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Bibliometric Analysis of Cooperatives Role in a Environmental Economy

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Abstract. *This study aims to analyze the development trends and direction of research on the role of cooperatives indexed in Scopus from 2014 to 2024. This type of research is quantitative research using bibliometric analysis. Based on the search results, there are 149 research articles, then inputted into the VOSviewer application and analyzed descriptively through a literature review study. The results showed that the number of publications has increased every year. Then, based on the mapping results using the VOSviewer application, research on the role of cooperatives is divided into 13 clusters. Meanwhile, based on the results of the literature review study, there are 7 main themes around the role of cooperatives. Recent trends show increased attention to environmental issues and adjustment to change. The practical implication of this research is the need to strengthen cooperative management through innovation in various fields, such as technology, education and the environment. Then for potential research directions to be developed in the future is research that includes keywords of agricultural cooperatives, cooperative interaction, cooperative learning, cooperative assembly, cooperative extension, SMES and environmental cooperatives variables because they are still rarely researched.*

Keywords: *Agricultural cooperative, cooperative assembly, cooperative extension, enviromental cooperative, SMES*

1. Introduction

Cooperatives are one of the important pillars in an economy based on the principles of mutual cooperation and economic democracy. As an organization oriented towards the welfare of its members, cooperatives not only act as economic institutions, but also as a tool to improve people's lives. In Indonesia, cooperatives have great potential to be the driving force of economic development, especially at the grassroots level, by empowering the community through various services such as savings and loans, joint businesses, and economic education. In the context of community welfare, cooperatives act as a platform that can reduce social inequality, expand access to economic resources, and encourage local community empowerment. With a membership-based approach, cooperatives are able to provide solutions to various economic challenges, including unemployment, poverty, and gaps in access to finance. Therefore, understanding and strengthening the role of cooperatives is key to creating a more prosperous and independent society.

Cooperatives, as one of the economic institutions based on the principles of kinship and gotong royong, play a strategic role in improving the welfare of society, especially in developing countries such as Indonesia. Cooperatives are business entities that are in line with the economic system in Indonesia because they are based on family principles (1). In recent

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decades, cooperatives have been recognized as an instrument of community economic empowerment capable of bridging economic and social gaps. However, the effectiveness of cooperatives in achieving these goals often depends on several factors, including internal management, government policy support, member participation, and adaptation to market dynamics. This study is motivated by the fact that although cooperatives have grown rapidly, their contribution to the welfare of society has not been fully optimized. Empirical data shows that many cooperatives still face various challenges, such as limited capital, low managerial capacity, and lack of active participation from members (2). Cooperative modernization needs to be done immediately so that cooperatives can work together to develop for the better (3). On the other hand, there are cooperatives that have successfully demonstrated a positive impact on increasing income, creating jobs, and reducing social inequality, thus attracting attention for further analysis.

Scientific publications on the role of cooperatives increase from year to year based on searches through the Garuda website (Garba Rujukan Digital). From 2014 to 2024 there were 79 studies on the role of cooperatives. This shows that the development of research on the role of cooperatives is still not much examined. The purpose of this study is to map research topics around the role of cooperatives over the past 11 years. In this study, the data were processed using 1) bibliometric studies with the VOS viewer bibliometric method to analyze and study the map of the development of literature in a scientific field and 2) literature review studies to examine, identify and review articles from scopus journals.

Cooperatives have long been considered one of the key mechanisms in supporting economic development and improving people's welfare, especially in developing countries such as Indonesia. As community-based economic entities, cooperatives play a role in distributing economic benefits more equitably and empowering people in various sectors. However, although the role of cooperatives has been widely recognized, research on cooperatives, especially focusing on their contribution to community welfare, is still scattered and not systematically integrated. Previous research has never discussed a bibliometric study on the role of cooperatives on community welfare so this is a novelty of research. Bibliometric studies have the potential to provide a deeper understanding of developments, trends and research gaps in this topic. By mapping the relevant scientific literature, a bibliometric study can identify areas of study that have been widely discussed, potential new areas that need to be explored, and patterns of collaboration between researchers and institutions. In addition, this study can also help uncover existing theoretical and methodological contributions in supporting the implementation of cooperatives as agents of economic development.

The urgency of this study lies in the importance of providing an organized framework for understanding and evaluating the contribution of cooperatives to the well-being of the community. . By utilizing bibliometric analysis, this study can provide strategic guidance for researchers, policy makers, and practitioners in developing more effective cooperatives. In addition, the results of this study are expected to strengthen the scientific argument regarding the relevance of cooperatives in facing global economic challenges, such as social inequality and unemployment. Through this approach, the study is expected to not only contribute to the scientific literature, but also make a real impact in strengthening the role of cooperatives as a pillar of sustainable community welfare.

2. Methods

This research uses a research method with a quantitative approach with a bibliometric study and analyzed with a literature review study. The object of research is the role of cooperatives. The type of data used is secondary data. The scope of the data used is research journal articles on Scopus regarding the role of cooperatives over the past 11 years, from 2014 to 2024.

The source of data collection comes from searching Scopus indexed international journals through the Perish/Harzing application. Data analysis tools use Microsoft Excel software, Mendeley Dekstop, and VOSviewer. Data collection techniques include: 1) opening the Publish or Perizh (PoP) software, then searching for journals based on the title words category saying the key "Cooperative Role" within a period of ten years (2014-2024); 2) collecting journal title data in Microsoft Excel, and identifying multiple journal titles; 3) downloading RIS (Research Information Systems) and PDF (Portable Document Format) format files from all journals that have collected data; and 4) entering RIS data files into Mendeley Dekstop software. Data analysis techniques include: 1) mapping RIS data files on Mendeley Dekstop based on the order of year, author, and publisher; 2) mapping the results of bibliometric network visualization and scientific publication trends using the VOSviewer (Visualization of Similarities) algorithm software based on the number of clusters and items; and 3) mapping research topics based on literature review studies (4).

3. Results and Discussion

3.1. Mapping the Distribution of Scientific Publications on the Role of Cooperatives

The results of the search for scientific publications on cooperative roles from 2014 to 2024 experienced a fluctuating increase (Table 1). The highest number of publications in the year was 21 articles and the number of publications in 2014 and 2019 was only 9 articles. Thus, the average scientific publication on cooperative roles is 15 articles each year.

Table 1. Journal publication data on cooperative role by year

Year	Total of Publications	Year	Total of Publications
2014	9	2020	10
2015	10	2021	13
2016	17	2022	16
2017	12	2023	14
2018	18	2024	21
2019	9	**Total**	**149**

Source: Data processed by researchers, 2024

In Table 2, 130 journals publish articles about cooperative roles. The International Journal of Environmental Research and Public Health and the Journal of the American Chemical Society are the most journal publishing institutions that publish about Cooperative Role, with a total of 4 publications.

Table 2. Scientific journals that discuss Cooperative Role

Journal Name	Total of Publications
International Journal of Environmental Research and Public Health, Journal of the American Chemical Society	4
International Journal of Molecular Medicine, Journal of Extension, Journal of Immunology	3
Asian Journal of Technology Innovation, European Physical Journal B, Journal of Behavioral and Experimental Economics, Journal of Business and Industrial Marketing, Journal of Co-operative Organization and Management, Journal of Technology Transfer, New Journal of Chemistry, Qubahan Academic Journal, Journal of Family Psychology	2
American Journal of Agricultural Economics, Applied Soft Computing Journal, Asia Pacific Journal of Tourism Research, Asian EFL Journal, Asian Journal of Social Psychology, Journal of Beijing University of Aeronautics and Astronautics, Biological Journal of the Linnean Society, Blood Cancer Journal, Business Process Management Journal, Canadian Journal of Agricultural Economics, Journal of Dalian Maritime University, El-Cezeri Journal of Science and Engineering, European Journal of Innovation Management, IAENG International Journal of Applied Mathematics, Indian Journal of Agricultural Research, Indian Journal of Extension Education, International Journal for Equity in Health, International Journal of Advanced Science and Technology, International Journal of Aerospace Engineering, International Journal of Agricultural and Biological Engineering, International Journal of Autonomous and Adaptive Communications Systems, International Journal of Christianity and Education, International Journal of Dentistry, International Journal of Disaster Risk Reduction, International Journal of Economic Research, International Journal of Electrical Power and Energy Systems, International Journal of Engineering Education, International Journal of Entrepreneurial Behaviour and Research, International Journal of Environmental Science and Technology, International Journal of Forecasting, International Journal of General Systems, International Journal of Globalisation and Small Business, International Journal of Human Resource Management, International Journal of Human Rights, International Journal of Intelligence	1

Journal Name	Total of Publications
and CounterIntelligence, International Journal of Law and Management, International Journal of Logistics Research and Applications, International Journal of Mechanical Engineering and Technology, International Journal of Oncology, International Journal of Project Management, International Journal of Smart Grid and Clean Energy, International Journal of Supply Chain Management, International Journal of Sustainable Development and Planning, International Journal of Technology Management and Sustainable Development, International Journal of the Commons, International Journal of Value Chain Management, Italian Law Journal, Jamba: Journal of Disaster Risk Studies, Japanese Journal of Cancer and Chemotherapy, Journal of African Union Studies, Journal of Agricultural Economics, Journal of Agricultural Extension, Journal of Agricultural Science and Technology, Journal of Agricultural Sciences - Sri Lanka, Journal of Applied Fluid Mechanics, Journal of Biomechanics, Journal of Bioscience and Bioengineering, Journal of Business Research, Journal of Catalysis, Journal of Cell Science, Journal of Cellular and Molecular Medicine, Journal of Chemical Physics, Journal of Classroom Interaction, Journal of Coordination Chemistry, Journal of Crop Improvement, Journal of Early Adolescence, Journal of Economic Asymmetries, Journal of Economic Psychology, Journal of Economics and Economic Education Research, Journal of Education and Work, Journal of Entrepreneurial and Organizational Diversity, Journal of Environmental Management, Journal of Environmental Planning and Management, Journal of Experimental Psychology: Human Perception and Performance, Journal of General Management, Journal of Geophysical Research: Space Physics, Journal of Hepatology, Journal of Higher Education Outreach and Engagement, Journal of Housing and the Built Environment, Journal of Industrial Engineering and Engineering Management, Journal of Inorganic Biochemistry, Journal of Legal, Ethical and Regulatory Issues, Journal of Management Inquiry, Journal of Marketing Analytics, Journal of Materials Chemistry A, Journal of Medical Regulation, Journal of Neuroscience, Journal of Organic Chemistry, Journal of Pharmacology and Experimental Therapeutics, Journal	

Journal Name	Total of Publications
of Physical Chemistry C, Journal of Physical Chemistry Letters, Journal of Social Sciences, Journal of Strategy and Management, Journal of Structural Biology, Journal of the Royal Society Interface, Journal of the Saudi Society of Agricultural Sciences, Journal of Translational Medicine, Journal of Vocational Behavior, Journal of Wine Economics, Journal on Chain and Network Science, Mediterranean Journal of Social Sciences, Pakistan Journal of Life and Social Sciences, Pflugers Archiv European Journal of Physiology, Plant Journal, Proceedings of the Institution of Mechanical Engineers, Scandinavian Journal of Management, Social Enterprise Journal, World Applied Sciences Journal, World Journal of Entrepreneurship, Management and Sustainable Development, Journal of Astronautics	

Source: Data processed by researchers, 2024

Table 3 shows the most productive researchers, namely A.E. Okem, L. Yang, N. Zhou, S. Zhang, X. Wang, Z. Wang, who each wrote 2 articles.

Table 3. Researcher productivity related to cooperative role

Researcher	Total of Publications
A.E. Okem, L. Yang, N. Zhou, S. Zhang, X. Wang	2
A. Budhisulistyawati, A. Chennak, A. Emir, A. Espín, A. Galati, A. Paredes, A. Podda, A. Sarkar, A. Savory, A. Soetens, A.A. Alzaidi, A.D. Masegosa, A.F. Forgione, B. Kim, B. Sieben, B. Sonnenschein, B. Vizio, B.A. Sumantri, C. Giagnocavo, C.D. Mull, D. Drewery, D. Duran, D. Halstrup, D. Huggins, D. Imami, D. Luo, D. Ni, D. Panagiotou, D. Santhanaraj, D.T. Sisay, E. Hadjielias, E.L. Fornero, F. Ai, F. Morais, F. Qi, G. Li, G. Miribung, G.H. Mead, H. Judd, H. Kleis, H. Li, H.N. Fageeh, H.R. Contreras, J. Cadot, J. Eichler, J. Gao, J. Grashuis, J. Halverson, J. Kim, J. King, J. Lazniewska, J. Li, J. Morimoto, J. Sathapatyanon, J. Steen,	1

	J. Yu, J.K. Sidhu, K. Limbach, K. Lin, K. Liu, K. Malu, K.C.L. Go, L. Andress, L. Bellando, L. Gadelshina, L. Udensi, L. Wang, L.D. Osellame, L.H. Pojoga, M. Costa, M. De Santis, M. Khafid, M. Kim, M. Laurila-Pant, M. Li, M. Motamed, M. Obana, M. Peverini, M. Salazar, M. Samian, M. Zandebasiri, M.C. Burroughs, M.E. Al-Atroush, M.P. Tabe-Ojong, N. Bharti, N. Broer, N. Chitrapriya, N. Gaeini, N. Kakoty, N. Wang, N.B.I. Wulandhari, O. Bensahri, O. Miyawaki, O.M. Edun, P. Kaushik, P.V. Möllers, Q. Guo, Q. Zhu, R. Shen, S. Ailawadhi, S. Bailleul, S. Barrett, S. Damberg, S. Ghauri, S. Glover, S. Hawkins, S. Hendriani, S. Mhembwe, S. Taimoory, S. Takagi-Niidome, S. Wu, S. Zainurossalamia, S. Zhuang, S.A. Pérez Perdomo, S.A.R. Pishbin, Suparnyo, T. Mu, T. Nishida, T. Tanaka, T. Zidat, T.J. El-Baba, U.R. Sorg, V. Semou, V.A. Vieira, W. Ma, W. Mawardi, W. Ronan, W.M. Hollingsworth, X. Liu, Y. Agustina, Y. Cho, Y. Guo, Y. Liu, Y. Ma, Y. Yang, Y.B. Li, Z. Li, Z. Wang

Source: Data processed by researchers, 2024

3.2 Mapping of Bibliometric Studies on the Role of Cooperatives

Search results on scopus research articles exported in RIS (Research Information System) format are inputted and analyzed using VOSviewer. The following are the results of network visualization, overlay visualization and density visualization analysis (Figure 1).

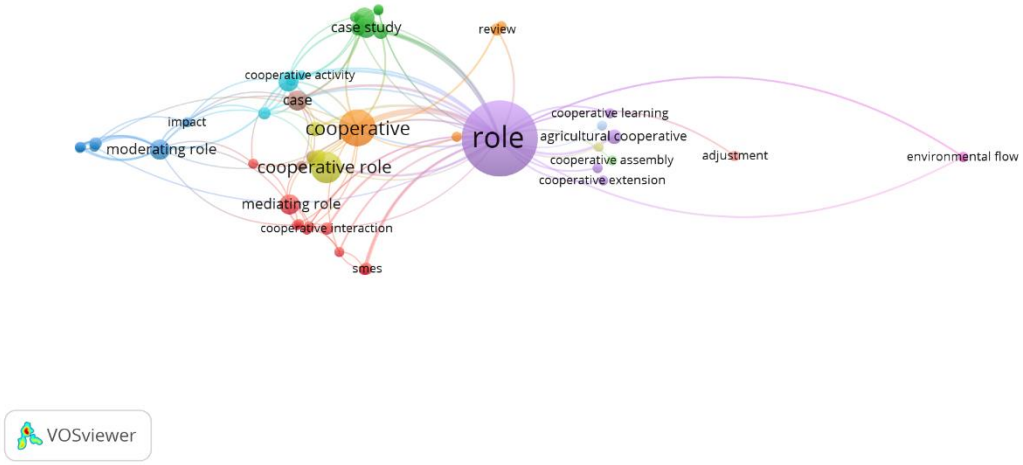

Figure 1. Network visualization
Source: Data processed by researchers, 2024

The results of the network visualization image show that in the last ten years, 2014-2024 (according to the year limit used by researchers), it can be seen that the most researched topics are about cooperative roles. From the results of this analysis, 13 clusters were formed. The thirteen clusters show that research on cooperative roles involves variables of agricultural cooperatives, cooperative interaction, cooperative norms, cooperative innovation, cooperative learning, cooperative assembly, cooperative extension, cooperative interaction, cooperative strategy, cooperative societies, SMES and environmental cooperatives.

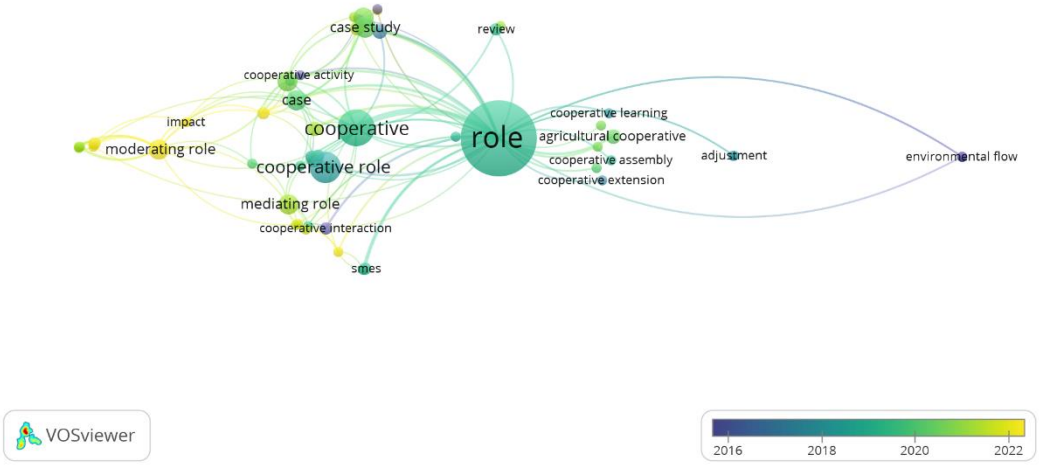

Figure 2. Overlay visualization
Source: Data processed by researchers, 2024

Based on the overlay visualization of VOSviewer in Figure 2, cooperative role is one of the important points that has a close relationship with words such as cooperative activity, mediating role, and cooperative interaction. This indicates that many studies highlight cooperative roles in various contexts. The colors reflect the time distribution based on the year

of publication. Nodes in yellow are more dominant in recent research (2020-2022). Green and blue nodes are more abundant in the previous year (2016-2019). Environmental flow is more dominant in recent publications, indicating new trends related to environmental roles. The association of cooperative role with terms such as agricultural cooperative and cooperative learning indicates a focus on practical applications in agriculture and education. Recent research (yellow) seems to lean more towards environmental and adjustment issues, signaling a shift in focus to sustainability and adaptation themes. Thus, figure 2 reflects the evolution of research on cooperative roles with various other variables, including agriculture, learning, and the environment. Recent trends show increased attention to environmental issues and adjustment to change.

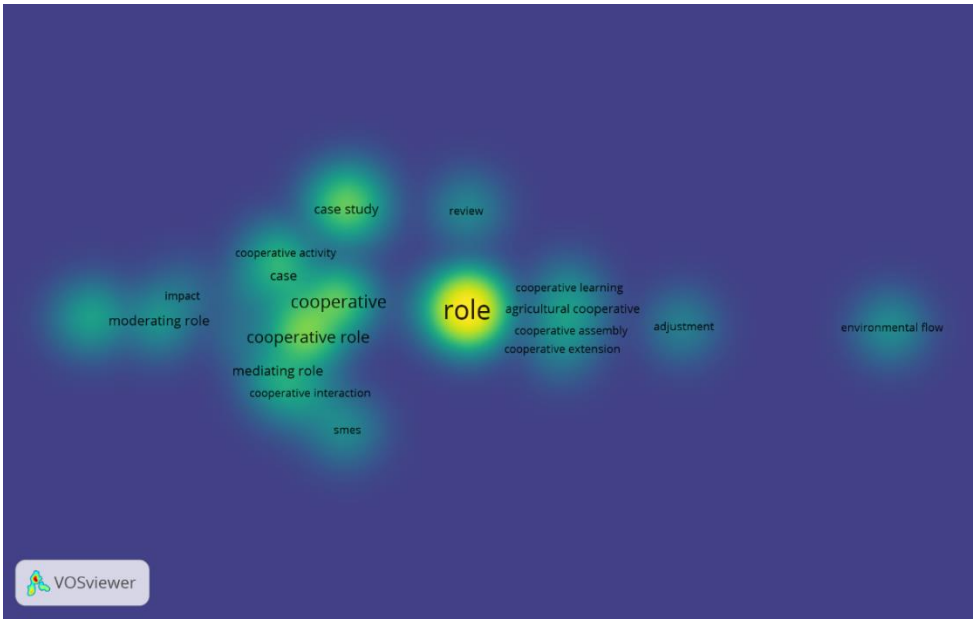

Figure 3. Density visualization
Source: Data processed by researchers, 2024

The density visualization results show that the color of the cooperative role variable is the brightest compared to the others so that many previous studies have examined this variable (Figure 3). Then, followed by cooperative activity which is brightly colored. However, for the variables of cooperative interaction, SMES, cooperative learning, agricultural cooperative, cooperative assembly, cooperative extension and environmental flow tend to be darker in color which indicates that they are still rarely studied.

3.3 Mapping of Literature Review Studies on the Role of Cooperatives

Based on the literature review on the research articles that have been processed, the researchers summarized 7 main themes of research trends around the role of cooperatives, namely:

1) Cooperative interaction (5–7,7). Studies on cooperative interaction have shown the importance of cooperation in various contexts, such as education, organizations, and communities.

   Previous studies underline that cooperative interaction can improve teamwork efficiency, strengthen relationships between individuals, and create an

environment conducive to knowledge sharing. In the educational context, cooperative interaction is proven to improve student learning outcomes through collaborative approaches, such as cooperative learning. In the business world, cooperative interaction between cooperative members encourages innovation, increases productivity, and builds an inclusive work culture. Meanwhile, in local communities, this form of interaction plays an important role in building social solidarity and facing common challenges, such as environmental crises or economic development. However, the literature also notes challenges, including potential conflicts of interest, contribution gaps between members, and the need for moderation to ensure common goals are effectively achieved. As such, cooperative interaction is a fundamental element in promoting collective success, but requires thoughtful management to achieve optimal results.

2) SMES (8–11). Studies on Small and Medium Enterprises (SMEs) highlight their important role in the global economy, especially as key drivers of innovation, job creation, and economic growth. Research shows that SMEs contribute a large proportion of Gross Domestic Product (GDP) in many developing and developed countries. Despite their huge potential, SMEs often face significant challenges, such as limited access to finance, limited human resources, and technological and infrastructure constraints. The literature also highlights the importance of digital technology adoption in improving the competitiveness of SMEs in the digital transformation era, including the utilization of e-commerce, cloud technology, and big data. In addition, the role of the government in providing supportive policies, such as subsidies, entrepreneurship training, and easy market access, is crucial to ensure the sustainability of SMEs. Recent studies have also highlighted the importance of cooperation between SMEs through cooperative networks and collaboration to overcome common obstacles. As such, SMEs have great potential to drive innovation and economic growth, but require strategic support to overcome the challenges they face.
3) Cooperative learning (12,13). Studies on cooperative learning have shown that this learning approach can provide significant benefits in various educational contexts. Cooperative learning, which involves students working together to achieve a common learning goal, has been shown to improve concept understanding, social skills and learning motivation. Research also shows that this strategy helps students with diverse abilities to contribute actively to the learning process, creating an inclusive atmosphere that supports collective success. Various cooperative learning models, such as jigsaw, think-pair-share and group investigation, have been implemented at various levels of education with positive results. Moreover, cooperative learning not only improves academic outcomes but also strengthens communication and collaboration skills that are essential for the world of work. However, challenges in implementing this method, such as time management, the teacher's role as facilitator, and the contribution gap between group members, require special attention. Through a planned approach and strong pedagogical support, cooperative learning can be an effective strategy to create active and meaningful learning.

4) Agricultural cooperatives (14–17). Studies on agricultural cooperatives show that they play an important role in improving farmers' welfare, especially in developing countries. Agricultural cooperatives help smallholder farmers overcome challenges such as low economies of scale, limited access to markets, and price instability. The literature highlights that these cooperatives enable their members to access agricultural inputs at lower costs, share modern technologies, and strengthen their bargaining position in the market. In addition, agricultural cooperatives support sustainable development through the promotion of environmentally friendly agricultural practices and capacity building of their members. In the context of globalization, these cooperatives also help farmers compete in international markets by providing access to market information and wider trade networks. However, key challenges include governance issues, internal conflicts of interest, and limited financial resources. With transparent management and adequate policy support, agricultural cooperatives can be an effective tool to increase productivity, reduce poverty, and achieve food security.
5) Cooperative assembly (18,19). The study of cooperative assembly focuses on collaboration in the assembly process, whether in the context of manufacturing, technology, or biology. In the manufacturing industry, cooperative assembly refers to cooperation between humans and robots (cobots) to improve efficiency, accuracy, and flexibility in production. Research shows that this collaborative interaction can reduce production time and improve work safety through ergonomic design and the integration of smart technology. In the field of biology, cooperative assembly refers to the phenomenon where molecules or biological structures work together to form complex systems, such as protein folding or cell membrane construction. The literature also highlights challenges in the application of cooperative assembly, such as coordination between components, resource management, and reliability of large-scale systems. Algorithm-based approaches and artificial intelligence are often used to address these issues in a technological context. With the development of automation technologies and a deeper understanding of complex systems, cooperative assembly is becoming a promising field for innovation in various sectors.
6) Cooperative extension (20–23). Studies on cooperative extension highlight its role as a bridge between research, education and practical application to support community development, particularly in agriculture and natural resource management. Cooperative extension serves to transfer scientific knowledge to communities through training, extension, and advisory services, thereby helping to improve the productivity, sustainability, and quality of life of communities. The literature shows that cooperative extension programs have successfully empowered farmers, small business owners, and local community groups to adopt new technologies, manage resources efficiently, and improve food security. In the United States, the cooperative extension model has become a global model for disseminating university-based innovations to the wider community. However, implementation challenges include limited funding, lack of community participation, and gaps between local needs and the solutions offered. To increase effectiveness, research recommends the integration of digital technologies, such as

web-based applications and social media, to reach a wider audience and increase interactivity. With proper management, cooperative extension has great potential to drive sustainable social and economic change.

7) Environmental cooperative (24,25). Studies on environmental cooperatives highlight their important role in promoting environmental sustainability through community cooperation. Environmental cooperatives allow individuals or groups to collectively manage natural resources, such as water, land and forests, with sustainability principles. Research shows that these cooperatives are effective in addressing environmental challenges, such as land degradation, pollution, and climate change, by implementing environmentally friendly practices, such as organic farming, waste management, and energy conservation. The literature also notes that the success of environmental cooperatives often depends on active member participation, government policy support, and access to funding. In some countries, environmental cooperatives have become models for grassroots initiatives, such as collective water management or community-based reforestation. However, challenges include conflicts of interest among members, limited technical knowledge, and lack of economic incentives to maintain sustainable practices. To increase their impact, the research recommends strengthening environmental education, improving access to green technologies, and integrating environmental cooperatives into regional development policies. With a collaborative approach, environmental cooperatives can be a catalyst for change in achieving sustainable development goals.

Based on the results of this research, it shows that cooperatives have great potential in supporting sustainable economic development, especially in developing countries like Indonesia. Through mapping scientific literature using bibliometric analysis and literature review studies, the research results provide an overview of trends that continue to develop, with increasing attention to environmental issues and adaptation to change. The practical implication of this research is the need to strengthen cooperative management through innovation in various fields, such as technology, education and the environment. Cooperatives that focus on environmental sustainability, such as environmental cooperatives, can play a strategic role in facing global challenges such as climate change and natural resource degradation.

On the other hand, this research also highlights the need for further exploration of themes that are still rarely researched, such as cooperative interaction, cooperative learning, and agricultural cooperatives. The results of this study can serve as a guide for researchers and policy makers in formulating more effective and inclusive cooperative development strategies. In addition, the emerging policy implication is the importance of government support in providing a regulatory framework and incentives for cooperatives to adapt to market dynamics and community needs. With the evidence-based approach from this study, cooperatives can further strengthen their role as pillars of economic development oriented towards sustainable community welfare.

Conclusions

Based on the search results, there are 149 research articles. The results show that the number of publications has increased every year. Then, based on the results of mapping using the VOSviewer application, research on the role of cooperatives is divided into 13 clusters. Meanwhile, based on the results of the literature review study, there are 7 main themes around the role of cooperatives. Recent trends show increased attention to environmental issues and adjustment to change. Then for potential research directions to be developed in the future is research that includes keywords of agricultural cooperatives, cooperative interaction, cooperative learning, cooperative assembly, cooperative extension, SMES and environmental cooperatives variables because they are still rarely researched. The practical implication of this research is the need to strengthen cooperative management through innovation in various fields, such as technology, education and the environment. Cooperatives that focus on environmental sustainability, such as environmental cooperatives, can play a strategic role in facing global challenges such as climate change and natural resource degradation.

Conflicts of Interest

The authors declare no conflict of interest.

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