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Understanding the trends of agricultural extension research in India through bibliometric analysis

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Abstract

This study conducts a bibliometric analysis of agricultural extension research from January 2015 to August 2024, aiming to map the evolution, key contributors, and emerging trends within the field. Utilizing data from the dimension.ai database, the analysis covers publication counts, citation metrics, keyword co-occurrence, and journal contributions. Results show a notable increase in research output, peaking in 2022, with a subsequent decline in 2023 and 2024. The Asian Journal of Agricultural Extension Economics & Sociology leads in publication volume, while Sustainability stands out for its high citation count, reflecting its significant influence. Key research domains include Human Society and Agricultural Sciences, with high-impact keywords such as Knowledge and Food Security. The study identifies influential publications and trends, providing insights into the field's growth and areas needing further exploration. The findings underscore the importance of continuing to align research with the evolving needs of the agricultural sector and highlight the value of bibliometric analysis in shaping future research directions.

Keywords: Agricultural extension, bibliometric analysis, research trends

1. Introduction

Agricultural extension research is pivotal in advancing agricultural productivity and sustainability, especially in diverse agrarian contexts such as India. Agricultural extension involves disseminating knowledge, technologies, and best practices to farmers to enhance their skills, productivity, and livelihoods (Jamilah *et al.*, 2010; Swanson, 2008) [3, 8]. Over time, numerous efforts have been directed towards improving agricultural extension methods, yet a systematic analysis of research trends is necessary to understand the field's evolution, identify gaps, and guide future research effectively. Bibliometric analysis serves as a valuable tool for this purpose, offering a quantitative approach to examining academic literature and uncovering patterns, trends, and insights within a specific research domain (de Bellis, 2009; Moed, 2005) [2, 6]. By analyzing bibliometric indicators such as publication counts, citation metrics, keyword co-occurrence, and author collaborations, researchers can gain a comprehensive understanding of the research landscape (Martinez-Lopez *et al.*, 2018; Bornmann & Leydesdorff, 2014) [5, 1]. This method helps identify influential publications, prolific authors, key research themes, and emerging areas of interest. In agricultural extension research, bibliometric analysis can elucidate the field's development over the past decade, highlighting growth in research output, leading journals, and prominent research topics. It can also pinpoint research gaps by revealing underexplored areas that require further

investigation. Understanding these gaps is crucial for directing future research efforts to better address the needs of farmers and the broader agricultural sector (Kumar *et al.*, 2020; Sheehan *et al.*, 2021) [4, 7]. This study employs bibliometric methods to analyze agricultural extension research from January 2015 to June 2024, examining publication trends, author networks, research domains, leading journals, and frequently used keywords to provide a detailed overview of the field's current state and future directions.

2. Materials and Methods

All research output was retrieved from the dimension.ai database between January 2015 and August 2024 by searching for Agricultural extension. The number of publications by year, the network analysis between author linkage, research domain, articles from leading journals with high citations, and commonly used keywords was all used to evaluate articles. The data were analysed using MS Excel, Word Cloud generator, and VOS viewer. Keywords were searched in the title, abstract, and keywords. Papers were first evaluated for eligibility for inclusion as titles, and abstracts and full texts were also reviewed in case of ambiguity. Articles with their primary focus on agricultural extension or those related to agricultural extension in India are included. Studies published only in English are included. The analysis included 50,619 articles discovered through a systematic search on Agricultural Extension Research.

3. Results and Discussion

Distribution of agricultural extension research publications by year

The data represents the total number of publications related to agricultural extension research from 2015 to 2024, reflecting trends in research activity over the past decade. Starting with 2,735 publications in 2015, the field saw steady growth, peaking at 7,185 publications in 2022. This increase highlights a rising focus on agricultural extension,

likely driven by the growing need for improved agricultural practices and the dissemination of knowledge to farmers and stakeholders. The slight decline to 6,882 publications in 2023 and the more noticeable drop to 3,720 in 2024 may indicate a shift in research priorities or a reallocation of resources to other emerging areas within agricultural sciences. Overall, the data underscores the significant expansion and dynamic nature of agricultural extension research over the years.

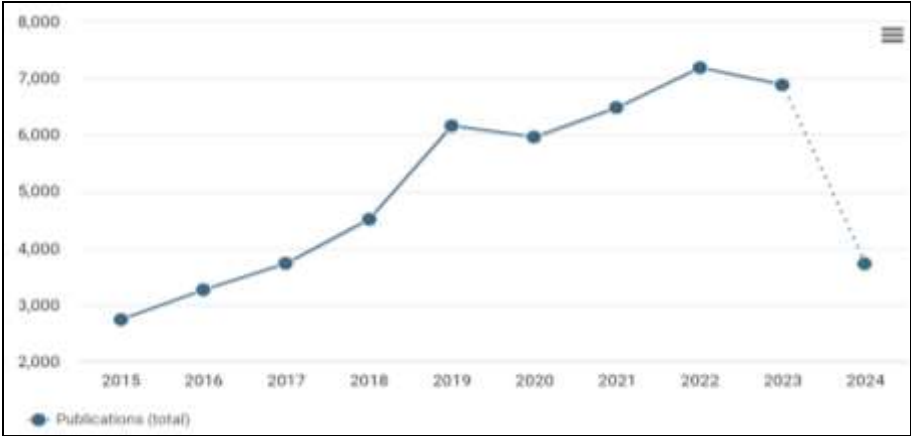


Fig 1: Year wise distribution of extension research publications, 2015-2024.

Top Journals on Agricultural Extension Research

Total Publications by Journal, provides a comprehensive view of the research output across various journals within the field of agricultural extension and related disciplines. The Asian Journal of Agricultural Extension Economics & Sociology leads significantly with 2,431 publications, indicating its prominent role as a platform for disseminating research in this area. This journal's large volume of publications suggests that it is a go-to source for researchers, possibly due to its wide scope or the

accessibility of its publication process. Other journals like Sustainability and SSRN Electronic Journal also show considerable publication activity with 852 and 720 publications respectively, reflecting their importance in the broader context of sustainability and social sciences research as it intersects with agriculture. The diversity in publication counts among the journals illustrates the varying levels of focus and specialization, with some journals catering to broader audiences and others targeting niche aspects of agricultural research.

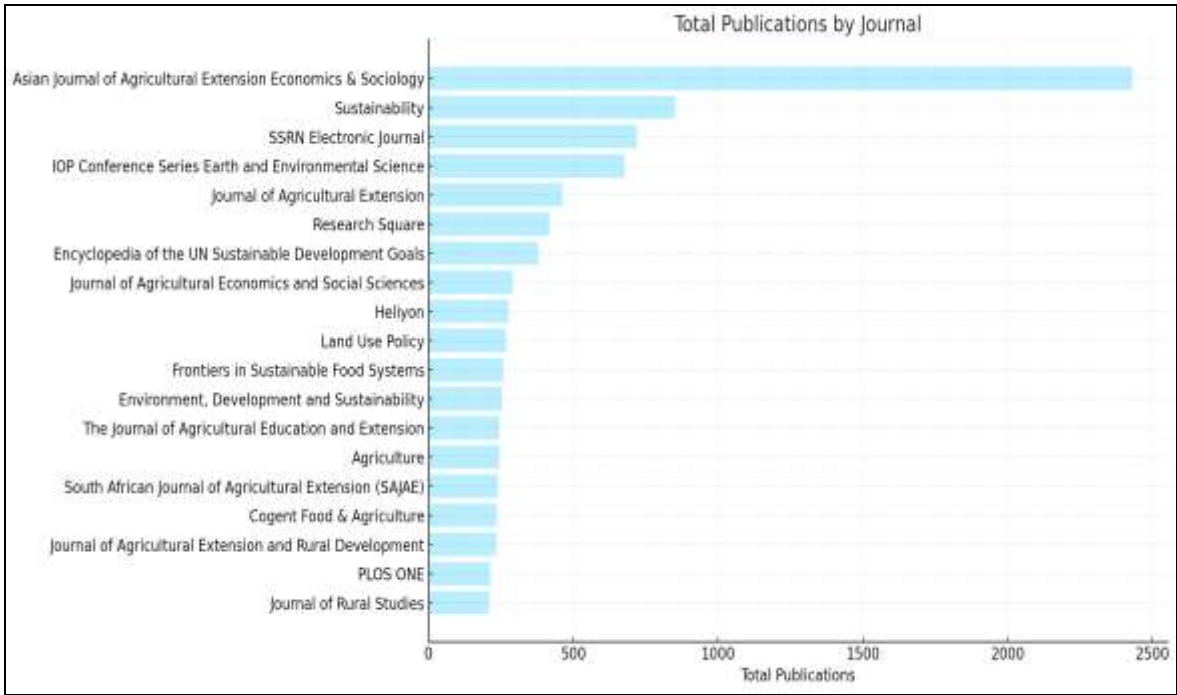


Fig 2: Total publications by Journal

Total Citations by Journal, shifts focus from sheer volume to the impact these journals have in the academic community, as measured by citations. Sustainability emerges as a leader with 13,135 citations, underscoring the broad influence of research published in this journal. The high citation count indicates that the articles in Sustainability are frequently referenced by other researchers, contributing to ongoing discussions and developments in sustainable agriculture and related fields. Land Use Policy also stands out with 9,797 citations,

emphasizing its critical role in shaping policies and practices related to land use in agricultural contexts. On the other hand, journals like Asian Journal of Agricultural Extension Economics & Sociology, despite having the highest publication count, have a relatively lower total citation count (1,857), suggesting that while it publishes a lot of research, the impact or influence of each individual paper might be lower compared to those in more highly cited journals.

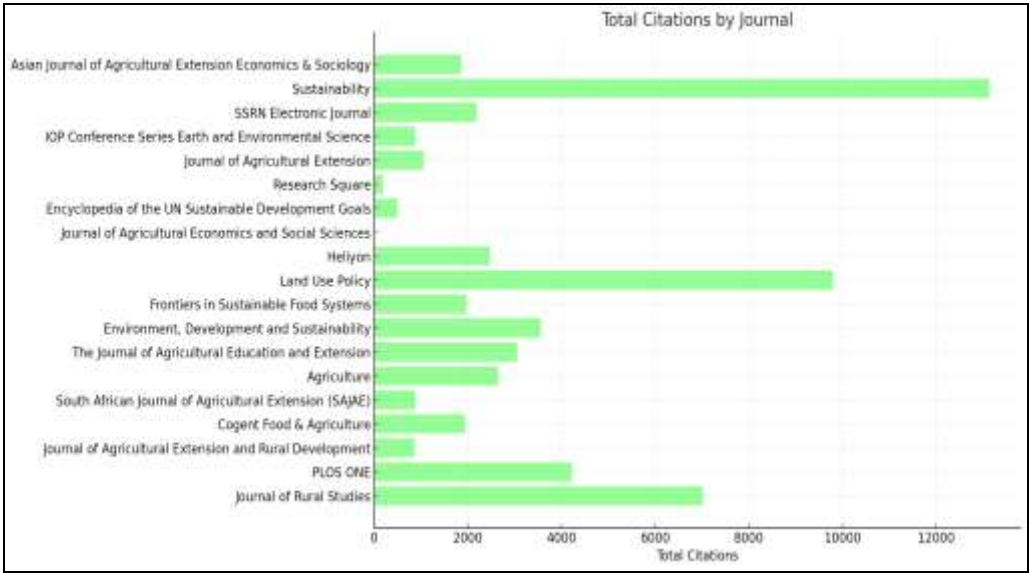


Fig 3: Total citations by Journal

Mean Citations per Publication by Journal, provides a deeper insight into the relative influence of individual articles within each journal. Land Use Policy and Journal of Rural Studies lead with mean citations per publication of 36.56 and 33.40 respectively, indicating that the articles published in these journals are not just widely read, but are also highly influential in advancing the field. This high average suggests that these journals attract or produce research of exceptional quality, likely contributing to

significant advancements or paradigm shifts in agricultural and rural studies. In contrast, journals like Asian Journal of Agricultural Extension Economics & Sociology and Research Square have lower mean citations per publication (0.76 and 0.45 respectively), which might reflect a broader but less impactful readership. These journals may serve as accessible outlets for early-stage or regionally focused research, which, while important, might not receive as widespread recognition in the global academic community.

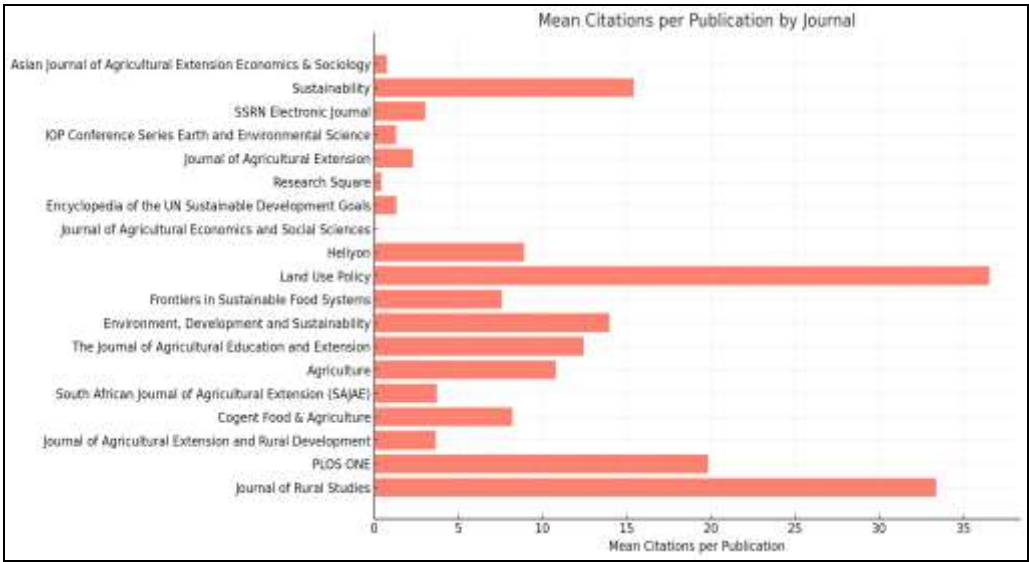


Fig 4: Mean citations per publication by field of research



Fig 5: Total publications by field of research

Publications by Field of Research

Total Publications by Field of Research, illustrates the volume of research activity across various disciplines. Fields such as Human Society and Agricultural, Veterinary, and Food Sciences lead with the highest number of

publications, reflecting extensive research activity and well-established research communities. In contrast, fields like Strategy, Management, and Organisational Behaviour and Horticultural Production have fewer publications, which may indicate more specialized or emerging areas of study.

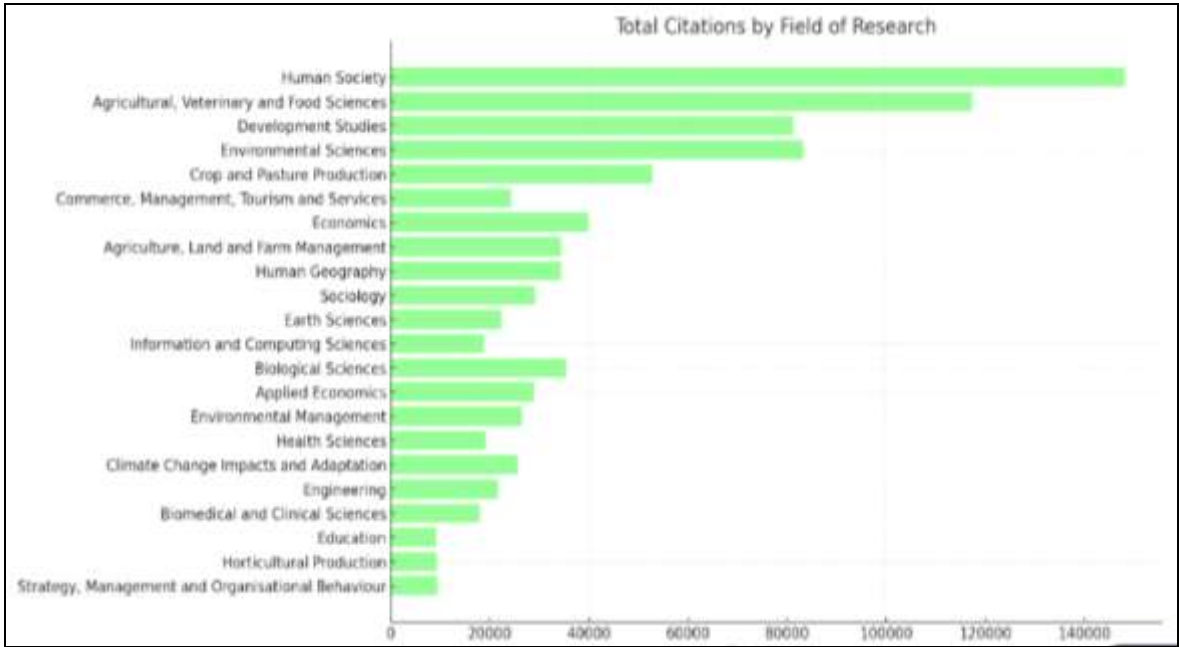


Fig 6: Total citations by field of research

Figure 6, Total Citations by Field of Research, emphasizes the impact of research by showing the total number of citations each field has received. Citations are often used as a measure of influence, and fields like Environmental Sciences and Human Society emerge as highly influential,

with their research being widely recognized and referenced. On the other hand, fields with lower citation counts might produce more specialized research that is less frequently cited.

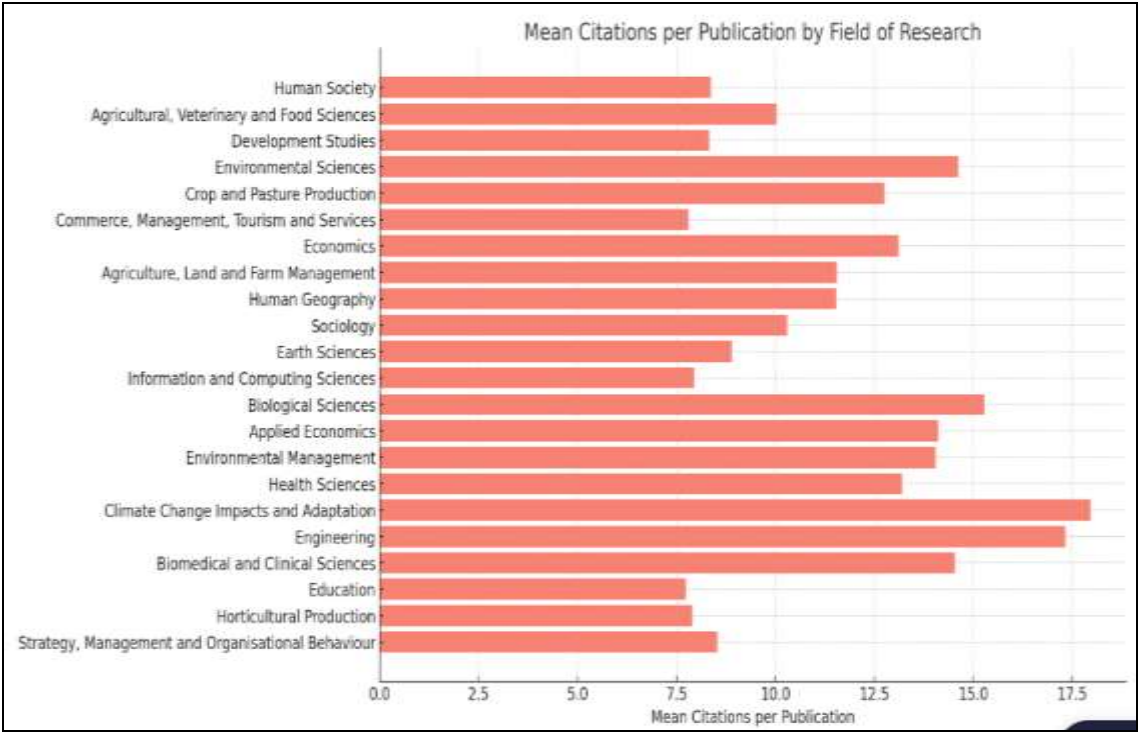


Fig 7: Total citations by field of research

Mean Citations per Publication by Field of Research
Finally, Mean Citations per Publication by Field of Research, provides insight into the average influence of individual publications within each field. Notably, fields such as Climate Change Impacts and Adaptation and Engineering have the highest mean citations per publication, suggesting that research in these areas tends to be highly influential, even if the total number of publications is lower. This metric highlights fields where individual research outputs are particularly impactful, contrasting with fields that may produce a larger volume of work with less frequent citations. Together, these charts offer a comprehensive

overview of both the quantity and quality of research across different disciplines.

Co-occurrence of author keywords
Figure 3 describes the networks between the two bubbles representing the co-occurrence of author keywords, with the size of the bubble corresponding to the number of times that keyword appears in all publications. Keywords such as Knowledge, Communication, Food security, Environment, and Innovation are the most used author keywords with high strengths.

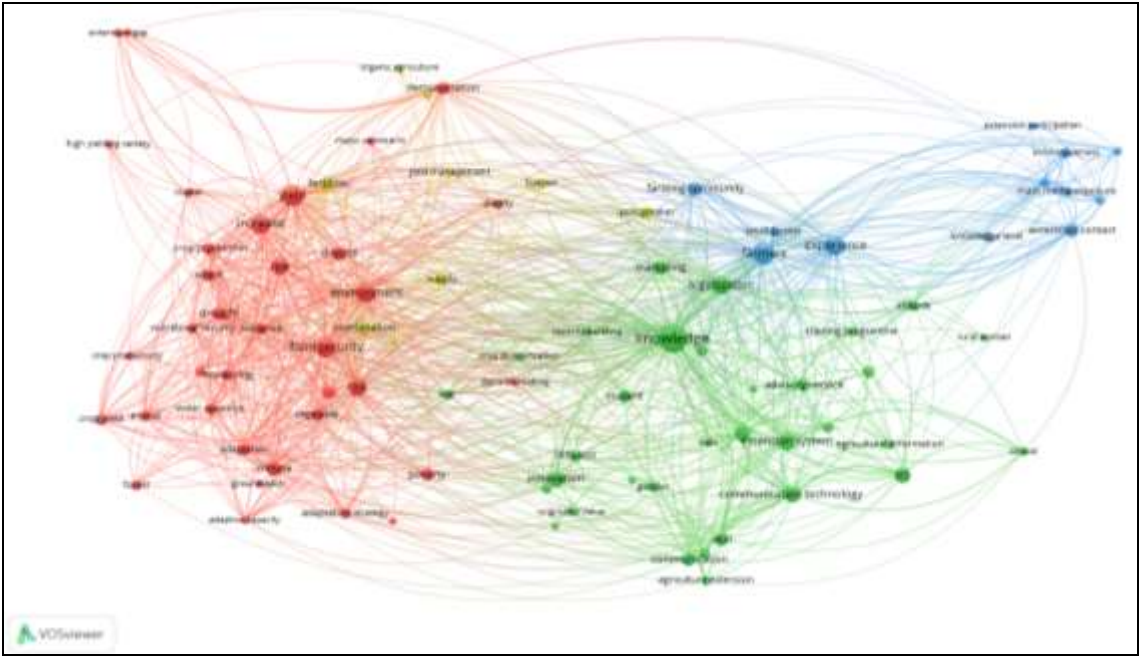


Fig 8: The networks between the two bubbles represent their co-occurrence of all keywords and the size of the bubble relates to the number of times that key word has appeared in all the publications

Top 10 agricultural extension publications in terms of total citations: Figure 9 interprets the top 10 articles in agricultural extension based on the citations. The article

entitled “Jatropha cultivation in southern India: assessing farmers' experiences,” published in 2015, has nearly 266 citations.

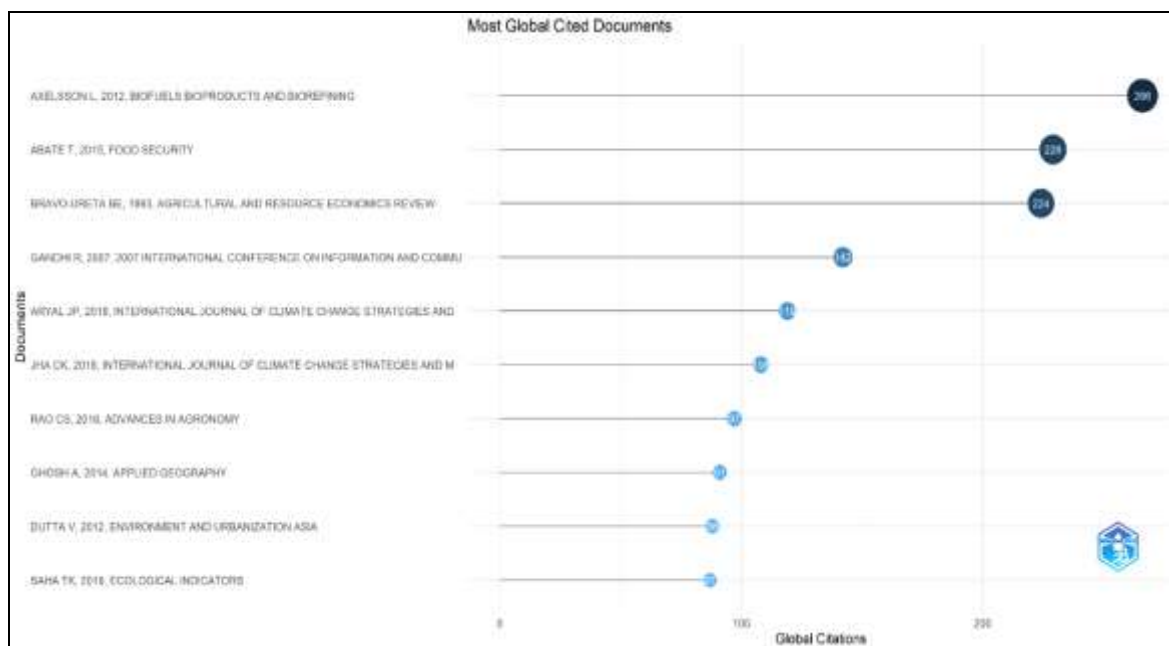


Fig 9: Top 10 articles on agricultural extension with their total citations

Conclusions

This bibliometric analysis of agricultural extension research from January 2015 to August 2024 provides a comprehensive overview of the field's development, key contributors, and emerging trends. The analysis reveals a robust growth in research output, peaking in 2022, which highlights the increasing emphasis on agricultural extension as a critical component of agricultural development. Despite a slight decline in recent years, the overall trend indicates a dynamic and expanding field. Key findings include the prominence of journals such as the Asian Journal of Agricultural Extension Economics & Sociology, which has published the highest volume of articles, and Sustainability, which has garnered significant citations, underscoring its influential role in the discourse on sustainable agriculture. The differential impact of journals, with some exhibiting high citation counts despite fewer publications, reflects varying degrees of influence and specialization within the field.

The analysis of research domains reveals a focus on established areas like Human Society and Agricultural, Veterinary, and Food Sciences, with emerging interests in specialized fields such as Climate Change Impacts and Adaptation. The identification of high-impact keywords such as Knowledge, Communication, and Food Security indicates prevailing themes in agricultural extension research. The top-cited publications, such as the study on Jatropha cultivation in southern India, demonstrate the significance of region-specific research and its broader impact on the field. Overall, this study provides valuable insights into the evolution of agricultural extension research, highlighting areas of growth and identifying gaps that warrant further investigation. The findings suggest that while the field has made substantial progress, ongoing efforts should focus on addressing underexplored areas and

fostering research that aligns with the evolving needs of farmers and agricultural stakeholders. Future research should continue to leverage bibliometric tools to monitor trends, assess research impact, and guide strategic directions in agricultural extension.

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