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Bibliometric Analysis of Rural Economic Development: Convergence Between Sustainable Agriculture, Digital Technology, and Community Engagement for Village Self-Reliance

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ABSTRACT

This article provides a bibliometric study of rural economic growth, focusing on sustainable agriculture meetings, digital technologies, and community participation as important drivers of village self-sufficiency. The purpose of this study is to thoroughly investigate academic trends and linkages in driving long-term economic growth in rural areas. This methodology takes a complete bibliometric approach, analyzing a large number of scientific papers in the Scopus academic database. The study examines keyword patterns, and key research groups related to rural economic growth. These findings show a considerable increase in the keyword patterns of rural economic development, namely sustainable agriculture, technological innovation, and community participation. This study emphasizes the need for a comprehensive approach to rural development, where sustainable agricultural practices, digital technology, and active community involvement work together to encourage self-reliance in rural areas. This strategy can encourage long-term economic growth while ensuring environmental sustainability. Future rural development plans and initiatives should incorporate these three pillars to promote the overall well-being and self-reliance of rural populations. The study concludes that despite advances in research on sustainable agriculture and digital technologies and community participation. Further research is needed to explore the synergy between digital technologies, sustainable agricultural practices, and community participation.

1. INTRODUCTION

Rural economic development is one of the major foundations in achieving social and economic sustainability internationally. Villages as social and economic entities that are closest to nature have immense potential to inspire economic independence via the utilisation of local resources and current technologies. However, villages in many nations, especially in developing regions, still confront enormous hurdles gaining economic independence. Reliance on traditional farming practices, limited access to modern technology, and lack of active engagement from the community are some of the primary barriers that must be addressed.

Rural economic development based on sustainable agriculture, the use of digital technologies, and community engagement are ways that are rapidly garnering attention as solutions to overcome these difficulties. Sustainable agriculture not only promotes efficient food production but also preserves the balance of ecosystems and natural resources. By implementing eco-friendly agricultural practices, farmers may boost their yields while reducing harmful consequences on the environment. Successful village/rural development is commonly associated with the successful utilisation of agricultural potential; thus the major focus of village development is more on the domination of the role of the agricultural sector [1]. Community participation has an influence on sustainable village development (0.110), as does the exploitation of natural resources (0.281), whereas poverty has an impact on sustainable village development (-0.025) [2].

Rural economic development is a key priority in achieving social and economic sustainability, particularly in developing countries. However, rural areas often encounter significant challenges, including developmental inequalities, limited access to modern technology, and inadequate infrastructure, which contribute to a persistent reliance on traditional agricultural practices. As highlighted by Lewis et al. [3] in their study on rural mechanization for equitable development, these challenges are further exacerbated by disarray in policy implementation, disjuncture between local needs and technological solutions, and the disruptions caused by uncoordinated mechanization efforts. Addressing these issues requires a more integrated and context-specific approach to foster sustainable and inclusive rural development.

However, with the emergence of various innovations in the

field of digital technology and a paradigm shift towards sustainable agriculture, the potential to change this dynamic for the better is increasingly wide open. Based on the research by Purcal [4] the study explores how rural economic initiatives contribute to both economic growth and the social cohesion of communities in the region. One of the concepts that is now increasingly being paid attention to is self-reliance or village independence, which focuses on empowering rural communities to manage and develop their own resources in order to establish a more autonomous and sustainable economy. The integration of sustainable agriculture, digital technology, and community engagement is considered a very potential strategy in realizing this goal. On the other hand, although many studies have addressed related topics, a deeper understanding of how these three elements—sustainable agriculture, digital technology, and community engagement—correlate in advancing rural economic development is limited.

As a first step to fill this knowledge gap, bibliometric analysis is an effective tool to identify trends, patterns, and relationships between various existing studies. This analysis provides a more systematic understanding of the development of existing literature and research directions that need to be developed to support village independence. Therefore, this essay seeks to undertake a bibliometric analysis of the extant literature on rural economic development, focusing on the convergence between sustainable agriculture, digital technology, and community involvement as an effort towards village self-reliance. By conducting this analysis, it is hoped that new insights can be found that can be used to formulate more effective policies and strategies in encouraging sustainable and inclusive rural economic development.

Digital technology offers tools that enable farmers and rural communities to increase productivity, access wider markets, and manage resources more efficiently. New opportunities to improve efficiency and accessibility in the agricultural sector. Digital technologies, such as smart farming applications, e-commerce platforms, and geographic information systems, enable farmers to access better information, expand markets, and improve their competitiveness. Meanwhile, community engagement in the planning and execution of local economic development programs is crucial to ensure long-term success and sustainability. The community's active engagement in rural tourist management may be conducted in an effort to increase the rural community's economy by exploiting the existing potentials, so that the community-based tourism notion will be exceptionally suited to apply [5].

Sustainable agriculture, digital technology, and community engagement are crucial pillars that are linked in developing ecosystems that enable inclusive and sustainable economic growth in rural regions [6]. The urgency of this research cannot be overstated, considering that disparity between urban and rural communities is still a pressing concern. Rural financial system efficiency, deepening, and enhancing its structure may greatly improve the expansion of the rural economy, agricultural development, and peasants' income [7].

In this context, digital technology not only functions as a tool to increase the efficiency of agricultural output but also as a method to strengthen community participation. Zhang underlined the necessity of digital platforms that are attentive to social, economic, and cultural settings in rural regions, which may help establish more inclusive and sustainable practice [8]. Economic and mathematical modelling, as well as multidimensional statistical analysis in the agro-industrial sector, may be utilised to build strategic plans for the expansion of agricultural formations [9].

The goal of this research intends to examine how the convergence of sustainable agriculture, digital technology, and community participation might produce a more autonomous and sustainable economic growth model in communities. By employing the analysis of current literature data, this article tries to give a better insight into how the three aspects interact with each other, as well as their role in supporting village economic independence. Through this research, it is intended that in-depth research patterns may be established and suggestions for the establishment of more successful policies for rural development based on sustainability, technology, and active community engagement.

Furthermore, the digitalisation of physical infrastructure in rural regions might be a chance to expedite economic growth, broaden the industrial base, and improve export potential. This illustrates that investment in digital infrastructure will not only increase people's access to information and services but may also fuel broader economic development. By understanding the relationship between sustainable agriculture, digital technology, and community engagement, it is hoped that this research can make a significant contribution to efforts to create economic independence in villages and reduce inequality between urban and rural areas [10, 11].

Although bibliometric analyses have been widely applied across numerous fields, studies particularly targeting rural economic development through a bibliometric lens are relatively sparse. Existing research frequently studies technology breakthroughs, sustainability, or community engagement alone, resulting in a lack of understanding of the interplay among these essential factors. This study tries to solve this gap by merging these three basic pillars, presenting a holistic perspective on the synergies required to create self-reliant rural economies.

In addition, this study employs an enormous dataset encompassing the period from 1948 to 2024, providing a thorough historical examination alongside the identification of developing trends. The use of advanced visualization tools, such as VOSviewer, further enables the thorough mapping of collaboration networks and research clusters, distinguishing this work from past bibliometric studies on the topic.

This study provides significant theoretical advances to the field of rural economic development by presenting a fresh bibliometric perspective. Unlike prior bibliometric studies that primarily focus on isolated dimensions such as sustainability [12] or technological advancements [13] this research integrates three critical dimensions—sustainable agriculture, digital technology, and community engagement. This convergence approach gives a holistic perspective that has not been thoroughly addressed in earlier studies. By combining these features, this study presents unique theoretical insights into the complex, multi-faceted nature of rural economic growth, proposing that a more integrated strategy is necessary to properly address the special difficulties confronted by rural communities.

This study is highly pertinent to tackling the challenges of rural economic development in today’s rapidly evolving social and technological landscape. By investigating the convergence of sustainable agriculture, digital technology, and community participation, the project intends to suggest a more effective and sustainable method for achieving rural economic self-sufficiency, thereby boosting the well-being of rural communities. The combination of these three factors offers a dynamic framework that may move rural economies ahead

while ensuring environmental sustainability and sustaining the social fabric of these communities.

While several studies analyse the separate contributions of sustainability, technology, and community participation to rural development, only a limited number have extensively studied how these factors interact within this framework. Most earlier studies have concentrated on one component in isolation, neglecting the possible synergy between the three. To address this gap, this study undertakes an exhaustive bibliometric review of current literature, attempting to find patterns, collaborative networks, and untapped regions within rural economic growth.

This integrated approach not only enhances academic discourse on rural development but also sets the path for future interdisciplinary research. By emphasising the intersection of sustainability, digital innovation, and community participation, the research urges a deeper examination of holistic approaches to rural development. Furthermore, its theoretical contributions can guide future policy-making and research efforts to solve major challenges faced by rural economies.

2. LITERATURE REVIEW

The theory of sustainable development underlines that sustainable agriculture focuses not only on ecologically benign farming techniques, but also on enhancing the welfare of rural people. In this scenario, digital technology may act as a tool to increase the efficiency of agricultural output and extend market access for farmers. Swastiningsih remarked that the growing prominence of digital media, it is crucial to comprehend its influence on public discourse [14]. However, there are also concerns of the use of digital technology that has the ability to disrupt the current social and cultural structures in rural communities, as described by Fahmi and Savira, which indicates that digitalization can affect social cohesiveness in communities [15]. Furthermore, community engagement is a vital aspect in the process of rural economic development. Community-based efforts in the building of digital infrastructure might promote social and economic resilience in rural regions [16].

Furthermore, digital economy theory also provides insight into how technology can affect rural economic dynamics. Cai and Wang point out that the use of digital technology can have a negative impact on the sustainability of agricultural businesses, with some households having difficulty adapting to the changes brought about by technology [17]. This suggests that while digital technologies can improve efficiency, there are risks associated with reliance on technology and potential abandonment of traditional agricultural practices that have proven sustainable.

Convergence with Digital Technology, such as precision agriculture, the Internet of Things (IoT), and drones for crop monitoring, have been found to boost agricultural yields in a more efficient and ecologically friendly way [18]. The digitisation of agriculture allows farmers to monitor the state of soil and crops in real-time, which eliminates the excessive use of pesticides and fertilizers and reduces the negative influence on the environment. By employing ecologically friendly farming practices, villages may strengthen their economic resilience in a sustainable manner.

However, some theories of dependency suggest that over-reliance on agriculture as a key sector can lead to its vulnerability to external factors, such as climate change or fluctuations in global market prices. Previous study [19] criticized that an economic model that relies heavily on agriculture without diversification can lead to stagnation of the village economy. Dependence on sustainable agriculture can ignore the potential of other economic sectors that can contribute to the diversity of the village economy.

In many rural areas, access to modern technology is still limited, both in terms of infrastructure and skills. This hinders the potential convergence between sustainable agriculture and digital technology. As noted by Rural Development and Technology [20], although technology can improve agricultural yields, its adoption is limited to villages that already have internet access and technology training. Somalia is one of the countries where political instability and poor infrastructure have led to a decline in agricultural production, prompting foreign aid donors to encourage overall development and agricultural production [21]. Residents in rural areas have an advantage in ensuring the sustainability of rural tourism. They explore possible community-supportive behaviors Malaysian in the rural tourism landscape [22].

In Digital Economy Theory, digitalization allows for the development of a more inclusive and knowledge-based village economy. According to the Digital Economy Theory [23], digitalization provides great opportunities for rural communities to connect with a wider market, access distance education, and increase productivity. In the context of villages, this can help introduce data-driven agricultural innovations that not only increase yields, but also reduce production costs and diversify incomes.

E-commerce platforms provide an opportunity for farmers and village entrepreneurs to reach a wider market, which was previously difficult to reach due to physical and transportation limitations. A report by the OECD [24] states that e-commerce in developing countries has great potential to increase household income and create new business opportunities, especially in isolated villages.

Digital Inequality Theory states Although digital technology has great potential, the inequality of access to digital skills between villages and cities can exacerbate socio-economic gaps. According to the Digital Divide Theory, digitisation has the potential to aggravate inequality by expanding the divide between those who have access to technology and those who do not [25]. In many rural locations, infrastructure and access to the internet are still restricted, thus digital technologies cannot be completely maximised.

Reliance on technology can increase its vulnerability to technical glitches or cyberattacks. Technology security and resilience are issues that need to be considered in the context of the deployment of digital technology in rural regions, where infrastructure and technical competence are sometimes not strong enough. Government and Digital Regulation [26] emphasizes that although technology can improve efficiency, issues related to infrastructure and security must be addressed to mitigate the risk of over-dependence [27], they advocate developing an integrated development strategy that involves the distribution of urban areas and directing the city's expansion away from infrastructure features that endanger the population's health.

In the Community Empowerment Theory, community empowerment is a key approach in sustainable village development. Asset-Based Community Development (ABCD) [28] proposes that the key to creating sustainable village development is to empower communities to utilize

their local assets (be it skills, knowledge, or natural resources). This empowerment can create local capacity to design and implement solutions that are relevant to the needs of village communities. Cortes et al. [29] found that farmers can benefit significantly from a strong aggregator channel customer base, which suggests that farmers should promote and advertise the aggregator channel even if they only use it for a limited amount of their product. Previous reference identifies factors that influence the capacity of rural local governments to break path dependency and its potential as a bridge for rural economic development [30].

With access to the right technology, community empowerment can be more effective. Digitalization allows rural communities to access technology-based training and education, expand social networks, and introduce new skills. According to UNDP [31], the use of digital technology can help in creating a more inclusive empowerment model, improving community skills, and opening up economic opportunities that were previously unavailable.

Structural Theory and Power Inequality that community empowerment is not always successful because of inequality in the social and political structure in the countryside. Local elites or influential figures often dominate the decision-making process, leading to injustices in the distribution of development benefits [32]. In this case, even if community empowerment efforts are initiated, the existing power structure can hinder the achievement of true independence.

Community empowerment, while important, cannot be fully realized without adequate basic infrastructure. According to the World Bank [33], many villages experience limitations in education, health, and technology infrastructure, which hinders the potential for empowerment. Without good basic infrastructure, community empowerment efforts will be difficult to develop.

Diverse development routes, such as sustainable agriculture, rural industrialization, and poverty reduction, are necessary, with the availability of power aiding growth [34]. Although study has been undertaken on the link between higher education institutions and regional economic growth, few studies have studied the influence of research on rural economic development [35].

Digital technology has emerged as a transformative force in agriculture, facilitating the adoption of sustainable practices. Previous study [36] highlights the critical role of technology-based start-ups in Indonesia, suggesting that these entities provide innovative solutions to agricultural challenges, thus promoting sustainability. Similarly, Singh et al. [13] emphasize the profound impact of digital tools on agricultural extension services, which revolutionize information dissemination and access for farmers. The integration of digital technologies into agricultural management is further supported by Kramar et al. [37] who argue that the Fourth Industrial Revolution necessitates the combination of agriculture with technology to achieve sustainable growth.

Moreover, Tsvetkova and Vakhovskaya [38] discussed how modern digital technologies enhance agricultural management by optimizing resource use and minimizing environmental impacts. This is echoed by Gao et al. [39] who notes that government support mechanisms can significantly enhance farmers' willingness to adopt digital agricultural extension services, thereby fostering sustainable practices. The synergy between digital technology and sustainable agriculture is also evident in previous study [40] which identifies green technology innovation as a mediator in enhancing agricultural productivity through digital economic advancements.

Community engagement is a crucial element in the successful implementation of sustainable agricultural practices. MacPherson et al. [41] argued that understanding the societal sustainability imperatives is essential for aligning digital agriculture with community needs. This perspective is reinforced by Bolfe et al. [42], who analyze the perceptions of Brazilian farmers regarding precision agriculture technologies, highlighting the importance of community buy-in for successful technology adoption.

The barriers and enablers of digital technology use in agriculture are further explored by Sidib et al. [43] who advocate for a systemic approach to understanding how community dynamics influence technology adoption. Cook et al. [44] emphasized the need for inclusive policies that consider community engagement in embedding digital agriculture within sustainable food systems. This aligns with the finding of previous study [45] which assert that digital technologies can enhance the sustainability of agri-food systems globally, particularly when community engagement is prioritized. This economic perspective is complemented by Duan and Luo [46], who discuss the role of digital agricultural technology in enhancing the sustainable development of family farms in China, emphasizing the economic benefits of adopting such technologies.

Furthermore, the transformative potential of digital agriculture for enhancing global food security is underscored by Aliev et al. [47] who note that digital technologies empower farmers to become data-driven decision-makers, ultimately improving productivity and sustainability. Despite the promising potential of digital agriculture, challenges remain. Previous study [48] points to the risk of digital inequality, particularly for small and medium-sized farmers in South Africa, emphasizing the need for equitable access to digital solutions. Moreover, the importance of institutional support for digital transformation in agriculture is highlighted by Bellon-Maurel et al. [49] who argue that effective governance structures are necessary to facilitate the adoption of digital technologies in agricultural value chains. This is further supported by Popescu et al. [50] who emphasize the role of connectivity and access to digital tools in advancing digital agriculture.

The need for mission-oriented policies that anticipate the challenges and opportunities of digital agriculture is emphasized by MacPherson et al. [41]. Additionally, the integration of digital technologies into agricultural practices must be accompanied by robust support systems that empower communities and enhance their capacity for sustainable development.

Rural economic development research is of critical importance in terms of rural population development and welfare. The widening urban-rural gap, combined with digital financial inclusion, has offered a chance for rural communities to recover from the economic downturn [51]. Furthermore, research on rural economic development is critical for identifying the potential of the local economy that may be developed to benefit the rural economy [52]. Understanding the potential of the local economy allows for strategic initiatives to optimize the use of current resources and boost the rural economy's competitiveness. Research on rural economic development will play an important role in promoting long-term rural development [53].

Local personnel and resources are critical to rural industrialization and urbanization [54]. Another study

discovered that urban and rural economic development can coexist with environmental friendliness [55]. Furthermore, government support for the sustainable growth of small-scale agriculture is critical since it contributes to the long-term development of the rural economy [56]. Farmers' wellbeing can be increased by maximizing environmental functions so that they can contribute to economic development [57].

The theoretical debate in the context of the convergence between sustainable agriculture, digital technology, and community empowerment shows that although these three elements have great potential to support independent village economic development, the main challenges lie in inequality of access and adoption of technology, dependence on the agricultural sector, and social inequalities in rural areas. To ensure the success of this convergence, a holistic, inclusive, and locally-specific context-based approach is needed. Diversification of the village economy, increasing access to technology, and strengthening community empowerment capacity are decisive factors in realizing sustainable village independence.

3. METHOD

This study adopts a bibliometric analysis approach to systematically explore and analyze the body of literature on rural economic development, with a particular focus on the keywords "rural economic development" and "rural industrialization." This method facilitates the identification of research trends, collaboration networks, and recurring themes in existing studies. Scopus was selected as the primary database for this analysis due to its comprehensive coverage of high-quality academic resources across diverse disciplines, including journal articles, conference proceedings, and other scholarly outputs. Using Scopus ensures the inclusion of relevant and credible publications, providing a solid foundation for the analysis.

The inclusion criteria for article selection were rigorously defined to ensure relevance and quality. Articles were selected if they included the keywords "rural economic development" or "rural industrialization" and were published between 1948 and 2024, thereby capturing both historical and contemporary research developments. Only peer-reviewed journal articles were considered to maintain the credibility of the data, and the analysis was restricted to English-language publications, reflecting the prominence of English in international academic discourse.

To enhance the depth of the analysis and provide visual insights, this study employed two specialized tools. VOSviewer was used to map collaboration networks among researchers and institutions and to identify frequently occurring keywords, offering a detailed visualization of relationships and thematic connections in the literature. Additionally, Bibliometrix, an R package for bibliometric analysis, was utilized for more in-depth statistical and thematic exploration of the data. This methodological approach aims to present a comprehensive overview of trends and patterns in rural economic development research while identifying underexplored areas within the existing body of knowledge. The detailed methodology applied in this study is presented in Figure 1.

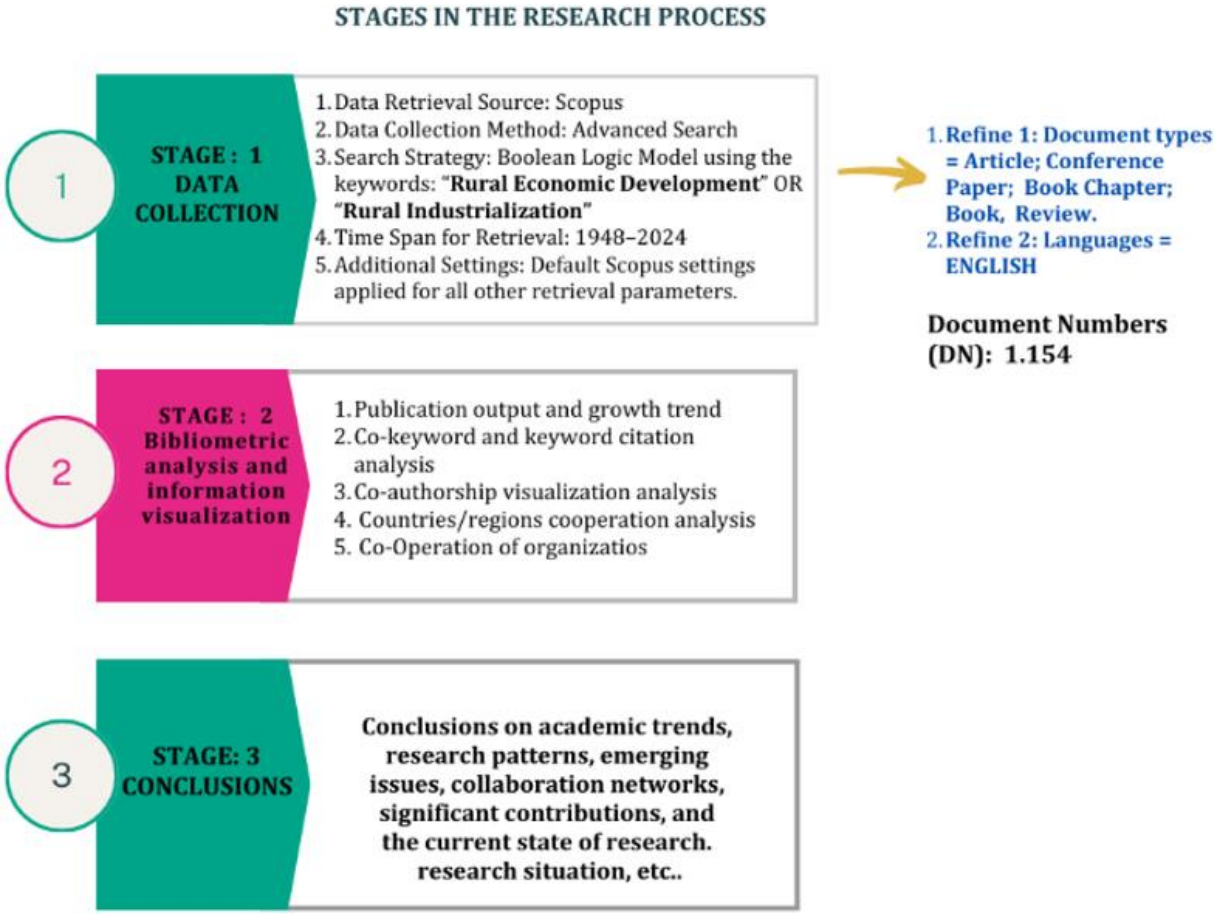

Figure 1. Stages of bibliometric analysis in rural economic development research
Note: "*" The Scopus core collection was last updated in 2024

The literature underscores the advantages of bibliometric approaches in analyzing scholarly sources [58]. Bibliometrics have been widely employed by researchers as an analytical tool, supporting the preparation of academic articles [59], evaluating journal impact [60], and assessing university rankings [61]. These methods have been applied across diverse sectors, including economics [62], politics [63], and social sciences [64]. Additionally, bibliometric studies have explored various fields such as environmental research [65], Industry 4.0 [66], artificial intelligence [67], business [68], social networks [69], administrative law [70], e-learning [71], social media [72], and Islamic proselytization [73].

Bibliometric analyses have also been applied to critical global issues, including climate change and the Sustainable Development Goals (SDGs) [74, 75]. Martínez-Falcó et al. [76] conducted a bibliometric and systematic literature review using the Web of Science database and employed tools such as VOSviewer and Bibliometrix to create network maps. Such reviews provide valuable visualizations and insights into the evolution and interconnectedness of research topics [77, 78]. Bibliometric analysis offers significant benefits to academic institutions, organizations, and industries by enabling the examination of large datasets and uncovering theoretical and practical contributions [79, 80].

In the context of rural economic development, bibliometric methods are invaluable for identifying knowledge gaps, guiding future research directions, and strengthening scientific foundations [81-84]. Despite the utility of bibliometric analysis in various fields, there remains a notable lack of its application specifically to rural economic development. Furthermore, bibliometric studies reveal geographical and collaborative dynamics within disciplines, offering insights into the global interconnectedness of researchers and institutions [85]. By visualizing these collaborations, bibliometric analysis not only enhances our understanding of academic networks but also informs strategies for fostering greater research synergy.

4. RESULT

4.1 Publication development trend

The focus and methodology employed in research articles on village economic development have increased significantly over time. These studies encompass diverse topics, such as rural tourism development and economic diversification, all of which play a crucial role in fostering economic growth and promoting sustainability within rural communities.

A bibliometric review of 1154 papers on village economic development from 1948 to June 10, 2024, revealed numerous noteworthy conclusions. Tabel 1 describes the top ten most productive sources, authors, organizations, and nations are listed in the table below. This analysis seeks to provide a comprehensive picture of the various parties' contributions to research on village economic development, as well as to uncover trends and patterns in the academic literature. The most productive sources are major publications that serve as platforms for new and relevant research on rural economic development. The most prolific contributors to this journal demonstrate both their expertise and dedication to exploring topics related to rural economics, significantly advancing both the theoretical understanding and practical applications in this field.

Table 1. Top ranking of co-authors based on the most citations

RO	Author	Link Strength	Citation	APY
Top 1	Oi, Jean C.	2	999	1992
Top 2	Lin, George C.S.	517	754	2004
Top 3	Ho, Samuel P.S.	327	482	2003
Top 4	Yeh, Anthony Go	324	336	2009
Top 5	Tian, Li	937	281	2016
Top 6	Yang, Chun	287	280	2006
Top 7	Li, Xia	164	259	1999
Top 8	Kuhn, Richard G.	618	241	2001
Top 9	Chen, Zongyu	224	241	2013
Top 10	Huang, Guanxing	224	241	2013

RO: Ranging order

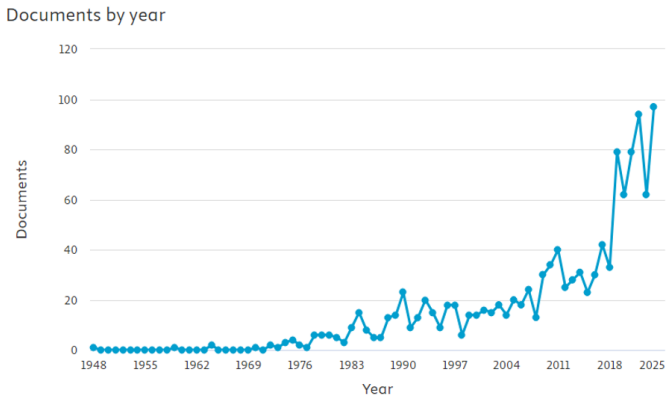

Figure 2. The publishing trend of the Scopus database relating to rural economic development

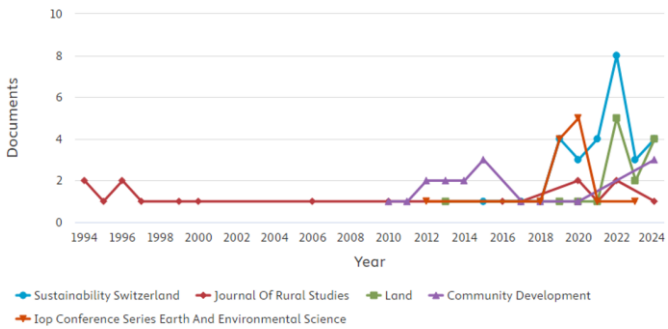

Figure 3. Document per year by source (Compare the document count for up to 10 sources)

The analysis of documents published per year by source, as shown in Figure 2, reveals a notable increase in the number of publications related to economic development since the early 2000s. This indicates that the topic has become more relevant and has received greater attention from academics, researchers, and practitioners in fields such as social sciences, economics, and development studies. This rise could be driven by global factors such as economic crises, changes in development policies, or the increasing need to understand the social and economic impacts of various policies.

In addition to the trend in publication growth, the analysis, as illustrated in Figure 3, also highlights the leading publishers in this field. The top publishers in economic development research include Sustainability (Switzerland), Journal of Rural Studies, Community Development, IOP Conference Series: Earth and Environmental Science, and Land Journal. From this

analysis, it can be concluded that research on economic development has experienced substantial growth, with an expanding scope that now includes sustainability, community development, and environmental issues. The leading publishers in this field highlight the multidimensional nature of economic development research, showing that it now encompasses not just economic factors but also social, environmental, and policy considerations. This trend reflects the growing recognition that economic development is a complex, interdisciplinary issue that cannot be addressed in isolation.

4.2 Analysis of keyword citations

Keywords are nouns or phrases that reflect a publication's primary substance [86]. The frequency with which an article is cited in other works reflects its scientific importance. Citation analysis serves as a key metric for assessing the quality of research published in scientific, technological, and social science journals. Since 1948-2024 Rural Economic Development Research identified 1154 publication items with a total of 5501 keywords. Figure 4 shows a visual representation of citation keywords.

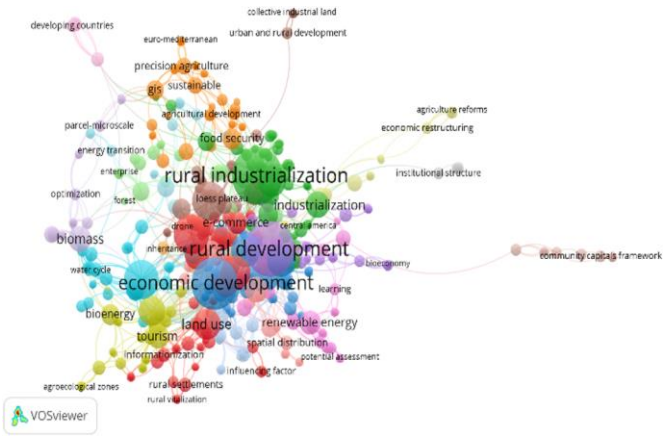

Figure 4. Co-keyword network visualisation for rural economic development study
Note: The co-keyword network visualisation was based on occurrences

Figure 4 depicts a visualization of terms from the Rural Economic Development research. The circle's size shows how many times the keyword appears. The wider the circle, the more terms are chosen together in the magazine Rural Economic Development. There is a flurry of keywords from various groups. Cluster 1 (red cluster) has 147 keywords, Cluster 2 (green cluster) has 102 keywords, Cluster 3 (blue cluster) has 97 keywords, Cluster 4 (yellow cluster) has 97 keywords, Cluster 5 (purple cluster) has 96 keywords, Cluster 6 (sky blue cluster) has 93 keywords, Cluster 7 (orange cluster) has 90 keywords, Cluster 8 (brown cluster) has 78 keywords, and Cluster 9 (bright purple cluster) has keywords. Figure 4 also shows that cluster 1 is related to keywords related to the environment; cluster 2 is related to economic and social issues in rural areas; cluster 3 is related to public policy; cluster 4 is related to industrialization; cluster 5 is related to rural development; cluster 6 is related to rural finance; cluster 7 is related to sustainable development; cluster 8 is related to rural industrialization; and cluster 9 is related to economic development. Cluster 10 covers energy sources, Cluster 11 covers environmental protection, Cluster 12 covers development approaches, and Cluster 13 covers location analysis.

The hue in Figure 5 represents the occurrence of terms from the longest time (dark purple) to 2024 (yellow). The color circle represents the keyword that appears, with the color change from blue to yellow showing that the keyword is new. Figure 5 shows the most recent terms highlighted in yellow, such as Sustainable Agriculture, Community Engagement, Technology, Big data, economic management, and agricultural technology. However, the depiction in Figure 5 demonstrates that there are still a few completely new keywords.

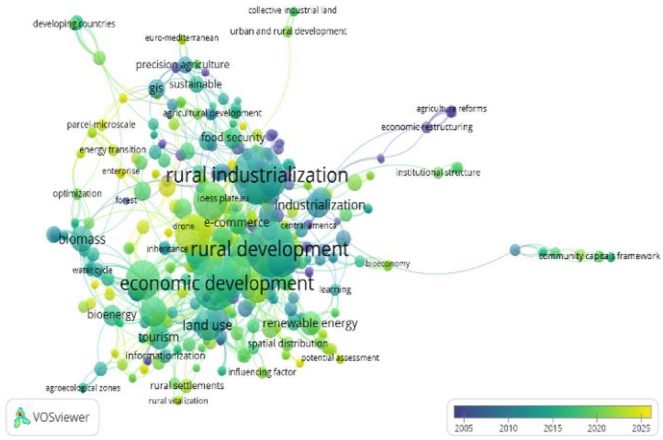

Figure 5. Co-keyword network visualisation for rural economic development study
Note: The co-keyword overlay visualisation was based on the occurrences and average publication per year scores

4.3 Co-authorship visualization analysis

The authorship visualization in VOSviewer is used to examine patterns of collaboration among authors, organizations, and nations in rural economic development publications. Out of 2648 authors who contributed to research on rural economic development, Table 1 shows the top ten with the most citations. These ten authors have the most citations compared to the other authors. However, of the top ten authors, Tian Li has the most network strength or association, with a total of 937 links.

Figure 6 depicts 2648 writers who participated in the research on rural economic development. Each author has at least one publishing document and at least ten citations, and 951 authors meet this requirement. Of the 951 authors, 662 have the strongest networks. Figure 6 shows the most powerful visualization of the author's network, while Figure 5 shows the strength of the author's citations, as well as the visualization of the number of publishing documents with the author's average score.

Figure 6 shows that 662 of the 951 authors have selected networks with other authors. Based on the strength of the network in Figure 6 which consists of 152 clusters, it is clear that Andree Peter has the most networks (3155 out of 121842 in the author's network). Andree Peter is likewise in the same category as other top writers with the most extensive networks. Other authors with the most networks after Andree Peter include Fraser Evan, Haze Shelley, Holmes Shawna, Knezic Irena, Landman Karen, Mount Phil, Nelson Erin, Ohberg Lisa, and Winson Anthony.

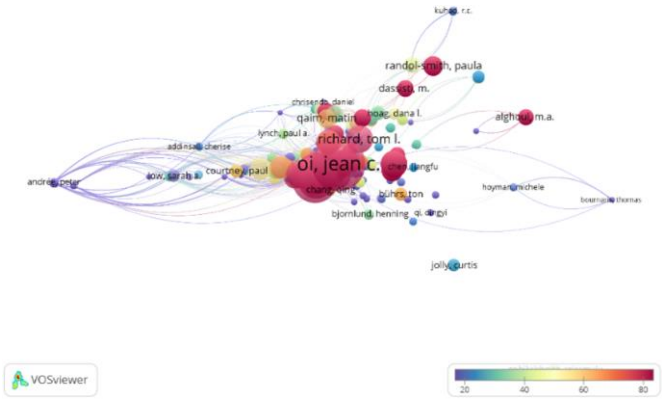

Figure 6. Author cooperation network for rural economic development
Note: Author citation

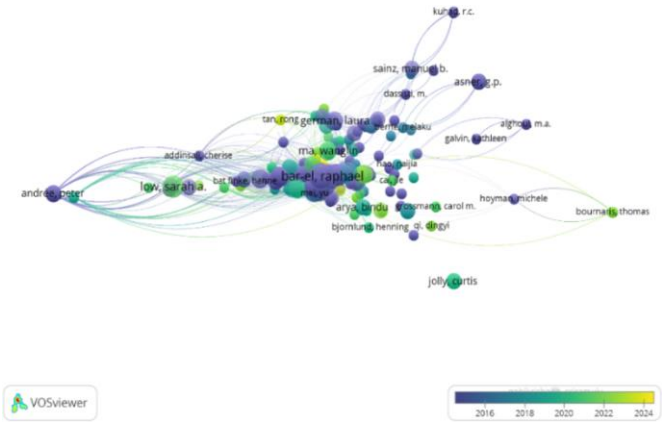

Figure 7. Author cooperation network for rural economic development
Note: Document average publication year score

Figure 7 depicts the most authoritative network in the research on rural economic development. The larger circle in Figure 7 represents the author's greater contribution to the study. Based on the Scopus database, VOSviewer visualizations demonstrate that Jean C. Lin has the most citations, but there are few linkages or relationships with other writers. George C.S., on the other hand, is the author with the second-highest number of citations (754), but he has strong linkages and relationships with other authors. In Figure 4, the size of the circle represents an author's average publication, while the color gradient from blue to yellow denotes the newness of the published item.

Table 1 presents the top-ranking co-authors based on the most citations in the field of rural economic development. This table highlights key researchers who have significantly influenced the literature and shaped the trajectory of the field. The dominance of certain authors and their collaborations reflects their substantial contributions to the advancement of rural economic development research.

Jean C. Oi (Top 1), with 999 citations, stands out as the leading researcher in this field, indicating the far-reaching impact of her work. Her long-standing influence since 1992 suggests that she has consistently contributed to foundational concepts or theories in rural economic development. Her pioneering role likely lies in introducing key frameworks or models that have shaped subsequent research.

George C.S. Lin (Top 2) follows closely with 754 citations. Lin's contributions have evidently addressed crucial issues in rural development, particularly in the Asian context, given his frequent involvement in international collaborations. His work since 2004 may have focused on applying rural economic development theories to real-world case studies, making his research highly influential.

Samuel P.S. Ho (Top 3) with 482 citations has also made noteworthy contributions. Ho's research, emerging in the early 2000s, could be crucial in bridging the gap between technological advancements and rural economic growth, a focus area that aligns with contemporary research trends.

Anthony Go Yeh (Top 4), another highly influential researcher with 336 citations, is likely recognized for his contributions to sustainable rural development, particularly in Asia. His works might have emphasized the importance of integrating sustainability practices with rural economic strategies, a theme central to the current research.

Li Tian (Top 5) is another notable contributor with 281 citations. Tian's research, emerging in 2016, may reflect a more recent focus on integrating digital technologies with rural development, aligning with global efforts to digitally empower rural communities.

Chun Yang (Top 6), Xia Li (Top 7), Richard G. Kuhn (Top 8), Zongyu Chen (Top 9), and Guanxing Huang (Top 10) are also influential in shaping the discourse on rural economic development. Their collective work emphasizes the interdisciplinary nature of the field, integrating aspects of sustainability, technological adoption, and community participation.

The dominance of certain authors, particularly those who have been active for several decades (Oi, Lin, Ho), suggests the existence of longstanding research traditions that have driven the field forward. In contrast, newer contributors, such as Tian (Top 5), and others who have emerged over the past decade highlight the increasing relevance of contemporary themes, such as digital technology and sustainability, in the context of rural development. The collaboration networks of these authors indicate strong cross-border partnerships, highlighting the global nature of rural economic development research.

The citation counts in this table also reveal the evolving trends in rural economic development. Authors who have consistently published work that integrates multiple aspects of development—sustainability, technology, and community engagement—tend to attract higher citations. This supports the notion that interdisciplinary approaches are gaining recognition in the field. By understanding these prominent authors and their collaborative networks, we can better understand the key drivers in rural economic development research, as well as the directions in which the field is heading. These authors are not just researchers; they are also thought leaders whose work guides and influences both academic discourse and practical policy implementations in rural areas.

4.4 Cooperation analysis by countries or regions

The use of VOSviewer to visualize inter-country author collaboration contributes significantly to understanding the pattern of scientific collaboration between nations, institutions, and authors in a variety of fields of research. By integrating bibliometric data with advanced visualization techniques, researchers can gain a comprehensive understanding of the structure and dynamics of global scientific collaboration. This aids in detecting emerging research trends as well as potential future study directions

[87]. Collaboration between scholars from these nations indicates a high degree of interest in rural economic development research. This analysis shows that collaboration among academics from different countries and regions has a considerable impact on knowledge development on the topic being studied.

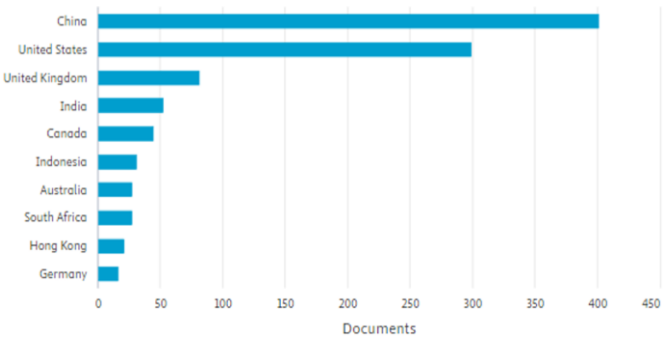

Figure 8. Top ranking of countries based on the number of joint publication collaboration documents

Figure 8 shows rural economic development research country-based or regional co-authorship analysis can provide a more in-depth understanding of collaboration among researchers from China, United States, and United Kingdom, the three countries with the most jointly published collaborative documents. Understanding the collaboration patterns among countries and regions in this study can help identify each country's contributions to knowledge development and best practices in rural economic development. As a result, country-based or regional co-authorship analyses can provide useful insights into understanding researcher collaboration in rural economic development research, as well as recognizing substantial contributions from specific countries or regions to the advancement of this subject.

The analysis of co-authorship visualization by country or region in rural economic development research offers critical insights into the collaborative patterns among researchers across different parts of the globe [88-91], Notably, China, the United States, and the United Kingdom emerge as the leading contributors in terms of joint publication collaborations in the field of village economic development research.

Figure 9 depicts a bibliometric visualization for the Rural Economic Development research, with analysis from the Co-Author of Country. The data shows that only 73 of the 93 nations involved in the collaboration of scholarly articles on rural economic development have strong collaboration. Figure 6 depicts many color clusters indicating cooperative scientific writing partnerships across multiple countries. According to the Scopus database on Rural Economic Development study, China has the most joint published papers (370), followed by the United States (293), and United Kingdom (81).

Figure 9 illustrates the strong contributions of China, the United States (US), and the United Kingdom (UK) to research on rural economic development. This dominance highlights the significant role these countries play in advancing global research in this field. The US appears to benefit from a broad international collaboration network, as evidenced by its strong connections with countries such as Germany, Canada, and India. Meanwhile, China demonstrates robust links with Asian and some European nations, reflecting its focus on regional issues and collaborative approaches to addressing local challenges.

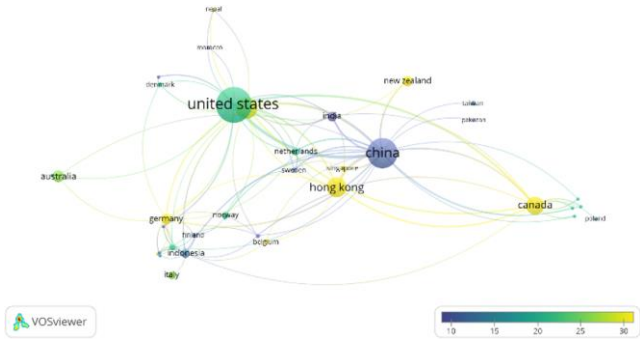

Figure 9. Presents a graphical map highlighting the network of countries and regions engaged in rural economic development research
Note: The visualization is constructed based on document weights

This dominance can be attributed to several factors. First, these countries possess robust research infrastructures and funding mechanisms that facilitate extensive studies in rural development. For instance, the UK's collaboration with China has significantly increased, with co-authored publications rising from 1% in 2000 to 11% in 2019, reflecting enhanced research partnerships and investments [92].

Second, government policies in these countries play a critical role. China's "Rural Revitalization" strategy, focuses on integrating digital technologies into rural economies, modernizing agriculture, and improving rural livelihoods [93]. Similarly, studies have shown that the digital economy significantly promotes rural revitalization in China by impacting industrial prosperity and ecological sustainability [94]. Additionally, international collaboration further strengthens the research output from these regions. The US, for example, actively engages in diverse global partnerships, enhancing the applicability of its research findings to various contexts [95].

However, this concentration of research contributions may lead to a focus on issues specific to these countries, potentially overlooking challenges faced by rural areas in other parts of the world. While China's emphasis on digital solutions in rural development is effective in its context, it may not adequately address the infrastructural challenges prevalent in rural regions of developing countries [96]. To achieve a more balanced global perspective in rural economic development research, it is essential to encourage broader collaboration with researchers and institutions in underrepresented regions such as Africa, Latin America, and Southeast Asia. These collaborations can incorporate diverse experiences and challenges into the research discourse. Furthermore, diversifying research agendas to include traditional community-based approaches and indigenous knowledge systems is crucial for fostering sustainable development in various rural contexts [97]. By adopting these strategies, the research community can develop more inclusive and comprehensive insights into rural economic development, ultimately fostering sustainable growth across diverse global contexts.

4.5 Research organization

In bibliometric analysis, collaboration between organizations refers to the partnerships and interactions between different organizations in the realm of scientific research and publication. When organizations collaborate on research, they often engage in co-authorship, co-citation, and

co-occurrence relationships, which can be analyzed using bibliometric tools to gain insights into the dynamics of these collaborations and their influence on the scientific community [75, 98, 99].

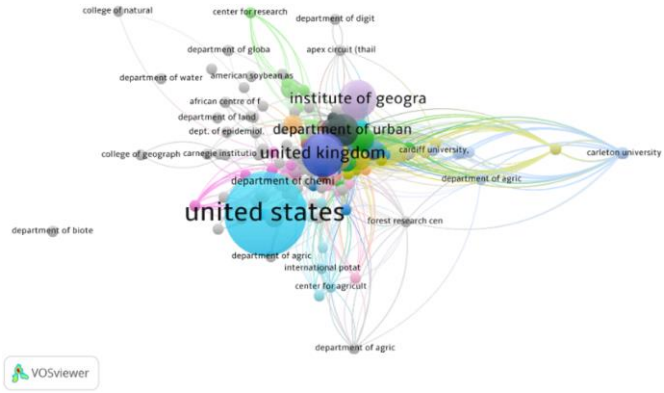

Figure 10. Visualization map of research organizations centered on rural economic development
Note: The map of the organizational network visualization was constructed based on document weights

Figure 10 shows the type of study that can reveal important information on the structure of collaborative networks, the distribution of research contributions across organizations, and the evolution of research themes over time [100, 101]. According to a study on rural economic development, 1849 groups cooperate. Research organizations are ranked according to the strength of their publishing linkages to one another. The organizations with the most connections and networks include the University of Chinese Academy of Sciences, China Center for Agricultural Policy, School of Economics Peking University, Institute of Geographic Sciences and Natural Resources, School of Public Administration China, State Key Laboratory of Urban and Regional Ecology, College of Resources and Environment, Baseflow Galaxy House, and State Key Laboratory, Leibniz Institute of Agriculture.

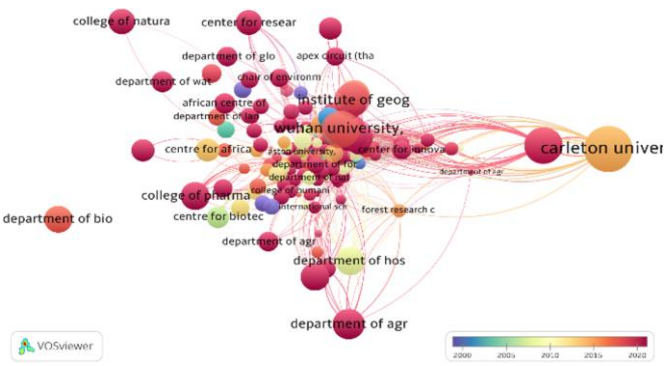

Figure 11. Visualization map of research organizations focused on rural economic development
Note: The overlay map of organizations was based on total link weights and the average publication year score

Figure 11 depicts groups collaborating on scientific publications on rural economic development. According to the Scopus database, there are 1849 organizations, but only 1166 have relationships, as shown in the Vosviewer graphic Figure 11. Figure 10 depicts a network of research organizations based on the strength of their publication links with one another. The University of Chinese Academy of Sciences, China Center for Agricultural Policy, School of Economics Peking University, Institute of Geographic Sciences and Natural Resources, School of Public Administration China, State Key Laboratory of Urban and Regional Ecology, College of Resources and Environment, Baseflow Galaxy House, and State Key Laboratory, Leibniz Institute of Agriculture are among the organizations that have the most connections and networks. Figure 11 depicts a network of research groups based on the overall strongest network and the most current average number of publications each year. Groups in red are new to rural economic development research, while blue groups have been active for a while.

5. DISCUSSION

5.1 Convergence between sustainable agriculture and digital technology

Sustainable agriculture and digital technology complement each other in the context of rural economic development. This discussion could include examples of the use of technology to improve sustainable agricultural yields, such as the use of smart sensors for soil monitoring, precision agriculture, and geographic information systems (GIS) for land analysis. Telework, technological advancements, and internet connections can all help rural governments achieve their economic development goals [102]. Rural financing and Internet finance help boost rural economic growth [103]. The convergence between sustainable agriculture and digital technologies plays a key role in improving efficiency and sustainability in the agricultural sector in rural areas. Digital technology not only helps farmers to be more efficient in managing natural resources, but also increases productivity and long-term sustainability by reducing environmental impact and supporting data-driven decisions. The integration of technology in sustainable agriculture provides a way for villages to become more economically independent and contribute to global food security.

Technology has a big role in accelerating rural economic development. Technology can be used to improve production efficiency, facilitate market access, and reduce dependence on outside technology. For example, digital technologies such as e-commerce platforms allow farmers or village artisans to market their products to a wider market without having to rely on intermediaries. Additionally, technology can improve natural resource management, such as the use of smart irrigation systems in agriculture or data-driven applications for environmental monitoring. With the use of technology, villages can be more independent in terms of managing natural resources and local products.

The publication trend in research on village economic development reflects diverse goals and methods employed by researchers. Investigating the link between digital inclusive finance and non-agricultural employment for rural workers is essential for fostering rural economic growth and achieving widespread prosperity [104]. Additional findings provide strong evidence to support governmental efforts in promoting rural e-commerce as a strategy to boost incomes and stimulate rural economic development, which is also valuable for China in reducing the urban-rural income disparity [105].

On the other hand, economic diversification is a critical component of village economic development studies. Podgorskaya [106] emphasized the significance of

strengthening rural areas' competitiveness through economic diversification, which includes leveraging local potential and innovation. This study demonstrates that incorporating innovative aspects into the economic system can assure long-term growth and social development in villages. Furthermore, Dax et al. [107] found that agritourism can be a successful diversification strategy due to the numerous assets and activities associated with land management, as well as the added value of local products. Digitalization is also becoming an increasingly relevant topic in research articles. In addition, Kashina et al. [108] demonstrated that the use of digital agricultural technology can improve the competitiveness of agricultural firms, contributing to long-term economic development.

By integrating digital technologies in agricultural practices, farmers in rural areas have the opportunity to increase market access and income. Technology can help them sell products directly to consumers, reduce dependence on intermediaries, and increase selling prices. This strengthens economic sustainability in the village. Digital technologies also support diversification in agriculture, which in turn increases productivity and sustainability. For example, by using livestock and crop integration systems, farmers can utilize agricultural waste for animal feed or organic fertilizers, creating a more sustainable system and reducing reliance on chemicals and external inputs.

Many studies have also shown that the use of technology can improve efficiency and productivity in the rural agricultural sector, as well as open up new market opportunities. Previous studies [109, 110] highlight how information and communication technology (ICT) can help farmers access market information, more efficient agricultural practices, and increase income through better access to global markets. Other research shows that digital technology can also strengthen the resilience of the village economy by opening up opportunities for economic diversification, such as through e-commerce for local products or technology-based agro-industries.

5.2 Local potential and community engagement to achieve village economic independence

Local potential refers to the resources that exist within a community or village, such as natural resources, local culture, community skills, and access to local markets. In the context of rural economic development, utilizing local potential enables villages to take advantage of the strengths present in their environment without being overly reliant on external factors. This approach can improve the sustainability of the village economy by tapping into existing assets like agricultural products, handicrafts, and nature-based tourism. Rather than depending on external sectors, the village can build its economy from within by leveraging the wealth of resources it already possesses.

Community involvement is essential in ensuring that village development is both inclusive and responsive to local needs. In rural economic development, the active participation of the community in the planning, implementation, and evaluation of economic programs can significantly accelerate the achievement of economic independence. When communities are actively involved, they are more open to adopting changes and new technologies introduced through development projects. This involvement also creates a sense of ownership over the projects, which contributes to their long-term success and helps build sustainable collective capacity within the community.

Several studies have highlighted the significance of local potential and community engagement in fostering rural economic development. Research has shown that development based on local potential is key to leveraging the comparative advantages that villages possess. Rural economic development driven by resources such as organic agriculture, handicrafts, and eco-tourism can substantially increase rural incomes while promoting nature conservation.

Additionally, local potential strengthens food security and offers more sustainable economic models that do not rely on outside aid or investment. Moreover, previous research emphasizes the positive impact of community involvement in village development projects. Villages that involve their communities in decision-making processes tend to achieve higher success levels, as the solutions implemented are more relevant and acceptable to local people. Active participation not only raises awareness of sustainable economic practices but also encourages communities to innovate in addressing their own economic challenges.

One of the themes that emerged was the importance of tourism for local economic development. According to research, tourist development can be a significant driver of local economic prosperity. Pratt [111] found that investment in tourism infrastructure in China not only enhances economic growth but also improves income distribution from urban to rural areas. According to the study, domestic tourism can considerably contribute to local economic growth while also helping to eliminate disparity between urban and rural communities. Agritourism can provide additional income for rural communities, hence supporting long-term economic growth.

Research [112] focuses on smart village initiatives designed to enhance the quality of life and sustainability in rural areas. This study shows that policies promoting innovation and collaboration between the government, communities, and the private sector are essential for achieving sustainable development objectives.

Furthermore, Qu et al. [113] found that reducing inequality in rural industrial growth requires a comprehensive approach that incorporates social, cultural, and economic factors. In the study by Singh et al. [114], the authors examine rural economic development by applying the Adaptive Neuro-Fuzzy Inference System and the Fuzzy Delphi Technique to evaluate the socioeconomic effects of rural road construction. The results suggest that this approach offers a robust framework for handling both qualitative and quantitative data effectively.

In keyword analysis in the village economic development study, some keywords appear frequently and significantly. The most frequently used terms are economic development, rural development, and "village economy." This demonstrates that research in this sector is frequently focused on initiatives to enhance economic factors at the village level. Keyword analysis reveals that there is a strong emphasis on elements influencing village economic growth, such as, Sustainable Agriculture, Community Engagement, Tecnology, Big data, Economic management, and agricultural technology infrastructure development, community empowerment, and village fund management. Research frequently looks at how development policies and initiatives affect economic growth and the well-being of rural areas [115-120].

In the context of rural economic development research

country-based or regional co-authorship analysis can provide a more in-depth understanding of collaboration among researchers from China, the United States, and the United Kingdom, the three countries with the most jointly published collaborative documents. Understanding the collaboration patterns among countries and regions in this study can help identify each country's contributions to knowledge development and best practices in rural economic development. As a result, country-based or regional co-authorship analyses can provide useful insights into understanding researcher collaboration in rural economic development research, as well as recognizing substantial contributions from specific countries or regions to the advancement of this subject. According to related studies, analyzing citation visualization by nation or region can aid in discovering strong patterns of collaboration among researchers from various countries or regions.

The disparity in the number of publications and citations in rural economic development research between China and the United States can be attributed to factors such as research volume, quality of academic network, research focus, and publishing strategy. China has made enormous investments in R&D during the last many years. Many Chinese institutions and research institutes produce a large number of publications, focusing on economic and social growth. While the number of publications in the United States is lower, the quality and impact of the research produced are frequently higher, attracting more attention from the global academic community. Quality and Academic Network in the United States, where colleges like Harvard, MIT, and Stanford have a great reputation and an extensive academic network. These universities' research is more frequently cited because of its sound methodology and important policy implications. Although considerable research is published in China, its quality and influence may vary; hence, not all papers acquire equal citations. Research in China typically focuses on local issues and specific conditions, which may appeal less to international researchers than the more general and theoretical approaches observed in research in the United States. Publishing Strategy Researchers in China are more encouraged to publish several works to meet academic and bureaucratic requirements, whereas researchers in the United States are more concerned with the quality and impact of their research. The combination of these factors explains why China has a large number of publications while the United States has more citations for rural economic development.

While the initial analysis highlights the individual contributions of sustainable agriculture, digital technology, and community engagement to rural economic development, further exploration into the synergies among these elements can provide a more comprehensive understanding of their interplay. A more integrated approach would demonstrate how these dimensions intersect to create a self-reliant rural economy.

For example, in regions where sustainable agricultural practices are adopted, the use of digital technology—such as precision farming tools or mobile applications for market access—can greatly enhance the efficiency and profitability of rural enterprises. In India, the digital agricultural transformation, where mobile technology has been utilized to connect farmers with market information and sustainable farming techniques, illustrates how digital tools support both agricultural sustainability and community engagement by providing farmers with essential knowledge and access to resources [121]. Similarly, in African countries like Kenya, farmer cooperatives have been instrumental in spreading digital agricultural solutions while ensuring that sustainability goals are achieved through collective efforts [122]. In these cases, community-driven initiatives, such as cooperative farming models or local knowledge-sharing platforms, ensure that sustainable practices and digital innovations are adapted to local needs [123].

Moreover, countries like the Netherlands and Japan provide relevant examples where technology and sustainability are seamlessly integrated. The Netherlands, for instance, has been leveraging precision farming technologies to reduce environmental impacts while enhancing agricultural output [124, 125]. Similarly, Japan’s adoption of smart agriculture, integrating robotics and IoT in farming practices, further highlights how technological innovations can support sustainability goals, particularly when paired with local community involvement and governmental support [126]. Lajoie-O'Malley et al. [127] explored how technological interventions can improve rural economic outcomes in developed countries, while Oppedahl [128] highlighted how similar technological advances are transforming rural economies in North America.

By incorporating such case studies from diverse regions, this study can better illustrate the real-world applications of the convergence between these three dimensions and demonstrate their cumulative impact on fostering rural self-reliance. These examples show that integrating sustainable practices, technological advancements, and community engagement can foster more resilient rural economies and promote long-term development.

5.3 Implications for policymakers and practitioners

The findings of this study not only advance the theoretical understanding of rural economic development but also provide practical guidance for policymakers and practitioners aiming to address rural development challenges. These findings hold significant implications for promoting sustainable and self-reliant rural economies by highlighting the convergence of sustainable agriculture, digital technology, and community engagement as actionable opportunities to address persistent challenges.

Policymakers can leverage the role of digital technology to improve rural connectivity and economic inclusion by introducing policies that subsidize digital infrastructure or provide training programs for rural communities. Such initiatives enhance access to markets and knowledge resources, integrating rural economies into the global economic system while fostering local innovation. Similarly, the study emphasizes the importance of promoting sustainable agricultural practices through the adoption of environmentally friendly farming techniques. Policymakers can create incentives, such as tax breaks or grants, to support farmers transitioning to sustainable practices, while practitioners, including agricultural extension workers, can design training and outreach programs that align with global sustainability goals.

Community engagement also emerges as a central pillar of rural development. Policymakers and practitioners can collaborate to design participatory rural development programs that actively involve local stakeholders in decision-making processes, ensuring initiatives are contextually relevant and widely accepted by the community. Additionally,

the analysis of collaboration networks reveals opportunities for interdisciplinary partnerships. Governments and development agencies can facilitate collaborations between researchers, businesses, and local organizations to develop integrated solutions tailored to rural challenges.

The study underscores the importance of global learning and knowledge sharing in addressing rural economic disparities. Policymakers can adapt successful rural development strategies from other countries by leveraging knowledge-sharing platforms and participating in international conferences to disseminate best practices. These insights offer a comprehensive roadmap for actionable strategies, ensuring the findings are not only academically relevant but also practically applicable. By addressing the intersections of sustainability, technology, and community involvement, this study provides a robust framework for shaping effective rural economic policies and programs.

6. CONCLUSION

Based on the bibliometric analysis of rural economic development, it can be concluded that the convergence between sustainable agriculture, digital technology, and Community participation is crucial in attaining sustainable economic independence for villages. The combination of local potential, active community participation, and the use of technology creates a holistic and efficient approach to encourage self-sustaining economic growth in rural areas. Previous research has shown that integrating local potential with technology can increase the productivity and sustainability of the agricultural sector and open up wider new market opportunities. In addition, community involvement in the planning and implementation of development projects ensures that the solutions taken are relevant to local needs and can be quickly adapted by the community. This improves social and economic sustainability at the village level. The adoption of digital technology, particularly in agriculture, can enhance the efficiency of natural resource use and expedite the marketing of local products. Technology also allows for wider market access as well as the diversification of village economies, which in turn contributes to reducing dependence on external assistance and creating a more self-sufficient economic ecosystem. By combining these three factors, it provides a solid foundation to realize an independent, competitive, and sustainable village. In the midst of global challenges and growing social changes, a rural economic development strategy based on local potential, with the support of technology and active community involvement, is a very relevant and strategic step to achieve village economic independence in the long term.

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