Bibliometric Analysis on Ecotourism in Agriculture (2012 to 2022) Through VOSviewer

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Abstract. Ecotourism, natural resource protection, and local livelihood are considered a kind of nature-based tourism that targets two key attributes: the enhancement of livelihoods and the protection of biodiversity. Bibliometric analysis is a quantitative review approach that employs statistics, data mining, and mathematics to identify new academic trends. To evaluate the evolution and extension of this body of knowledge and to forecast its future path, the present study analyzed Scopus-indexed research publications on ecotourism in agriculture from 2012 to 2022. To perform the bibliometric analysis, the VOSviewer software and Scopus analytics were used. VOSviewer has two separate visualization modes: network and overlay. A total of 274 journal articles (n = 181) and conference papers (n = 46) were extracted. The number of research documents published by 269 authors was steadily increasing annually. China is the leading country in the number of publications and research collaborations. In addition, monitoring the carrying capacity of ecotourism locations and giving vocational training to the untrained local people would increase the overall efficacy of the ecotourism industry. For a successful ecotourism company, it would be advantageous to get a thorough understanding of the ecotourist's role and the importance of eco-certification.

Keywords: Biodiversity, environmentally-friendly, nature-based tourism, quantitative review manuscript, scientific mapping.

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1 Introduction

Ecotourism is gaining popularity in biodiversity hotspots due to its ability to improve rural lives and further environmental protection. It has the capacity to reduce poverty, which is deeply ingrained in several aspects of society [1, 2]. The International Ecotourism Society (TIES) describes ecotourism as "ethical travel to natural places that benefits local communities and protects the environment". Consequently, the essence of ecotourism consists primarily of (i) a nature-based solution; (ii) a sustainability dimension from the perspective of conservation; (iii) a sustainable human factor taking into account the participation and benefits of local people; (iv) learning, education, and awareness; and (v) ethical marketing and business management of indigenous products. Additionally, it acts as a "human shield" by discouraging bad externalities like as mining, logging, and poaching [3]. In addition, it encourages recycling and protects against the continued danger of global warming and pollution [4]. In the tourist business, ecotourism has been seen as a way of life, a collection of activities, and a set of principles if properly planned and executed [5].

In certain nations, the tourist industry is one of the most important economic growth and development drivers [6, 7]. Tourism sector executives are often proactive and anticipatory in this highly dynamic industry. Tourism contributes to the economic growth and GDP of several nations, particularly in Europe, where five countries are among the top 10 tourist destinations in the world [8]. Travel is becoming more significant to many individuals. According to a UNTWO poll, nearly 1.4×10^9 peoples traveled in 2019 [9, 10]. A growing number of individuals value travel more [11, 12]. To lessen the negative environmental consequences of tourism, many are developing and implementing' sustainable tourism,' which is gaining prominence in the tourist industry [13].

Ecotourism has been lauded as a positive phenomena, but it has also been criticized for the vagueness of its several meanings [14]. From a human development perspective, Butcher [15] stated that human development-based analysis of ecotourism's potential as a strategy for integrated conservation and development (ICDP) in rural developing nations. Butcher [15] argues persuasively in his book that integrating the rural poor in developing nation communities with NGO programs links them to aid and assistance based on a set of Western-established predetermined criteria. Essentially, the power disparity between rural poor and relatively rich NGOs located in the West may be legitimized via the employment of vocabulary that promotes sustainability and community empowerment. From Butler [14] viewpoint, people are of the opinion that eco-visitors are preferable to mass tourists since they are ready to go to great efforts to see less-visited locations. However, it is frequently questioned if eco-tourists leave greater environmental footprints than other visitors owing to their considerable travel. This fact is being neglected since ecotourists are already designated as sustainable visitors. Therefore, a cost-benefit analysis of nature-based tourism is essential for wild and vulnerable areas, as opposed to simply labeling types of tourism or visitors as sustainable or unsustainable (*e.g.*, eco-lodges, the remote regions that need extensive long-haul travel to visit) [14].

While several reviews of ecotourism's sectoral impact have been undertaken [16, 17, 4], comparatively little study or assessment has been conducted on the sectoral effects of ecotourism in underdeveloped and industrialized countries. This research investigates the effects and solutions of ecotourism by doing a comprehensive literature review that gives several perspectives and implications. However, there is no research on agricultural ecotourism that can be combined to increase GDP. Thus, this work conducted a bibliometric analysis of multiple globally published papers on transportation packaging to provide an overview of its universal outputs and determine its present and future research path.

Bibliometric analysis is a type of quantitative evaluation that integrates statistics, data mining, and mathematics to detect patterns that emerge in a certain academic topic. Now it is gaining popularity and being used in several disciplines of study [18]. Through this method, the authors were able to determine that the unequal distribution of economic gains, which favors stakeholders outside the protected area, is the primary factor influencing the current general issues in the relationship between ecotourism and indigenous people in developing countries. Due to a lack of communal sovereignty over land and resources, indigenous tribes are discouraged from participating in ecotourism. In addition, the unequal power connections between stakeholders and indigenous people indicate that the latter have no real voice in management decisions. In this research, therefore, all available scholarly works on ecotourism in agriculture from 2018 to 2022 were combed through to assess the growth and development of this body of knowledge and to predict its future trajectories.

2 Methodology

Bibliometric studies involve several mathematical and statistical methodologies for analyzing bibliographic data [19]. The bibliometric review method tries to grasp the relationship between journal citations and research performance and offers a succinct evaluation of the current condition of an active or expanding research field. Bibliometric analyses extract the data required for a bibliometric investigation from multiple citation databases, such as Scopus and Web of Science [20]. In addition, additional review approaches, such as meta-analysis, may also be used to manage such data. Both meta-analysis and bibliometric analysis are quantitative methods of review. In a bibliometric analysis, the studies may be diverse, unlike in a meta-analysis. In addition, bibliometric studies examine just a quantitative assessment of the properties of an article (such as publications, citations, keywords, and authors) and their interrelationships. However, one must analyze the linkages between the actual results of publications and the extensive usage of meta-analysis in linked research fields. Nevertheless, both approaches may describe the contemporary research topic as well as the trends and directions of the area. In subheadings, the bibliometric investigation's most recent measurements are reported [21].

2.1 Determining the study's scope and data collection

In bibliometric analysis, the first factor to evaluate is the magnitude of the research. Before the study can begin, the scope and quantity of studies to be evaluated must be specified in detail. Otherwise, the findings would be substandard, riddled with errors, and conflicting with the primary objective of the research. It is essential to thoroughly assess the keywords employed in data collecting.

2.2 Positioning

When the amount of bibliometric data is considerable and the scope of the literature review is too vast for a manual examination, bibliometric analysis should be explored. Bibliometric analysis is recommended only when there are at least 200 articles to evaluate in the references. It was discovered that the average category-standardized citation impacts of bibliometric studies with lower sample sizes (200 articles) varied greatly, rendering this technique inappropriate [22]. Therefore, the present research included trial-and-error approaches and keyword filtering and decided that the sample size was enough for bibliometric analysis. Important to the bibliometric investigation was the selection of a

suitable database to gather data from the literature. As stated, the data for this research were extracted from the Scopus database in Microsoft Excel (.csv) format [23].

2.3 Colour illustrations

Every bibliometric research relies on performance assessment, network analysis, and scientific mapping as its foundation. Performance analysis is a method for analyzing publication and citation metrics (*e.g.*, appraisal of the total number of published articles and citations; h-index) [24]. The h index as "a scientist possessing index h if h of his or her Np articles each have at least h citations and the remaining Np - h papers each have at least h citations" [25]. Science mapping (or bibliometric mapping) examines the effects and strengths of relationships between specific article attributes using the co-occurrence weight and total link strength of each item. It encompasses citation analysis, bibliographic coupling, co-citation analysis, co-word (keyword) analysis, and co-authorship analyses. Network analysis may enhance the output quality of bibliometric mapping. Standard network analysis approaches include metric evaluation, grouping, and visualization. Scopus data including total publications, number of articles per active year, yearly total citations (as assessed by frequency), and h-index were utilized to support the performance analysis in this research. Scopus analytics capabilities were used for performance evaluation of SLN-related academic output. Moreover, the data file was used in conjunction with the VOSviewer program for scientific mapping and network analysis [26, 27]. The VOSviewer is extensively used in bibliometric research by van Eck and Waltman [27, 28] designed the program to simplify the development and presentation of comprehensible bibliometric maps. It performs an outstanding job of collecting pertinent information, recognizing similarities between articles that meet the same criteria, and identifying the overall theme that runs across the chosen papers. In addition, VOSviewer provides three separate viewing modes, including network visualization, overlay, and density visualization. The sole reason why researchers utilized network visualization was because it enabled them to easily examine how various keywords and publishing topics are associated based on characteristics such as co-occurrences, co-authorship, and country. It also use color to signify the prevalence and relevance of a certain research. As a phrase becomes increasingly prevalent across several academic disciplines, the contrast of its related line becomes more pronounced. On the other hand, a pale tint indicates a weak association [29].

3 Results and discussion

3.1 Biobliographic extraction

In this work, the researchers searched database from https://www.scopus.com/, based on [TITLE-ABS-KEY (ecotourism AND agriculture)]. The search recorded 406 studies (Table 1), covering articles, reviews, book chapters, and conference papers, published from 1991 to 2023. These documents (n = 274) between 2012 and 2022 accounted for 82.85 % of the Scopus-indexed research output. Furthermore, the researchers sorted original publication papers (n = 227) published in English between 2012 and 2022 to achieve the objectives of this research. The reason there are so many research articles in this field is because both the academic and professional communities are becoming more interested in it.

Direct (tourist visits, admission fees, monetary contributions such as environmental conservation levies and voluntary gifts, etc.) and indirect (travel and lodging taxes) financial advantages to the local community are the most important contribution of

ecotourism activities [30, 31, 16]. Thus, ecotourism is characterized from the viewpoints of both supply and demand [32]. Ecotourism is a suitable substitute for wood harvesting and tree felling for agricultural reasons [33]. In response, the forest sector often supports the ecotourism industry with commercial goods such as handicrafts and medicinally-used uncommon plant species. In the Commonwealth of Dominica, West Indies, a significant amount of the ecotourism sector's revenues are derived from the manufacture of forest product-based decorations, furniture, and houses using bamboo [34]. Moreover, the cost-benefit analysis of conservation efforts in South Africa's Makuleke Region of Kruger National Park has contributed to the region's economic independence via tourist activities [25]. In addition, using the Contingent Valuation Method (CVM), Adamu *et al.* [35] believed that most visitors are ready to pay far more than the actual admission price for conservation objectives, and that the excess cash aids protected area decision-makers in managing their financial policies successfully. The same is true for Amerindian villages in the Iwokrama rain forests, whose living conditions grew due to ecotourism activities [36].

Table 1. Bibliographic extraction.

Type of documents	1991 to 2023		2012 to 2022	
	Number	**Percentage**	**Number**	**Percentage**
Article	280	68.97	181	66.06
Conference paper	53	13.05	46	16.79
Book chapter	33	8.13	27	9.85
Review	26	6.40	13	4.74
Short survey	4	0.99	2	0.73
Conference review	4	0.99	2	0.73
Book	5	1.23	2	0.73
Erratum	1	0.25	1	0.36
Total	406	100	274	100

3.2 Overview of research performance

Prior to compose bibliometric mapping, the Scopus publications were evaluated for their productivity, which provides a descriptive analysis of how different variables (such as keywords, publication kinds, authors, institutions, countries, and journals) perform in Scopus searches. In this work, this research revealed the production per productive year of publishing, the total yearly citations, the h-index, the most-cited articles, and the most relevant publications. This data was compiled with the use of "document search results" from Scopus. Understanding the performance of research output in a certain field requires a careful examination of the yearly frequency of scientific article publication. Table 2 displays the annual rate of article publication from 2012 through 2022, totaling 274 publications. In 2016, the lowest number of articles was seen. Sustainability Switzerland majority of the 21 publications in 2022. Research on ecotourism was published in these two journals (Sustainability Switzerland and Journal of Sustainable Tourism) because of their Social Sciences specialization.

Citation counts measure the impact of a publication or an author by measuring the number of times other publications cite each. Table 2 and Table 3 include citations for years and scientific works. Compared to previous years, 2021 and 2022 have the highest proportion of citations. Due to the small number of scientific papers, 2022 was the most impactful year for ecotourism research. Environmental issues and education are two of the most important impacts of ecotourism on protected areas. The Halle Park in Mombasa, the Kimana Sanctuary in Amboseli, the Kakamega National Reserve, and the Tree-Top resort in Aberdares National Park, Britain are examples of areas that have been protected and preserved because of the growth of ecotourism [37]. According to Butarbutar and

Soemarno [38], as a result of the establishment of severe water consumption regulations and the mitigation of flooding risks as a result of afforestation and biodiversity conservation, clean water is now readily available in the majority of protected areas (PAs). In addition, the money created by ecotourism firms inhibits exploitative practices like as mining and slash-and-burn agriculture, as well as the long-term maintenance of carrying capacity (ibid.). The funds are also invested in organic farming to ensure the long-term financial viability of the property. Particularly, ecotourism helps alternative energy sources and waste management [39], include the capacity to comprehensively brand the environment of conservation sites [16]. Moreover, environmental education strengthens multiple ecotourism goals, including (i) providing satisfaction through recreation and assisting in getting to know nature intimately, (ii) enhancing individual environmental knowledge and awareness, and (iii) assisting in strengthening visitors' "pro-conservation" values to focus on sustainable conservation of natural assets [40].

Table 2. Publication performance analysis.

Years	Number of articles	Citation
2022	43	703
2021	43	504
2020	39	469
2019	18	265
2018	24	190
2017	23	157
2016	10	127
2015	17	85
2014	19	57
2013	13	20
2012	25	6

Table 3. Top-cited articles.

Rank	Title of the article	Year	Total citation	Ref
1	Advances and challenges in sustainable tourism toward a green economy	2018	189	[41]
2	Averting lemur extinctions amid Madagascar's political crisis	2014	186	[42]
3	A classification of the major habitats of Amazonian black-water river floodplains and a comparison with their white-water counterparts	2015	93	[43]
4	Perceptions of climate change impacts, adaptation and limits to adaption in the Australian Alps: The ski-tourism industry and key stakeholders	2013	85	[44]
5	Land use change and ecosystem services provision: A case study of recreation and ecotourism opportunities in Southern Chile	2014	83	[45]
6	Food and tourism: An effective partnership? A UK-based review	2013	80	[46]
7	Tourism-agriculture linkages in rural South Africa: Evidence from the accommodation sector	2012	73	[47]
8	Global population trends and human use patterns of Manta and Mobula rays	2012	65	[48]
9	A choice experiment study for land-use scenarios in semi-arid watershed environments	2012	64	[49]
10	Integrated innovative biotechnology for optimization of environmental bioprocesses and a green economy	2018	57	[50]

Ecotourism fosters community development by alleviating the limits posed by social discontent and resource exploitation [29]. Nyaupane and Poudel [51] using an appreciative inquiry methodology in three distinct buffer-zone villages near Chitwan National Park in Nepal, the authors discovered that small-scale and locally owned ecotourism firms are particularly useful for enhancing livelihoods. Furthermore, He *et al.* [52] focusing on the uneven distribution of ecotourism advantages among different stakeholders, as well as the factors that motivate local people's engagement and regular usage of local goods, may help to narrow the vast socioeconomic disparities. Through skill development and leadership training, ecotourism capacity-building initiatives mainly assist communities, particularly the poor and women (vulnerable groups), become self-sufficient. It strives to provide the locals a chance to stay on inheritable lands [53]. It helps preserve and maintain traditional ecological principles that encourage biodiversity protection. Japan is a well-known example, where World Natural Heritage (such as Ogasawara Island) is ecotourism recognized thanks to the efforts of the private sector and the government to promote ecotourism [54].

3.3 Bibliographic mapping

Bibliographic mapping technologies facilitate the monitoring of research progress and the creation of new trends, therefore facilitating the management of the huge volumes of information created by the rapid speed of research [55]. Using VOSviewer, the final data output visualization and bibliographic mapping were done. After the final article database had been checked, updated, and screened by the VOSviewer, it was used for bibliographic mapping using in-app algorithms to generate a visual file. For this purpose, the VOSviewer, an open-source Java tool that allows trend research via the viewing of bibliometric maps, was used [56].

The visualization used a co-occurrence analysis of the articles' keywords to identify study clusters and then investigated the emerging research trend. Keywords indicated the core concepts and advancements of each article's subject topic. A keyword co-occurrence network is advantageous for knowledge mapping since keywords represent the development of a research topic and the actual article content. The co-occurrence frequencies in the VOSviewer are determined by the author's keywords in the literature database. The authors used a total of 2 294 keywords for 274 research documents. Table 4 shows the most frequently occurring keywords, which had total link strength of 3 988 and five occurrences. The justification for adopting this minimal keyword occurrence rate is that the more frequently the term occurs, the more popular the research subject. After adopting the Full Count method, these authors' keywords were mapped into five clusters (Figure 1) based on VOSviewer software. Five big cluster of ecotourism in agriculture: ecotourism (red nodes), agriculture (green nodes), sustainable development (blue nodes), ecosystem (purple nodes), and general indicators (yellow nodes).

Table 4. Most highly occurring author's keywords.

	Keywords	Cluster	Occurrences	Total link strength
1	Ecotourism	1	135	636
2	Agriculture	2	84	523
3	Sustainable development	1	41	296
4	Tourism	1	38	260
5	Ecology	2	40	235
6	Biodiversity	2	31	206
7	Environmental protection	3	19	193

Continue on the next table.

Table 4. Continue.

	Keywords	Cluster	Occurrences	Total link strength
8	Land use	3	21	183
9	Sustainability	1	35	179
10	Conservation	2	28	166

VOSviewer generates two separate maps for network and overlay display. Both representations utilise a two-dimensional distance-based map that indicates the degree of the objects' associations depending on their distance [57]. Higher distance and vice versa suggest relationships with greater strength. Conversely, a tighter distance indicates a stronger affinity. A label and a circle, the size of which denotes the prominence of the term, are used to identify it. Although various colors signify different sorts of information, the bibliographic mapping for overlay visualization and network visualization is same. The overlay image depicts the average annual publication of each phrase, while the network visualization depicts keyword cluster groups. The overlay plot demonstrates that the terms in this cluster have trended since 2018. The keywords "conservation" and "sustainable development" trended in 2022 (Figure 2).

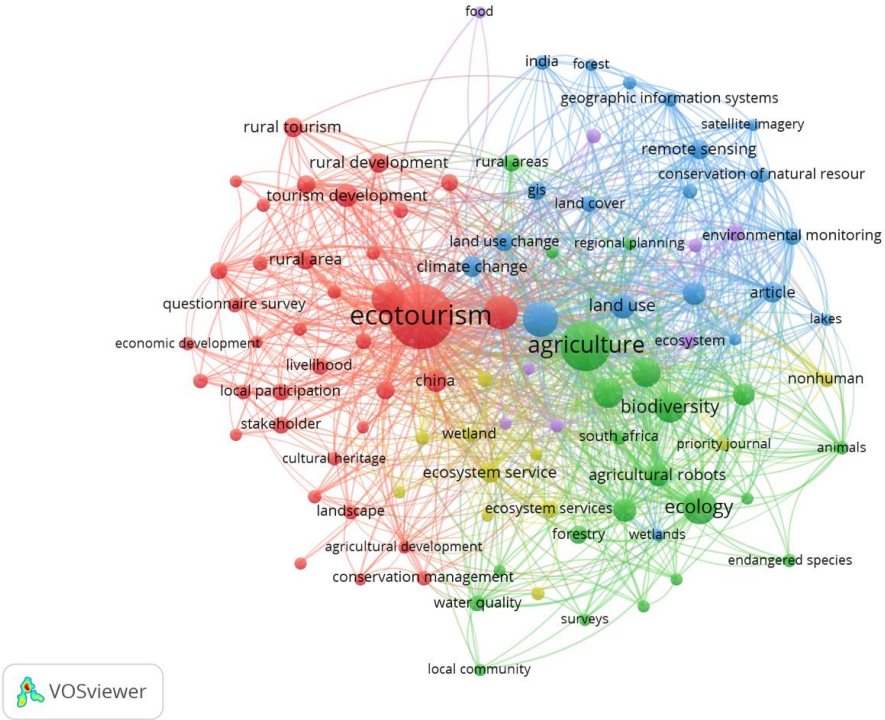

Fig. 1. Representation of the author's keyword network showing co-occurrence.

Ecotourism is a management tool that promotes women's empowerment and participation [58]. Participation in ecotourism businesses empowers indigenous women mentally, socially, economically, and politically, according to several studies [59]. Women are engaged in community-based ecotourism by selling their indigenous wares, while the younger generation is employed as tour guides [53]. This prevents the local workforce from migrating to urban areas in pursuit of employment. In addition, they learn how to become tourist hosts and manage their homestays with a focus on proper hygiene, cleanliness, and giving guests prepared meals [60]. Consider instances of women's empowerment in Nepal,

Samoa, and Siyabonga, among others. These women have organized cooperatives for the manufacture of handicrafts, defying gender preconceptions [61]. The Isecheno women's conservation organization was successful in addressing bigger social, environmental, and economic gaps for sustainable tourism in the Kakamega rainforest. To achieve economic independence, the women's association has engaged in environmentally responsible endeavors such as beekeeping and tree nursery development [62]. Similarly, males in Chile's Fray Jorge National Park maintain traditional lives, although females are highly engaged in tourism-driven activities [63].

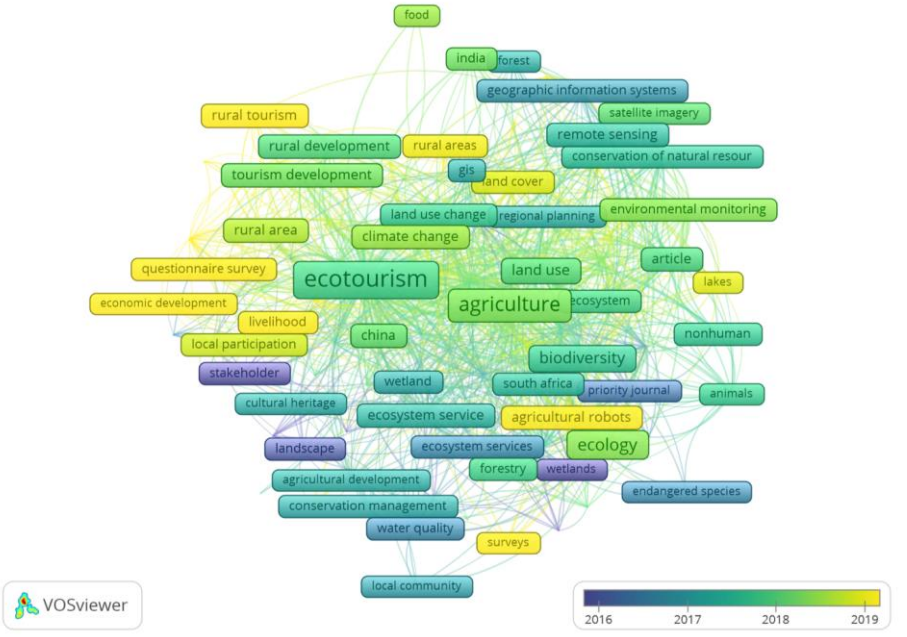

Fig. 2. Keyword's overlay visualization of co-occurrence based on average publications per 2018 to 2023.

Note: Keywords with different colors differ in their emergence.

In ecotourism, the institutional power structure includes three key parameters: (i) strong institutional ties, (ii) strict authorisation procedures and fewer visitors, and (iii) resource arrangements and natural resource exploitation [64]. Furthermore, in the administration of these power systems, stakeholders play a crucial role. In Marsegu Island Nature Tourism Park (MINTP), Indonesia, for instance, the local population, the Natural Resources Conservation Centre, and local governments are the primary stakeholders, while researchers and the commercial sector are supporting stakeholders. In general, multidimensional stakeholders with mutual trust via communication, coalitions, and corporate partnership demonstrate more competence for the effective management of ecotourism development [65]. It is supported by Osman *et al.* [66] ecotourism is connected to other development sectors because to the significant interdependence between government agencies and shared ownership. In India, the Ministry of Tourism has been awarding national tourism awards in categories such as Best Eco-friendly Hotel, Best Responsible Tourism Project, and Best Eco-friendly Practices by Tour Operators in the travel, tourism, and hospitality industry to encourage decision-makers to promote and engage in ecotourism practices. These prizes are presented to people of the local community who possess pertinent knowledge and experience on wildlife and traditional culture [67].

In terms of funding, the establishment of scientific and technological infrastructure, and the development of human skill sets, the governments of China and India play a crucial role in building transportation packaging fruit research capability. Since 2013, it has invested in packaging fruit as a separate field of study. The National Natural Science Foundation of China (NSFC) has raised its funding budget to 33×10^9 yuan ($\$5.2 \times 10^9$) in 2022, up 6.8 % over last year [69].

Frequent in scientific policy is the notion that collaborative research offers a range of benefits and should, therefore, increase research output. Knowledge and technique sharing, idea exchange, resource pooling, sharing expensive instruments, boosting visibility and recognition, and accelerating research progress are regularly cited among the many benefits of research collaboration in the literature [70]. Out of the 78 countries, only two had at least 22 co-authored documents. The overall strength of the co-authorship ties with other nations was computed for each of the 30 countries. As seen in Figure 3, the nations with the strongest overall linkages were chosen. China was found to possess the most intensive research connections.

4 Conclusions and perspectives

To the evolution and extension of this body of knowledge and to forecast its future path, the present study analyzed Scopus-indexed research publications on ecotourism in agriculture from 2012 to 2022 using VOSviewer software and Scopus analytics. Based on the results, China is the leading country in the number of publications and research collaborations. The presence of a link between ecotourism and five livelihood assets (natural, physical, human, social, and financial), as shown by a wide body of research, expands the concept of addressing a framework for a sustainable living. According to descriptive analysis, the bulk of research focuses on tourists and the local community, while few studies explain the role of government and non-governmental organizations. Moreover, in the face of a rapidly diminishing biodiversity owing to global warming and climate change, a focus on industry-oriented ecotourism research may significantly contribute to the long-term development of the sector. Future research should concentrate on the impact of ecotourism on animals, ecotourism in wetland or marine environments, a conceptual analysis of ecotourism, and ecotourism based on artificial intelligence.

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