094 records were retrieved. To ensure the comprehensiveness of the data, we searched the Scopus database again with the same retrieval strategy as above, and obtained 9513 documents. In order to make the analysis more accurate, we adjusted and merged the two data sets, removing duplicate data, advertisements, letters and other extraneous material, and ended up with 7081 pieces of information.

CNKI was used to search studies in Chinese, the search terms were "poverty alleviation" or "anti-poverty" or "poverty relief", the time span is also set from 2011 to 2020, the source of the journal is only set as Chinese Social Sciences Citation Index (CSSCI), and 5921 studies were obtained. In the process of data processing, we eliminated advertisements, book reviews, topic guides and biographies, and finally got 5635 records.

*Methods and tools*

Visual analysis is an important means to reveal the internal characteristics and laws of information. It can visualize a large amount of data and information so as to improve people's discovery, understanding, analysis and formation of the whole concept of things. Knowledge map is an important branch of visualization research. It integrates the theories and methods of applied mathematics, graphics, information science, and metrology. It can systematically describe the core structure, development history, frontier fields and the whole knowledge structure of a certain research field (ZENG et al., 2019; SHI & LIU, 2019).

CiteSpace is a knowledge mapping software developed by Dr. Chaomei Chen of the Drexel University in the United States, which has the characteristics of multiple, time-sharing and dynamic (CHEN, 2006). It can promote analytical reasoning through data mining of literature and visual interaction, thus effectively helping scholars to better understand the field of research they are engaged in it (ZHU & HUA, 2017). In this study, CiteSpace was used to generate the author collaboration network, institution collaboration network, subject categories co-occurrence network, burst detection, and so on. It is a systematic demonstration of the structural relationships between various knowledge units in academic research and the evolution path of subject knowledge (YIN & CHOWDHURY, 2001; DIEGO et al., 2019).

## RESULTS AND DISCUSSION

*Quantitative analysis of the studies on anti-poverty*

The annual distribution of publications can reflect the development progress, research hotspots, and the changing trend of research on anti-poverty. This study makes a preliminary statistical analysis of the publication of Chinese and English literature (Figure 1). It shows that although there are some differences in the number of anti-poverty studies issued in W&S and CNKI, they all show an upward trend on the whole. During the period 2011-2015, the number of literature in W&S was slightly higher than that in CNKI, but after 2015, the number of literature in CNKI showed a blowout growth trend, and its growth range were much higher than that in W&S, and reached a peak of 1259 in 2020. The possible reason is that General Secretary Xi Jinping, in response to various practical problems in China's anti-poverty campaign, put forward the concept of targeted poverty alleviation at the end of 2013, which promoted a major transformation of China's poverty alleviation strategy. The promulgation of important policy documents such as *The Decision of the CPC Central Committee and the State Council on Winning the Battle against Poverty* in 2015 has injected vigorous momentum into the academic circles.

The country collaboration network can reflect the degree of attention and cooperation of different countries on anti-poverty issues. In this

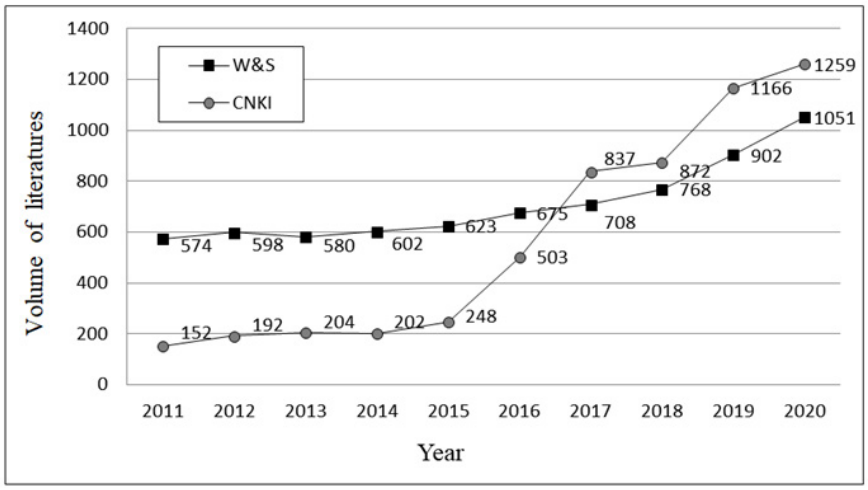


Figure 1 - Annual distribution of the studies on anti-poverty from Web of Science and Scopus (W&S) and China National Knowledge Infrastructure (CNKI).

study, visualization analysis was conducted with the software CiteSpace (Figure 2), by setting the Node Types to “country”, setting the time slice to one year. In figure 2, the node represents each country, and the number of annual studies is displayed with different color and size rings. The connection represents the cooperative relationship of each country (CHEN et al., 2012). Obviously, the cooperation network between countries has been initially formed, and academic research mainly revolves around the United States. However, the connection between the nodes is thin, indicating that the cooperation between countries is not strong enough.

Through the data analysis of literature quantity and centrality, we can understand the contribution and influence of each countries (Table 1). For the past ten years, W&S database contains 2598 articles from American scholars, accounting for 36.68% of the total literature, and the United States ranks first in the number of articles published, followed by United Kingdom with 1256 articles in the second place. China, Australia, and Canada also have a relatively large number of papers included in the W&S. Centrality is the indicator of determining the importance of a node in the network. The higher the centrality, the more important the node is in the network. In terms of network centrality, the United States, Germany, Netherlands, the United Kingdom, Australia, and Canada have higher scores, indicating that they play important roles in the global research network in the field of anti-poverty. Although, China has made a great contribution to the anti-poverty practice in the world and has published a large number of papers in English, its centrality scores only reach 0.05, indicating that its international influence in academic research is not strong enough.

The number of papers published by research institutions and the cooperation network can reflect their research capacity and social influence. Set the Node Types to “Institution”, the time slice to one year, select the top 50 institutions in each stage, then run CireSpace get the pictures of cooperative network of research institutions (Figure 3). Each circle in the picture corresponds to a research institution. The line indicated that there is a cooperative relationship between the institutions, and the line thickness represents the degree of cooperation. According to the analysis of W&S database (Figure 3a), the World Bank, the International Food Policy Research Institute, the Chinese Academy of Sciences and Oxford University have contributed the most to the publication of English literature in the past 10 years.

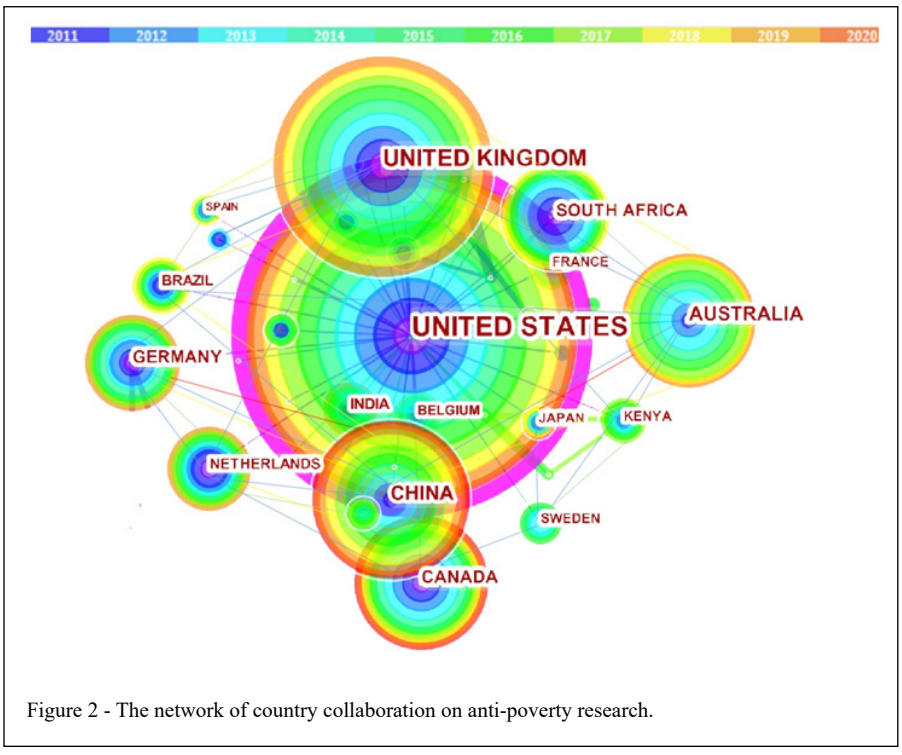


Figure 2 - The network of country collaboration on anti-poverty research.

Table 1 - The top ten countries that contributed to publications.

| No. | Country | Quantity | Centrality |
|---|---|---|---|
| 1 | UNITED STATES | 2598 | 0.29 |
| 2 | UNITED KINGDOM | 1256 | 0.11 |
| 3 | CHINA | 785 | 0.05 |
| 4 | AUSTRALIA | 567 | 0.11 |
| 5 | CANADA | 432 | 0.11 |
| 6 | SOUTH AFRICA | 379 | 0.05 |
| 7 | GERMANY | 326 | 0.25 |
| 8 | NETHERLANDS | 293 | 0.15 |
| 9 | INDIA | 258 | 0.02 |
| 10 | SWEDEN | 187 | 0.09 |

The overall connectivity of the network map is strong, indicating that the cooperation between institutions is close. Meanwhile, within the CNKI data (Figure 3b), we found that China Agricultural University, Renmin University of China, Central South University for Nationalities, Wuhan University and Central China Normal University are high-yielding institutions in Chinese publications.

The number of papers published by the authors and the collaboration network revealed their contribution to this field and co-operatives relationship during this period, and the top 10 authors are listed (Table 2). In W&S, Liu Y from Chinese Academy of Sciences ranks first with 21 papers published, followed by Shackleton CM (Rhodes University, 17 papers), Abdoulaye T (International Institute of Tropical Agriculture, 15 papers) and Handa S (United Nations International Children's Emergency Fund, 14 papers). They are more inclined to conduct independent research and have not formed a large-scale research team. In the Chinese literature, Wang Sangui from Renmin University of China has published 39 papers and is the most published scholar so far. He has formed a stable network of cooperative relations with Yin Haodong (Development Research Center of the State Council), Zeng Xiaoxi (Renmin

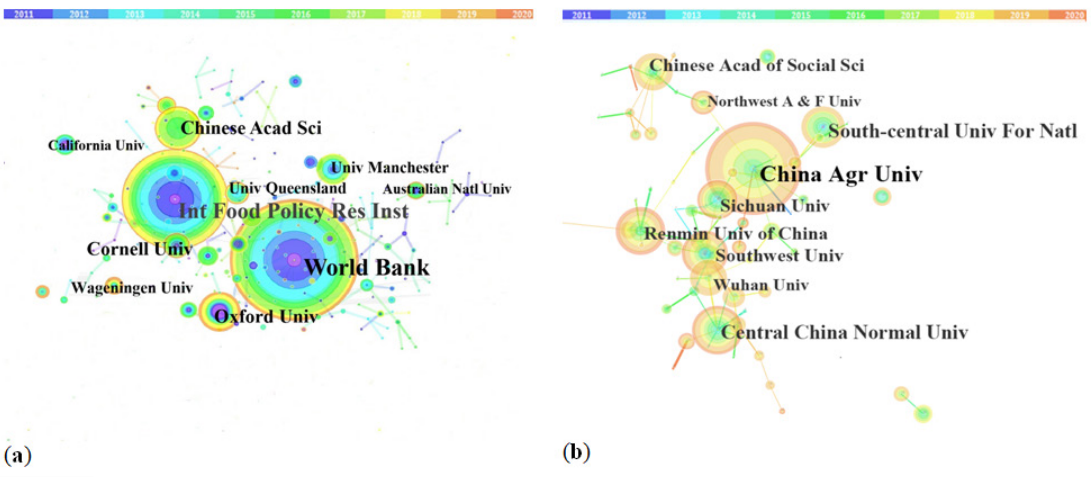


Figure 3 - The network of institution collaboration on anti-poverty research in Web of Science and Scopus(a) and in China National Knowledge Infrastructure(b).

Table 2 - The top 10 authors of anti-poverty research in Web of Science and Scopus (W&S) and China National Knowledge Infrastructure (CNKI).

| No. | Authors in W&S | Quantity | Authors in CNKI | Quantity |
|---|---|---|---|---|
| 1 | LIU Y | 21 | WANG SANGUI | 39 |
| 2 | SHACKLETON CM | 17 | ZUO TING | 33 |
| 3 | ABDOULAYE T | 15 | ZHANG QI | 32 |
| 4 | HANDA S | 14 | HUANG CHENGWEI | 28 |
| 5 | CHRISTIAENSEN L | 12 | LI XIAOYUN | 26 |
| 6 | WANG Y | 11 | ZHUANG TIANHUI | 26 |
| 7 | JAYNE T S | 10 | XIANG DEPING | 24 |
| 8 | CHOU KL | 9 | WANG ZHIZHANG | 21 |
| 9 | SOMMERS B D | 9 | ZHEN RUIQIANG | 19 |
| 10 | WOSSEN T | 9 | XING CHENJU | 18 |

University of China), Yang Long (Fujian Agriculture and Forestry University) and Wu Benjian (Central University for Nationalities). Zuo Ting (China Agricultural University) and Zhang Qi (Beijing Normal University) ranked second and third respectively in the number of articles issued.

*Important literature on anti-poverty*

CiteSpace can provide scientific and intuitive citations information, so that researchers can easily identify the foundation literature and important studies at the forefront of the subject. For the W&S data, we conduct the reference co-citation analysis, reflecting the situation that two (or multiple) articles are cited by other articles at the same time, to show the relationship between the studies and the common research direction. The centrality of each article represents the degree of importance in the network (PAN & HE, 2018). By setting time slice = 1 year, top N = 30, using the MST (minimum scheduling tree) method for network pruning, we get the co-citation knowledge map of the English literature (Figure 4). The results showed that, *Designing payments for environmental services in theory and practice: An overview of the issues*, published in *Ecological Economics* by Engel S in 2008, has the highest co-citation intensity (128) and high centrality (0.6). ENGEL S (2008) made a detailed analysis of the definition, operational mechanism and policy design of environmental services (PES) payments. He argued that PES, as a mechanism to translate external, non-market values of the environment into real financial incentives for local actors to provide environmental services, is more attractive to poor and landowners in remote areas. On the basis of the above, DAW T (2011) applied the concept of environmental services to poverty alleviation and discussed the classification and poverty reduction mechanisms for environmental services from the perspective of human well-being. FISHER (2014) proposed Ecosystem services and poverty alleviation (ESPA) conceptual framework, which serves as the basis for multidisciplinary and policy-relevant research.

The studies by ALKIRE S (2007), SCHILCHER D (2007), LONDON T (2010) and FISZBEIN A (2009) also with centrality values greater than 0.25 and them all have high co-citation intensity. These scholars promoted the development of multidimensional poverty theory and measurement methods, and emphasized that the lives of the rural poor can be effectively improved by creating common value with agribusiness, advancing agricultural development, developing the pro-poor tourism industry, and linking ecosystem services to components of human well-being. These important studies constitute the knowledge base of anti-poverty research.

Due to the limitation of data structure, this study focuses on the analysis of highly-cited documents for CNKI data (Table 3). The landmark study in this field is *China's Targeted Poverty Alleviation*, published by WANG SANGUI & GUO ZIHAO (2015) in *Guizhou Social Sciences* in 2015, which was cited 1730 times. They believe that targeted poverty alleviation is the main way of poverty alleviation in rural areas in the future, and it is a challenging task to identify the poor accurately and take the right measures to support them. The followed is *The Difficulties, Countermeasures and Path Choice of Targeted Poverty Alleviation*, which was published by DENG WEIJIE (2014) and has

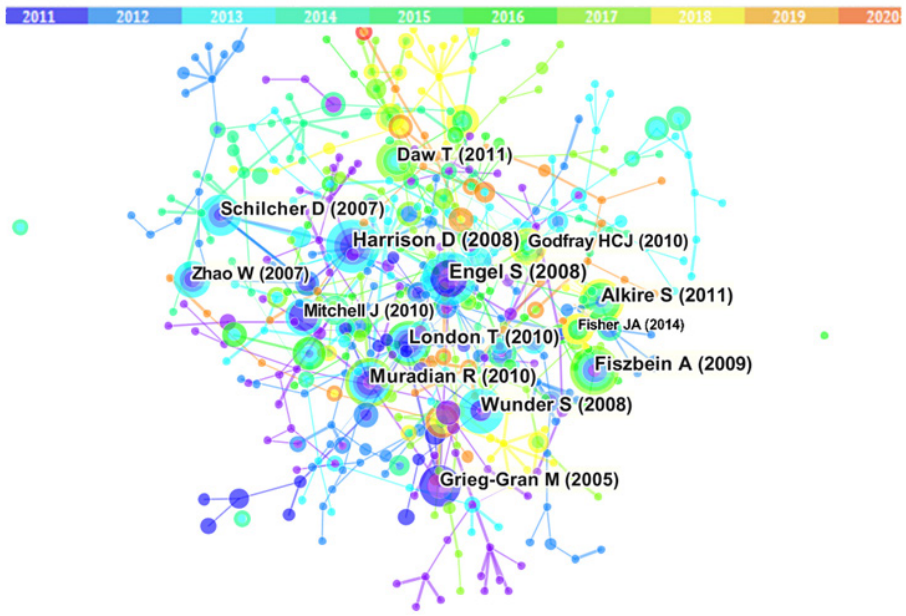


Figure 4 - The network of reference co-citation on anti-poverty research in Web of Science and Scopus.

been cited 1483 times. He pointed out that the size of the poor population and the difficulty of identifying the poor households are the main reasons for the difference in the effect of poverty alleviation. It would be necessary to carry out a national census and take classified measures to manage the poor households. In addition, GE ZHIJUN (2015) pointed out that the difficulties faced by poverty alleviation work are mainly in the aspects of social mobility in rural areas, insufficient funds for poverty alleviation, and lack of flexibility in policies. The articles published by ZUO TING (2015), TANG LIXIA (2015) and WANG GUOYONG (2015) were also cited more than 500 times. They respectively discussed the theoretical

Table 3 - Highly-cited studies on anti-poverty from China National Knowledge Infrastructure.

| No. | Title | Authors | Citation Count | Year |
|---|---|---|---|---|
| 1 | On China's Targeted Poverty Alleviation | WANG SANGUI & GUO ZIHAO | 1730 | 2015 |
| 2 | Difficulties, Countermeasures and Path Choice of Targeted Poverty Alleviation | DENG WEIJIE | 1483 | 2014 |
| 3 | Targeted Poverty Alleviation: Interpretation of Connotation, Practical Dilemma and Its Causes | GE ZHIJUN & XING CHENGJU | 1078 | 2015 |
| 4 | Targeted Poverty Reduction: Targeting, Theoretical Analysis and Practical Challenges | ZUO TING ,YANG YUXIN & ZHONG LIN | 785 | 2015 |
| 5 | Policy and Practice Dilemma of Targeted Poverty Alleviation Mmechanism | TANG LIXIA, LUO JIANGYUE & LI XIAOYUN | 632 | 2015 |
| 6 | Analysis on the Mechanism of Targeted Poverty Alleviation in China | WANG GUOYONG & XING WEI | 584 | 2015 |

innovation, policy making and working mechanism of poverty alleviation in China.

*Research hotspots*

Key words are one of the important parts of the article that express the core content of the research. The frequency analysis of key words is helpful to understand the research hotspots in the field of anti-poverty (REN et al., 2016). According to the statistical analysis of keywords, we listed the top 15 keywords of co-occurrence frequency, and calculated the centrality by CiteSpace (Table 4). The degree of centrality indicates the importance of the keywords (CHENG et al., 2018). In W&S, The keyword with the most frequent occurrence is poverty, which occurs 2104 times with a centrality of 0.27. This is probably due to the continuous discussion of the nature of poverty among scholars. The definition, measurement and manifestation of poverty have always been the focus of western scholars' attention, and their studies have formed the research foundation of anti-poverty field. Other keywords with high frequency and high centrality are as follows: poverty alleviation (1664, 0.14) , impact (1343, 0.18), women (1095, 0.25), policy (906, 0.19), inequality (756, 0.06), livelihood (674, 0.15), management (418, 0.13). These different keywords present a rich perspective on anti-poverty research in the English literature.

In CNKI, targeted poverty alleviation was the most frequent keyword (1,410 times), with the highest cardiac activity (0.24). It can be seen that how to accurately identify the poor population and provide accurate support measures is the most concerned issue of the Chinese government and scholars. The following keywords also reflect the direction of China's efforts in poverty reduction: development-orientated poverty reduction (307, 0.18), ethnic minority areas (267, 0.2), pro-poor tourism (226, 0.16), poverty governance (220, 0.11), and multidimensional poverty (217, 0.11).

From the distribution of keywords, we can see that in the English literature, scholars pay more attention to the influencing factors and mechanisms of poverty, They have made more rich and in-depth theoretical discussions in the field of anti-poverty, and have conducted detailed classified studies on women, children, equity, ecological services and other aspects. However, In Chinese journals, scholars have done a lot of research on the methods, models and efficiency evaluation of poverty alleviation. They paid more attention to ethnic minority areas and separately demonstrated the importance of regional development, pro-poor tourism, agricultural development, public culture and microfinance for poverty reduction.

In the process of keyword co-occurrence, nodes with higher co-occurrence frequency are closely related, and their clustering can reflect the same topic (WEI et al., 2019). Using the default algorithm LLR (Log-Likelihood Ratio) testing and MST (Minimum

Table 4 - High-frequency keywords in the field of anti-poverty.

| No. | Key word (Web of Science and Scopus) | Freq. | Centr. | Key word (China National Knowledge Infrastructure) | Freq. | Centr. |
|---|---|---|---|---|---|---|
| 1 | poverty | 2104 | 0.27 | targeted poverty alleviation | 1410 | 0.24 |
| 2 | poverty alleviation | 1664 | 0.14 | development-orientated poverty reduction | 307 | 0.18 |
| 3 | impact | 1343 | 0.18 | anti-poverty | 302 | 0.16 |
| 4 | women | 1095 | 0.25 | ethnic minority areas | 267 | 0.2 |
| 5 | policy | 906 | 0.19 | poverty alleviation | 267 | 0.07 |
| 6 | inequality | 756 | 0.06 | poverty eradication | 236 | 0.01 |
| 7 | livelihood | 674 | 0.15 | pro-poor tourism | 226 | 0.16 |
| 8 | management | 418 | 0.13 | developing industries | 221 | 0.04 |
| 9 | economic | 384 | 0.06 | poverty governance | 220 | 0.11 |
| 10 | governance | 332 | 0.08 | multidimensional poverty | 217 | 0.11 |
| 11 | child | 302 | 0.07 | rural revitalization | 213 | 0.02 |
| 12 | climate change | 293 | 0.05 | improving education | 197 | 0.04 |
| 13 | ecosystem service | 274 | 0.17 | poor households | 188 | 0.12 |
| 14 | developing country | 255 | 0.02 | culture communication | 174 | 0.05 |
| 15 | agriculture | 228 | 0.05 | financial service | 172 | 0.05 |

Scheduling Tree) pruning in CiteSpace, setting Node Types=keywords, Time Slice=1 year, Top N per slice=50, the cluster labels are extracted in this study. In W&S, the network had a modularity score of 0.5142 (>0.3), and the silhouette score was 0.6275 (>0.5), it shows that the clusters were well structured (CHEN, 2004). The results of cluster analysis are displayed in figure 5. There are seven clusters, and each polygon representing a subdivision of the field of anti-poverty research, and they are both cross-related and divergent. The details of each cluster are discussed below.

The largest cluster (#0 influence factor) includes 67 articles and the silhouette score is 0.608. In this theme, the impact factors of poverty have been fully discussed from the aspects of economic growth, globalization shock, migration, exchange rate, and so on, and extensive research on urbanization, reform and income equity has been carried out in the past two years (REHAM et al., 2018; KHAN et al., 2019). In 2020, the outbreak of COVID-19 attracted academic attention and caused heated discussion on a range of issues related to the global public health emergency and poverty (AKSEER N, 2020; BRAUER M, 2020).

The second cluster (#1 stress reduction) includes 52 articles, its silhouette score is 0.572. In this field, scholars have explored the interrelationship between poverty, stress, health and other issues. For example, HU J (2014) reported that patients living in high-poverty neighborhoods were 24 percent more likely to be readmitted to the hospital than others, and that individuals without social support performed similarly. COMMODORE-MENSAH (2016) noted that, the level of cardiometabolic risk (CMR) burden is closely related to socioeconomic status, Medicare status, geographical location and other factors. African Americans are 30% more likely to die from cardiovascular disease than whites. HJELM L (2017) believed that poverty reduction programs can reduce psychological stress, where food security is significantly related to stress perception, but cash transfer does not significantly reduce perceived stress.

The third cluster is #2 ecosystem services, which contains 49 articles and the silhouette score is 0.701. Most of the studies focused on issues such as poverty management, corporate social responsibility, biodiversity, ecologically sustainable development, and livelihoods. In recent years, discussions on the development of fisheries, land use, and environmental services have also increased (DAW et al., 2011; CAPPS et al., 2016). For example, in a study of Rwanda's green growth policy, BANERJEE et al.(2020) reported that the combination of crop fertilization and afforestation could better balance important ecosystem services and support economic development. JIAO et al. (2019) through a case study of the Greater Serengeti-Mara Ecosystem and its surrounding local communities in Tanzania and Kenya, found that the poorest people are highly dependent on environmental income, and that the degradation of protected area habitats will adversely affect income and may further reduce the welfare of the poorest families.

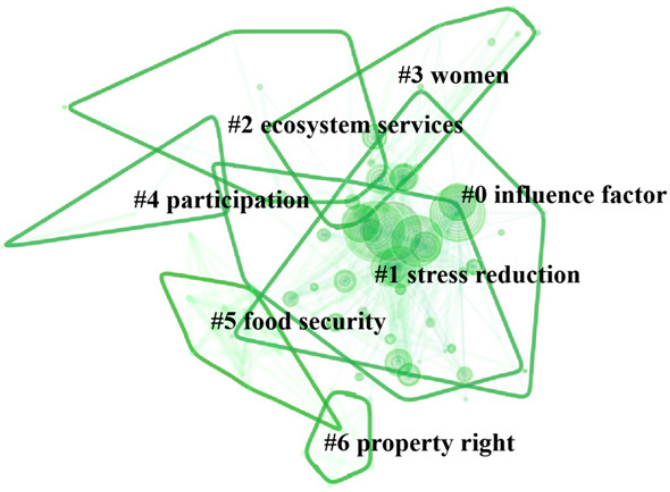


Figure 5 - Clustering map of keywords (Web of Science and Scopus).

The cluster #3 women includes 33 articles, the gender gap in anti-poverty efforts, especially in the areas of women's rights, employment and consumption, maternal health, has been fully discussed. After 2016, the issues of multi-dimensional poverty and entrepreneurial ability have attracted the attention of scholars (ANTONIADES et al., 2019). MEINZEN-DICK et al. (2019) reviewed the literature on women's land rights (WLR) and poverty reduction, he believed that WLR could reduce poverty and improve the well-being of women and their families in rural areas. FINLAY et al. (2018) reported that the improvement of reproductive health leads to the improvement of women's economic empowerment, and that women's working ability, education level and labor force participation rate have increased significantly, which is an important way for women and families to escape the poverty trap.

From the fifth cluster (#4 participation), we can see that government's participation in poverty reduction plays an important role in poverty alleviation (especially for children) through the formulation of strategies and policy design (GERRITSEN et al., 2019; WEATHERSPOON et al., 2019). RICHTER et al.(2018) believe that improving children's school readiness through optimal policies is critical to achieving social transformation in South Africa. Improving the quality of education, parental and family participation, home-based learning and preschool preparation are keys to reducing poverty and inequality.

The last two clusters are "#5 food security" and "#6 property right". SECK (2012) stressed that fears about global food security have led to soaring food prices and social unrest, resulting in poverty for hundreds of millions of people, and the rice sector should increase the rice yield ceiling through variety development and improved production methods. OZTURK (2017) believes that the poor in less developing countries are mainly affected by climate change, food security challenges, lack of water and inadequate power supply. He argued that agricultural sustainability is the prerequisite for reducing food-energy-water poverty. Researchers believe that by defining property rights, developing agriculture and tourism, rural economic growth can be promoted and rural livelihood problems can be effectively solved(GARZA-RODRIGUEZ, 2019; WANG et al., 2019).

By performing the same operation on the CNKI data, the clustering results of Chinese literature keywords are shown in figure 6. The modularity score is 0.5505, and the silhouette score is 0.5864, indicating the results are significant and reasonable. The map showed that Chinese anti-poverty research hotspots can be divided into the following 9 categories: #0 development-orientated poverty reduction (42,0.757), #1 prompting ambition (35,0.712), #2 targeted

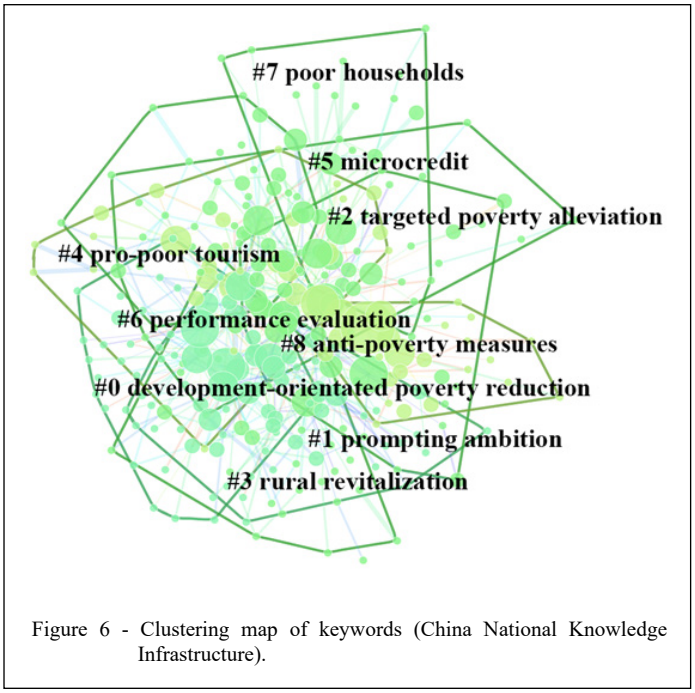


Figure 6 - Clustering map of keywords (China National Knowledge Infrastructure).

poverty alleviation (31,0.703), #3 rural revitalization (29,0.746), #4 pro-poor tourism (28,0.638), #5 microcredit (24,0.765),#6 performance evaluation (22,0.675), #7 poor households (22,0.721), and #8 anti-poverty measures (15,0.886).

From the overall content of the Chinese journal and the logic between the research hotspots, it can be seen that China has always adhered to the development oriented poverty reduction policy and made outstanding achievements in economic development, which has also inspired the aspiration of the poor people to get rid of poverty and become rich. After 2011, China has incorporated poverty control into the strategic goal of national governance, and implemented special government governance to mobilize all members of the party and government institutions, enterprises, the army, schools, social organizations and groups to participate. By the accurate identification of the poor population and the establishment of the archives of the poor households, and relying on the political and administrative advantages of the national system, the financial reserves of the central and local governments can be used to help the poor households effectively. By developing competitive industries, finding jobs elsewhere, relocating the poor, improving education, providing better healthcare, and guaranteeing basic living standard for people unable to work, the rural poor population has been greatly reduced.

According to the distribution of hot topics between Chinese and English journals in the past ten years, there are great differences in both hot keywords and hot clusters. In English literature, more attention is paid to the innovation and research of anti-poverty theory itself, and more keen to conduct in-depth discussion on the mechanism and principle of the problem. This may be related to the normative research paradigm and thinking mode formed by western scholars in the field of social science for a long time. In Chinese journals, scholars pay more attention to the practical methods and effect evaluation of solving the poverty problem at this stage. It may be due to the very limited time of the Chinese government's commitment to address the poverty problem of all the national population by the end of 2020. What is undeniable is that the development of global anti-poverty theories has provided a good reference and guidance for China's poverty reduction work. For example, China has made full use of the feasible capacity theory and the multidimensional poverty theory to set the minimum security standards for the poor in terms of food, clothing, education, medical care, housing and so on. China has also borrowed from the theory of ecosystem service in solving the poverty problem in high-altitude and remote rural areas, and has actively explored the ecological value conversion model in these areas. At the same time, China's successful poverty reduction practice has also become an important part of international poverty reduction and development, and its model has strong Chinese characteristics, especially in terms of government leadership and the participation of the whole people (CHEN, 2018; LI et al., 2016). In recent targeted poverty alleviation strategies, the participation of governments, enterprises, research institutions and common people have all played an important role, and the model and implementation plan of poverty reduction can provide reference to other countries in the world.

## CONCLUSION

This study conducted a scientometric review of the literature published between 2011 and 2020 in W&S and CNKI, and uses CiteSpace software to visualize the research progress, cooperation network, research hotspots, and frontiers in the field of anti-poverty. The conclusions are as follows:

Anti-poverty has become a hot issue in the world. In the past decade, the popularity of relevant research in W&S and CNKI has increased year by year, and the exponential growth of Chinese literature since 2015 has played a positive role in promoting the improvement of China's poverty alleviation policy. The United States and the United Kingdom have absolute advantages in the number and influence of English literature publication; although, China ranks third in quantity, the international influence still needs to be improved.

There is a certain cooperative relationship in the field of anti-poverty research in W&S and CNKI. Liu Y( Chinese Academy of Sciences), Shackleton CM (Rhodes University,), Abdoulaye T (International Institute of Tropical Agriculture) and Handa S (United Nations International Children's Emergency Fund) have a higher number of papers published, and prefer to complete the research independently, and their cooperation team is small. The cooperative team of Chinese scholars is more stable and larger, and has formed a network of author teams and research institutions with Wang Sangui (Renmin University of China), Zuo Ting (China Agricultural University), Zhang Qi (Beijing Normal University) as the core. Since anti-poverty has become a systematic project, it is necessary to further strengthen cross-institutional and interdisciplinary research in the future.

Based on the analysis of W&S data, there are seven landmark studies in this field that propose new research frameworks and concepts on anti-poverty emphasizing that agricultural development, pro-poor migration and linking ecosystem services to components of human well-being can effectively improve the lives of the rural poor. The topic of landmark studies in CNKI is mainly focused on targeted poverty alleviation, because a large number of poverty alleviation policies issued by the state every year stimulate the enthusiasm of Chinese scholars. Then, through keyword clustering analysis, it is reported that there are great differences in research emphasis in W&S and CNKI. The research topics of English literature can be divided into 7 clusters, while Chinese literature can be divided into 9 categories.

The comparative analysis of W&S and CNKI data showed that the evolution trend of research hot spots from 2011 to 2020 is not the same. In general, the common frontier topics of scholars from various countries in the future may involve issues such as poverty relief effort through consumption, innovation, health promotion of children and women, food security, green growth and sustainable development, etc.

## ACKNOWLEDGEMENTS

This research was funded by National Social Science Foundation Project of China, grant number 19FJYB022; Soft science project of the Ministry of agriculture and rural affairs of the People's Republic of China, grant number rkx201915.

## DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

## AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

## REFERENCES

ARCHAMBAULT, E. et al. Comparing of Science Bibliometric Statistics Obtained from the Web and Scopus. **Journal of the American Society for Information Science and Technology**, v.60, p.1320-1326, 2009. Available from: <https://doi.org/10.1002/asi.21062>. Accessed: Nov. 7, 2020. doi: 10.1002/asi.21062.

ANTONIADES, A. et al. Financial crises and the attainment of the SDGs: an adjusted multidimensional poverty approach. **Sustainability Science**, v.15, p.1683-1698, 2020. Available from: <https://doi.org/10.1007/s11625-019-00771-z>. Accessed: Nov. 12, 2020. doi: 10.1007/s11625-019-00771-z.

BANERJEE, O. et al. Economic, land use, and ecosystem services impacts of Rwanda's Green Growth Strategy: An application of the IEEM+ESM platform. **Science of The Total Environment**, v.729, 2020. Available from: <https://doi.org/10.1016/j.scitotenv.2020.138779>. Accessed: Nov. 12, 2020. doi: 10.1016/j.scitotenv.2020.138779.

BRAUER, M. et al. Global Access to Handwashing: Implications for COVID-19 Control in Low-Income Countries. **Environmental Health Perspectives**, v.15, 2020. Available from: <https://doi.org/10.1289/EHP7460>. Accessed: Nov. 15, 2020. doi: 10.1289/EHP7460.

CHEN C. Cite Space II: Detecting and visualizing emerging trends and transient patterns in scientific literature. **Journal of the American Society for Information Science and Technology**, v.57, p.359-377, 2006. Available from: <https://doi.org/10.1002/asi.20317>. Accessed: Nov. 15, 2020. doi: 10.1002/asi.20317.

CHEN, C. et al. Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. **Expert Opinion On Biological Therapy**, v.12, p.593–608, 2012. Available from: <https://doi.org/10.1517/14712598.2012.674507>. Accessed: Oct. 12, 2020. doi: 10.1517/14712598.2012.674507.

CHEN, C. Searching for intellectual turning points: Progressive knowledge domain visualization, **Proceedings Of The National Academy Of Sciences Of The United States Of America**, v.101, p.5303–5310, 2004. Available from: <https://doi.org/10.1073/pnas.0307513100>. Accessed: Oct. 12, 2020. doi: 10.1073/pnas.0307513100.

CHEN J. The realistic logics and practical paths of Xi Jinping's thought of targeted poverty alleviation in the new era. **Science of finance and economics**, v.7, p.48–58, 2018. Available from: <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2018&filename=CJKX201807006&uniplatform=NZKPT&v=TZeQIqsTkW-KdXqY2mDaVd8038UzPSDO6PUUaDpeDYK6dCFD1flaVnOSKQUqu9lo>. Accessed: Oct. 12, 2020. (in Chinese).

CHENG, F. F. et al. Mapping knowledge structure by keyword co-occurrence and social network analysis: Evidence from Library Hi Tech between 2006 and 2017. **Library Hi Tech**, v.36, p.636-650, 2018. Available from: <https://doi.org/10.1108/LHT-01-2018-0004>. Accessed: Oct. 12, 2020. doi: 10.1108/LHT-01-2018-0004.

CAPPS, K. A. et al. Poverty, urbanization, and environmental degradation: urban streams in the developing world. **Freshwater ence**, v.35, p.429-435, 2016. Available from: <https://doi.org/10.1086/684945>. Accessed: Oct. 12, 2020. doi: 10.1086/684945.

COMMODORE-MENSAH, Y. et al. Length of Residence in the United States is Associated With a Higher Prevalence of Cardiometabolic Risk Factors in Immigrants: A Contemporary Analysis of the National Health Interview Survey. **Journal of the American Heart Association**, v.5, 2016. Available from: <https://doi.org/10.1161/JAHA.116.004059>. Accessed: Oct. 12, 2020. doi: 10.1161/JAHA.116.004059.

DIEGO, C. G. et al. Knowledge areas, themes and future research on open data:A co-word analysis. **Government Information**

**Quarterly**, v.36, p.77-87, 2019. Available from: <https://doi.org/10.1016/j.giq.2018.10.008>. Accessed: Oct. 12, 2020. doi: 10.1016/j.giq.2018.10.008.

DENG WEIJIE. Difficulties, countermeasures and path selection of targeted poverty alleviation. **Rural Economy**, v.6, p.78-81, 2014. Available from: <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2014&filename=NCJJ201406017&uniplatform=NZKPT&v=ReDof9r5mUf0W9lzGzWG8gGcYl3kzGi9PMSXxA5pS_sWCChu6SeFrjSDomz3px8M>. Accessed: Oct. 12, 2020. (in Chinese).

DAW, T. et al. Applying the ecosystem services concept to poverty alleviation: The need to disaggregate human well-being. **Environmental Conservation**, v.38, p.370-379, 2011. Available from: <https://doi.org/10.1017/S0376892911000506>. Accessed: Oct. 12, 2020. doi: 10.1017/S0376892911000506.

ENGEL, S. et al. Designing payments for environmental services in theory and practice: An overview of the issues. **Ecological Economics**, v.65, p.663-674, 2008. Available from: <https://doi.org/10.1016/j.ecolecon.2008.03.011>. Accessed: Oct. 12, 2020. doi: 10.1016/j.ecolecon.2008.03.011.

FISHER, J. A. et al. Understanding the relationships between ecosystem services and poverty alleviation: A conceptual framework. **Ecosystem Services**, v.7, p.34-45, 2014. Available from: <https://doi.org/10.1016/j.ecoser.2013.08.002>. Accessed: Oct. 12, 2020. doi: 10.1016/j.ecoser.2013.08.002.

FISZBEIN, A. et al. Conditional Cash Transfers : Reducing Present and Future Poverty. **World Bank Publications**, The World Bank Group, number 2597, 2009. Available from: <https://ideas.repec.org/b/wbk/wbpubs/2597.html>. Accessed: Oct. 12, 2020.

FINLAY, J. E. et al. Identifying Causal Effects of Reproductive Health Improvements on Women's Economic Empowerment Through the Population Poverty Research Initiative. **Milbank Quarterly**, v.96, p.300-322, 2018. Available from: <https://doi.org/10.1111/1468-0009.12326>. Accessed: Nov. 15, 2020. doi: 10.1111/1468-0009.12326.

GERRITSEN, S. et al. Systemic Barriers and Equitable Interventions to Improve Vegetable and Fruit Intake in Children: Interviews with National Food System Actors. **International Journal of Environmental Research and Public Health**, v.16, 2019. Available from: <https://doi.org/10.3390/ijerph16081387>. Accessed: Nov. 15, 2020. doi: 10.3390/ijerph16081387.

GE ZHIJUN et al. Targeted Poverty Alleviation: connotation, practical dilemma and its reasons -- Based on the investigation of two villages in Yinchuan, Ningxia. **Guizhou Social Sciences**, v.5, p.157-163, 2015. Available from: <https://doi.org/10.13713/j.cnki.cssci.2015.05.025>. Accessed: Nov. 15, 2020. doi: 10.13713/j.cnki.cssci.2015.05.025.(in Chinese).

GARZA-RODRIGUEZ, J. Tourism and Poverty Reduction in Mexico: An ARDL Cointegration Approach. **Sustainability**, v.11, 2019. Available from: <https://doi.org/10.3390/su11030845>. Accessed: Nov. 15, 2020. doi: 10.3390/su11030845.

HU, J. et al. Socioeconomic status and readmissions: evidence from an urban teaching hospital. **Health Affairs**, v.33, p.778-785, 2014. Available from: <https://doi.org/10.1377/hlthaff.2013.0816>. Accessed: Nov. 15, 2020. doi: 10.1377/hlthaff.2013.0816.

JIE LI, CHEN C.M. CiteSpace technology text mining and visualization (Second Edition). **Capital University of Economics and Trade Press**, 2016. Available from: <https://www.researchgate.net/publication/308203904_CiteSpace_kejiwenbenwajuejikeshihua>. Accessed: Nov. 15, 2020.

JIAO X. et al. Protected areas, household environmental incomes and well-being in the Greater Serengeti-Mara Ecosystem. **Forest Policy and Economics**, v.106, 2019. Available from: <https://doi.org/10.1016/j.forpol.2019.101948>. Accessed: Nov. 15, 2020. doi: 10.1016/j.forpol.2019.101948.

KHAN, H. U. R. et al. Socio-economic and environmental factors influenced pro-poor growth process: new development triangle. **Environmental ence and Pollution Research**, v.26, p.29157-29172, 2019. Available from: <https://doi.org/10.1007/s11356-019-06065-2>. Accessed: Nov. 15, 2020. doi: 10.1007/s11356-019-06065-2.

LIU, M. et al. China's poverty alleviation over the last 40 years: successes and challenges. **Australian Journal of Agricultural and Resource Economics**, v.64, p.209-228, 2020. Available from: <https://doi.org/10.1111/1467-8489.12353>. Accessed: Nov. 15, 2020. doi: 10.1111/1467-8489.12353.

LI X. Y. et al. Discussion on the internationalization of China's poverty reduction experience. **China Agricultural University Journal of Social Sciences Edition**, v.33, p.18-29, 2016. Available from: <https://doi.org/10.13240/j.cnki.caujsse.2016.05.002>. Accessed: Nov. 15, 2020. doi: 10.13240/j.cnki.caujsse.2016.05.002. (in Chinese).

MEINZEN-DICK, R. et al. Women's land rights as a pathway to poverty reduction: Framework and review of available evidence. **AGRICULTURAL SYSTEMS**, v.172, p.72-82, 2019. Available from: <https://doi.org/10.1016/j.agsy.2017.10.009>. Accessed: Nov. 15, 2020. doi: 10.1016/j.agsy.2017.10.009.

OZTURK, I. The dynamic relationship between agricultural sustainability and food-energy-water poverty in a panel of selected Sub-Saharan African Countries. **Energy Policy**, v.107, p.289-299, 2017. Available from: <https://doi.org/10.1016/j.enpol.2017.04.048>. Accessed: Nov. 15, 2020. doi: 10.1016/j.enpol.2017.04.048.

PAN Y. N. et al. Construction of Expert Knowledge Map Based on Co-Author Network and Citation Network. **Information Journal**, v.37, p.128-132, 2018. Available from: <https://doi.org/10.3969/j.issn.1002-1965.2018.08.020>. Accessed: Nov. 15, 2020. doi: 10.3969/j.issn.1002-1965.2018.08.020. (in Chinese).

REN Z. Y. et al. Review and trend prospect of academic evaluation research in China-Based on the bibliometric analysis of 1429 literatures from 1998 to 2015. **Information Journal**, v.35, p.139-144, 2016. Available from: <https://doi.org/10.3969/j.issn.1002-1965.2016.12.025>. Accessed: Nov. 15, 2020. doi: 10.3969/j.issn.1002-1965.2016.12.025.(in Chinese).

REHAM, R. et al. Modelling the relationship between poverty, environment, and institutions: a panel data study. **Environmental science and pollution research international**, v.25, p.31459-31473, 2018. Available from: <https://doi.org/10.1007/s11356-018-3051-6>. Accessed: Nov. 15, 2020. doi: 10.1007/s11356-018-3051-6.

RICHTER, L. et al. The South African universal preschool year: a case study of policy development and implementation. **Child Care Health and Development**, v.44, p.12-18, 2018. Available from:

<https://doi.org/10.1111/cch.12511>. Accessed: Nov. 15, 2020. doi: 10.1111/cch.12511.

SHI, Y. et al. Research on the Literature of Green Building Based on the Web of Science: A Scientometric Analysis in CiteSpace (2002–2018). **Sustainability**, v.11, 2019. Available from: <https://doi.org/10.3390/su11133716>. Accessed: Nov. 15, 2020. doi: 10.3390/su11133716.

WANG S. G. et al.. On China's targeted poverty alleviation. **Guizhou Social Sciences**, v.5, p.147-150, 2015. Available from: <https://doi.org/10.13713/j.cnki.cssci.2015.05.023>. Accessed: Nov. 15, 2020. doi: 10.13713/j.cnki.cssci.2015.05.023. (in Chinese).

SECK, P. A. et al. Crops that feed the world 7: Rice. **Food Security**, v.4, p.7-24, 2012. Available from: <https://doi.org/10.1007/s12571-012-0168-1>. Accessed: Nov. 15, 2020. doi: 10.1007/s12571-012-0168-1.

TANG L. X. et al. The policy and practical dilemma of the implementation of targeted poverty alleviation mechanism. **Guizhou social science**, v.5, p.151-156, 2015. Available from: <https://doi.org/10.13713/j.cnki.cssci.2015.05.024>. Accessed: Nov. 15, 2020. doi: 10.13713/j.cnki.cssci.2015.05.024. (in Chinese).

WANG G. Y. et al. Analysis of the working mechanism of targeted poverty alleviation in China. **Rural Economy**, v.9, p.46-50, 2015. Available from: <https://webvpn.swufe.edu.cn/https/77726476706e69737468656265737421fbf952d2243e635930068cb8/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2015&filename=NCJJ201509009&uniplatform=NZKPT&v=38fn6VRuduEQPNRecH1wZEGZ_lIjDW717DVrKtgcr8K6GSLkOwQiQAMI6kwNLwqC>. Accessed: Nov. 15, 2020. (in Chinese).

WEI, R. B. et al. Comparative Study of Research Method Based on Document Co-citation and Co-words Analysis—Taking the Example of Co-words Analysis and Content Analysis, **Information Journal**, v.38, p.36-42, 2019. Available from: <https://doi.org/10.3969/j.issn.1002-1965.2019.02.006>. Accessed: Nov. 15, 2020. doi: 10.3969/j.issn.1002-1965.2019.02.006. (in Chinese).

WEATHERSPOON, D. D. et al. Stunting, food security, markets and food policy in Rwanda. **BMC Public Health**, v.19, 2019. Available from: <https://doi.org/10.1186/s12889-019-7208-0>. Accessed: Nov. 15, 2020. doi:10.1186/s12889-019-7208-0.

WANG, P. et al. Determinants of livelihood choice and implications for targeted poverty reduction policies: A case study in the YNL river region, Tibetan Plateau. **Ecological Indicators**, v.19, p.1055-1063, 2019. Available from: <https://doi.org/10.1016/j.ecolind.2019.02.007>. Accessed: Nov. 15, 2020. doi: 10.1016/j.ecolind.2019.02.007.

YAO, Q. et al. Scientometric trends and knowledge maps of global health systems research. **Health Research Policy and Systems**, v.12, 2014. Available from: <https://doi.org/10.1186/1478-4505-12-26>. Accessed: Nov. 15, 2020. doi:10.1186/1478-4505-12-26.

ZUO, J. et al. Green building research–current status and future agenda: A review. **Renewable & Sustainable Energy Reviews**, v.30, p.271–281, 2014. Available from: <https://doi.org/10.1016/j.rser.2013.10.021>. Accessed: Nov. 15, 2020. doi:10.1016/j.rser.2013.10.021.

ZUO, T. et al. Targeted Poverty Alleviation: technical target, theoretical analysis and practical challenge. **Guizhou Social Science**, v.8, p.156-162, 2015. Available from: <https://doi.org/10.13713/j.cnki.cssci.2015.08.026>. Accessed: Nov. 15, 2020. doi: 10.13713/j.cnki.cssci.2015.08.026.(in Chinese).

ZENG, Y. et al. Visual Atlas Analysis of Acceleration Sensor Research Literature Based on CiteSpace Bibliometrics. **Studies in Engineering and Technology**, v.6, p.70–77, 2019. Available from: <https://doi.org/10.11114/set.v6i1.4209>. Accessed: Nov. 15, 2020. doi: 10.11114/set.v6i1.4209.

ZHU, J. et al. Visualizing the knowledge domain of sustainable development research between 1987 and 2015: A bibliometric analysis. **Scientometrics**, v.110, p.893–914, 2017. Available from: <https://doi.org/10.1007/s11192-016-2187-8>. Accessed: Nov. 15, 2020. doi:10.1007/s11192-016-2187-8.