

Full Length Research Paper

A Bibliometric Analysis of Research Contributions on Agricultural Extension in India

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Accepted 20 December, 2024

For food systems and farming development to be sustainable, agricultural extension is essential. India has used a number of agricultural extension models during the past few decades. The scientific contribution of agricultural extension research over the past ten years (2011-2020) is the focus of this study. Bibliometric techniques have been used to analyze secondary data from 145 publications in order to find significant journals for publishing, topics under study, collaboration patterns, and pertinent themes. It was noted that there has been a recent surge in agricultural extension research. Multidisciplinary research has been emphasized by the journals that published the works in order to solve the discipline's issues. New extension approaches for technology transfer, the use of information and communication technologies (ICTs) in agriculture, and climate change-based extension research were the domain's primary study themes. This is most likely the first bibliometric study to provide comprehensive data on extension research in India. The study's conclusions will help scholars and policymakers create plans and strategies for more effective extension methods for agricultural development. Practitioners of agricultural extension may also utilize such findings to refocus consulting services at the local level.

Key words: Extension research; Bibliometrics; Agricultural extension research; Scopus database; Research mapping.

INTRODUCTION

Agriculture is a major source of employment and income in the majority of developing nations. In such a situation, economic growth is impossible without a burgeoning agricultural sector. Through enhancing farm productivity and profitability, connecting farmers with research systems, and other means, agricultural extension plays a critical role in maintaining rural development. One Discussions concerning the role that extension services play in agriculture have become more prevalent in recent years. At the early stages of technological distribution, when information disequilibrium (the difference between "have" and "have not") is at its highest, the function of extension services is more widely recognized.² Extension helps farmers evaluate their objectives and aspirations, improves decision-making, and facilitates the exchange of knowledge between farmers and researchers, all of which lead to positive agricultural advancements.³ Extension facilitates the development of customized technology that is appropriate for farmers' local circumstances by opening up communication channels between researchers and farmers. According to Kareemulla et al.⁴, the average landholding size in India is just 0.3 hectares. Given India's varied agroclimatic conditions and the socioeconomic

state of its rural populace, specialized extension activities that are tailored to the target audience are necessary.⁵ The extension system for farmers was developed a long time ago and needs to be quickly updated to address the difficulties of the twenty-first century.⁶ Any subject must conduct research in order to prevent stagnation and to hasten the discipline's expansion and advancement. An interdisciplinary area approach is replacing the single-discipline approach in extension systems research.⁷ With the utilization of possible advancements in the extension sector, the role of delivery and extension systems is rapidly evolving in the contemporary setting.⁸ By creating strategies, concepts, procedures, and methodologies, extension research is essential to enhancing the function and effectiveness of extension systems.⁹ The Indian Council of Agricultural Research (ICAR), New Delhi, and Agricultural Universities in various states (SAUs) conduct the vast majority of agricultural extension research, with the majority of these studies being conducted by students.¹⁰ In India, the most common method is survey-based extension research using ex post facto methodology.¹¹ In addition to researching the publication output, collaborating partners, preferred journals for publication, etc., a bibliometric analysis of research conducted during a certain period aids

in documenting the major subjects of study during that time. Establishing a national research agenda requires a thorough grasp of research themes. Twelve In order to comprehend the research state and progress of the discipline over the past ten years, the paper conducts a bibliometric analysis of publications in the field of agricultural extension. In order to promote better research, the current study's findings may be useful to policymakers as well as scholars.

2. LITERATURE REVIEW

The literature on agricultural extension emphasizes how crucial it is to pinpoint the discipline's focal points. In order to facilitate meta-analysed data and develop practical policy guidance, Ponnusamy and Padaria¹³ suggested starting the All India Coordinated Research Project in Extension. The report also suggests developing new techniques and strategies to enable discipline experts to impart knowledge in many fields.

According to a study by Bharadwaj¹⁴, a number of Indian institutions have established Research Data Repositories (RDRs); nonetheless, it can be challenging for academic institutions, publishers, and researchers to find the right RDR and comprehend its unique characteristics. In order to document the primary area of study during the study period, a bibliometric analysis of research conducted in the discipline during that time period may be useful.

Ponnusamy & Pachaiyappan¹⁵ examined the state of extension research in India today and concluded that by creating strategies, concepts, procedures, and techniques, the field's research is essential to enhancing the function and effectiveness of the extended system. In order to revitalize extension education and research, Ogundari¹⁶ also carried out an impact assessment on agricultural extension services and suggested that the field's research be updated periodically.

Rasheed¹⁷ looked at the future of agricultural extension in the nation and believed that during the past 20 years, research in the field has changed significantly, allowing for private extension services, agricultural public-private partnerships, consulting services, and more. Singh et al. (2018), however, felt that there is a lack of basic research in the field and proposed that extension should be essential in allowing nodes to establish chances for different organizations in the innovation system to access and share knowledge.

A bibliometric analysis of scholarly publications published in agriculture over the last 10 years using the Scopus database was carried out by Malanski¹⁹ et al. The study's main conclusions were that the most significant research in the previous ten years had been carried out by four major scientific communities: cattle farming systems, ergonomics, agricultural economics, and rural sociology. After a community study, it was discovered that the field's research is divided into five primary areas: family labor allocation strategies, work organization in livestock systems, occupational health in farms, and social issues in the labor market. Paul Mansingh²⁰, et al. conducted a

bibliometric analysis to look at the international literature on a particular area of agricultural extension that is connected to ICTs. Tracking publishing trends, citation rates, prominent authors, keywords, and institutions were the objectives of the investigation. 280 papers from 2004 to 2020 were found and examined using Scopus data. The authors discovered that the Netherlands had more citations per document, but the United States was ahead of India in terms of citations.

Similarly, Ribeiro²¹ et al. used the Scopus database from 2010 to 2020 to identify a set of research subjects related to ICT in agriculture. Two main themes emerged from the authors' analysis of 91 peer-reviewed publications. While the second subject was about the Internet of Things, the first one focused on how important it is for farmers to acquire knowledge and skills. The research objective, the source and type of data, and the statistical techniques employed all influence the optimal sample size for a bibliometric study in decadal research. According to Glanzel²², bibliometric research should have a sample size of at least 50-100 documents. Similarly, for bibliometric studies of scientific productivity, Borgman & Furner²³ suggested a minimum sample size of 50 papers each decade. Additionally, according to Li²⁴, the bibliometric analysis sample size ranged from 50 to 100. Our study's ultimate sample size was 145, which is sufficient to capture the typical population of Agricultural Extension publications in India during the study's ten-year period.

This has made it possible for us to do insightful comparisons and analysis for the research.

After examining earlier studies, a knowledge gap about the systematic review of agricultural extension research in the Indian context was found. As a result, specialized research employing various methodologies is required to determine the discipline's focus areas, which will support the development of the nation's agricultural extension system. Additionally, the authors discovered that one of the most used databases for bibliometric data analysis was Scopus. Therefore, by methodically examining the extension research conducted over the previous 10 years, the study is pertinent to filling the research gap and gaining understanding of the developments and potential paths forward.

3. OBJECTIVES OF THE STUDY

The study's goal is to assess agricultural extension research conducted between 2011 and 2020. The material published in journals listed on Scopus was examined using bibliometric analysis. The following goals were achieved through the analysis of articles and related metadata using these techniques:

- To study the publication output and growth trend over the years
- To identify the major collaborating countries for research
- To find out major productive institutions
- To reveal the preferred journals of publication
- To find out the most prolific authors

- To visualize thematic clusters using keyword analysis

4. METHODOLOGY

4.1 Data Source and Method of Retrieval

Scopus was the online database used to search and retrieve the publications (last access date: May 24, 2022). One of the most popular databases for retrieving bibliometric data is Scopus, which is owned by the Elsevier Group.²⁵ Compared to other databases like PubMed, Web of Science, and Google Scholar, Scopus has a more standardized record when it comes to gathering international scientific literature from a variety of subject areas.²⁶

4.2 Search Strategy

To minimize the bias caused by changes over time, the retrieval and export of articles were completed in a single day (May 24, 2022). First, a comprehensive review of the literature on extension research was done to identify relevant search terms. By finding and entering the terms "extension education," "agricultural extension," "extension systems," and "community extension" into the Scopus research engine, the study's goals were achieved. Secondly, every one of the chosen "terms" could only be used in the "Article Title/Abstract/Keywords" area. The source was restricted to journal articles and conference proceedings, and the time frame was set as 2011-2020. Furthermore, the nation was restricted to India. Only the years 2011-2020 were selected for the study because the literature analysis revealed that a substantial amount of work has been done during that time. A decade is a long time, so the most recent decade was only selected to allow for pertinent research that is still relevant in the present and hasn't become outdated. Furthermore, the National Academy of Agricultural Sciences (NAAS), the highest policy-making organization in Indian agricultural research and education, has made several significant remarks regarding agricultural extension research in the past ten years. Therefore, by examining the current state of extension research, the current work only considers the current decade to be more important in policy discourse. In order to include only pertinent research for the study, the source was restricted to journal articles and conference papers. The quality of the article chosen for the study may be weakened by other types of literature, such as book chapters, popular articles, etc., which are more focused on broad subjects and methodologies. Lastly, because India is an agriculturally oriented nation with a sizable population that depends either directly or indirectly on agriculture, the study is centered on the Indian setting. Additionally, compared to the required ratio of 1:750, the country's farmer-extension ratio is quite wide, at 1:1000, and has stayed low.²⁷

As a result, India was chosen for the study, and only Indian publications were picked. All of the documents that were obtained from the database were then downloaded. In Fig. 1, the methodology is further illustrated.

4.3 Data Analysis and Visualisation

Articles published between 2011 and 2020 that contained the chosen keywords were obtained from the Scopus database. Every publication was viewed as a possible contribution to this area of research. A total of 154 articles were taken out of the database. Nine of those articles were eliminated because they lacked sufficient citation details and related metadata. The 145 articles were thus the subject of the analysis. We utilized the BibExcel program²⁸ to manage the bibliometric data that was obtained. This included categorizing various components, finding indicators, and analyzing the data. Additionally, we used the VOSviewer program as a tool to build and graphically represent linkages in our network-based analyses.²⁹

5. ANALYSIS AND DISCUSSION

5.1 Publication Output and Growth Trend

One important factor influencing the trends in research progress is the volume of publications. An indicator of the publication's quality is the frequency with which other authors cite the work.³⁰ Citations have appeared during the course of the time period, as shown in the accompanying Table 1. Between 2011 and 2017, there were consistently fewer than 18 publications annually. Nonetheless, the number of publications increased from 16 in 2018 to 23 in 2020. A growing number of published articles suggests that the topic is entering a new stage of growth. With an average of 9.05 citations annually, the 145 publications published within the chosen time period have received 1266 citations overall.

An essential component of comprehending the main nations concentrating on the field of study is the inter-country collaboration. Table 2 shows that eleven documents were published as a result of collaborations between Indian and American researchers. Other nations where Indian scientists sought collaboration in this field were Bangladesh, Brazil, China, and Germany with two articles, the United Kingdom with eleven, and Canada, Ethiopia, and Nepal with three (Fig. 2). Improved collaborations offer a better perspective on the research from the researcher's point of view and create a window of opportunity for involving additional partners and institutions in collaborative research. The whole level of cooperation between Indian and foreign researchers is referred to as the "total link strength."

5.3 Major Productive Institutions

The literature on extension research includes contributions from social science researchers from different institutions around the nation. Table 3 shows the Indian institutions and Table 4 shows the international institutions according to research production. Following the "ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India" (14 citations) and the "Division of Socio-Economic and Extension, ICAR Research Complex for Eastern Region, Patna, Bihar, India" (four documents and six citations), the primary organizations disseminating the documents are the "Division of Agricultural Extension, Indian Council of Agricultural Research, New Delhi, India," with six documents and 53 citations. In the past ten years, just two documents have been made public by the other institutions. The total link strength indicates how many co-authorship relationships exist between researchers from that particular university and researchers from other universities. "University College London, Institute for Global Health, London, United Kingdom" had the most links overall (1009) according to this metric, followed by "Division of Agricultural Extension, Indian Council of Agricultural Research, New Delhi, India" (626). Following with 437 links were "ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India" and "Division of Dairy Extension, ICAR-National Dairy Research Institute, Karnal, Haryana, India," with 367 links.

The size of the nodes (journals) indicates the proportion of the journal's publications. A maximum of 86 links were detected in the Indian Journal of Animal Sciences, with the Indian Journal of Agricultural Sciences coming in second with 36 links. It was followed by the Journal of Rural Studies with 23 connections and Current Science with 25 links.

With 12 publications and 26 citations, the Indian Journal of Agricultural Sciences was the preferred journal for publishing research from India in the extension sector.

5.4 Preferred Journals of Publication

Only 28 of the articles, although being published in 68 journals and three conferences, accounted for more than 65% of all publications. The top ten favored journals in the chosen field are listed in Table 5. To further illustrate the most popular journals, Figure 3 provides a visualization map of the journals. The gap or spacing between the two journals, as shown in Figure 3, indicates how comparable the co-citation linkages are. The two journals' proximity to one another suggests a deeper level of relatedness. The strongest co-citation linkages between journals are also shown by lines. As an alternative, the separation between the nodes (journals) highlights the relative strength of the link. Seven publications from each of the two Plant Archives were published, with 24 and 2 citations, respectively. While the Indian Journal of Agricultural Research and the Journal of Rural Development each generated four articles, the Indian Journal of Animal

Sciences published five pieces with twelve citations.

5.5 Most Prolific Authors

In the sample of publications examined for the study, there were sixteen single authors. The study's most productive authors are shown in Table 6. The number of papers released between 2011 and 2020 served as the basis for the classification.

Six publications were published by Kumar S. of the "ICAR-National Institute of Economics and Policy Research, New Delhi, India." Climate variability and the economics of production in extension research were the primary topics of his articles. Five publications from "ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar, Uttar Pradesh, India" were produced by Chander M. His articles mostly concentrate on innovation systems and livestock extension systems. Four publications were produced by Pal S from the "ICAR-National Rice Research Institute, India." The analysis of farming systems and rural development are the main topics of his article. The total link strength indicates the overall strength of a researcher's co-authorship relationships with other researchers.

The second cluster offers information on effect assessment techniques backed by Ragasa's earlier studies.³³ This cluster was the result of 29 articles. Randomized control trials, cluster analysis, economic evaluation, social networks, and other topics were the main topics of the studies in this cluster. The final cluster, on the other hand, addresses the effects of climate change in extension research using related terms like susceptibility, adaptation, mitigation techniques, etc., which is in line with earlier study by Sajesh & Suresh.³⁴ There were ten articles in all under this domain.

With 3036 links, Kadiyala S had the strongest total link strength, followed by Kumar S with 1215 and Chander M with 1054 links.

5.6 Keyword Analysis

There are 1071 terms in all in the study sample. The 186 keywords that were referenced at least six times are shown in Fig. 4. The size of the nodes on the map corresponds to the weight of each word. Closely spaced words and lines demonstrate their close relationship.³¹ The analysis reveals three clusters of similar keywords. New methods of technology transfer, including ICTs, ANNs, and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis, are demonstrated in the first cluster. The results align with previous research conducted by Simpson and Burpee.³² 35 published publications in all fall under

6. FINDINGS AND CONCLUSION

The field of agricultural extension has drawn a lot of research interest in the past 10 years, especially in the areas of information and communication technology utilization and new approaches to technology transfer. The primary study fields might be identified as follows based on the co-keyword analysis: (a) research on climate change, (b) information and communication technologies for technology transfer, and (c) impact assessment methodologies. This article added something new to the literature that already existed. First, this essay explains the framework of research and is said to be the first attempt to examine current agricultural extension research in India in a systematic manner. Second, policymakers and researchers may find it useful to identify future development trajectories based on the study's identification of important scholars, collaboration patterns, and common topics in research. Thirdly, researchers can determine future research directions and place themselves inside the current research domain. Important organizations that published agricultural extension research were directly operating under the ICAR, according to our study. The research is necessary to give enough foundation for creating new studies in the extension domain or investigating connections between various frameworks and themes. By offering a national perspective on current agricultural extension research in India, this study contributes to the body of existing literature. It is impossible to exaggerate the significance of this study since it establishes a solid foundation for further research in the extension field, enabling a more thorough examination of the connections between subjects and frameworks. Finding the main themes in extension research will also be a useful tool for stakeholders and decision-makers, giving them the knowledge they need to develop this field.

6.1 Limitations of the Research

The study sample may not cover all published literature because journals that are not listed in the Scopus database were not included. The likelihood of finding the precise number of publications published during the time on other similar issues in agricultural extension may also be decreased by the search parameters based on a small number of keywords. Broader terms were chosen for assessment because this study focuses on the extension research scenario.

REFERENCES

1. Danso-Abbeam, G.; Ehiakpor, D.S. & Aidoo, R. Agricultural extension and its effects on farm productivity and income: Insight from Northern Ghana. *Agric. Food Secur.*, 2018, 7(1), 1-10. doi: 10.1186/s40066-018-0225-x.
2. Byerlee, D. Knowledge-intensive crop management technologies: concepts, impacts, and prospects in Asian agriculture. In *Impacts of Rice Research*, edited by P. Pingali & M. Hossain. International Rice Research Institute, Manila, 1998, 113-133.
3. Van den Ban, A.W. & Hawkins, H.S. *Agricultural Extension*. Blackwell Science, Oxford, UK, 1996.
4. Kareemulla, K.; Krishnan, P.; Ravichandran, S.; Kumar, B.G.; Sharma, S. & Bhatta, R. Spatiotemporal Analysis of Size and Equity in Ownership Dynamics of Agricultural Landholdings in India Vis-à-Vis the World. *Sustainability*, 2021, 13(18), 10225. doi: 10.3390/su131810225.
5. Glendenning, C.J.; Babu, S. & Asenso-Okyere, K. Review of agricultural extension in India: Are farmers' information needs being met?, 2010. <https://ideas.repec.org/p/fpr/ifprid/1048.html>. (Accessed on 04 May 2022).
6. Sulaiman, R. & Van den Ban, A.W. Funding and Delivering Agricultural Extension in India. *J. Int. Agric. Ext. Educ.*, 2003, 10(1), 21-30. doi: 10.5191/jiaee.2003.10103.
7. Green, S. & Andersen, H. Systems science and the art of interdisciplinary integration. *Syst. Res. Behav. Sci.*, 2019, 36(5), 727-743. doi: 10.1002/sres.2633.
8. Takahashi, K.; Muraoka, R. & Otsuka, K. Technology adoption, impact, and extension in developing countries' agriculture: A review of the recent literature. *Agric. Econ.*, 2020, 51(1), 31-45. doi: 10.1111/agec.12539.
9. Ponnusamy, K. & Pachaiyappan, K. Strengthening extension research in animal husbandry: Review of issues and strategies. *Indian J. Anim. Sci.*, 2018, 88(2), 137-143. doi: 10.56093/ijans.v88i2.79229.
10. Sivakumar, P. S. & Sulaiman, V. R. Extension research in India: Current status and future strategies. AESA Working Paper, 2015. <https://www.aesanetwork.org/aesa-working-paper-2-on-extension-research-in-india-current-status-and-future-strategies-p-sethurman-sivakumar-and-rasheed-sulaiman-v-december-2015/> (Accessed on 20 November 2022).
11. NAAS. Strengthening Agricultural Extension Research and Education—The Way Forward. National Academy of Agricultural Sciences, New Delhi, 2017. <http://naas.org.in/spapers/Strategy%20Paper%20No.%205.pdf> (Accessed on 30 May 2022).
12. Edgar, L.E.; Edgar, D.W.; Briers, G.E. & Rutherford, T. Research themes in agricultural education: Future gap analysis of the National Research Agenda. *J. South Agric. Educ. Res.*, 2008, 58(1), 1-20.
13. Ponnusamy, K. & Padaria, R.N. Research in agricultural extension: Review of its contribution and challenges. *Indian J. Agric. Sci.*, 2021, 91(5), 03-09.
14. Bharadwaj, R.K. Content analysis of Indian research data repositories: Prospects and Possibilities. *DESIDOC J. Lib. Inf. Tech.*, 2019, 39(6), 280-289. doi: 10.14429/djlit.39.6.15137.
15. Ponnusamy, K. & Pachaiyappan, K. Strengthening extension research in animal husbandry: Review of issues

- and strategies. *Indian J. Anim. Sci.*, 2018, 88(2), 137-143. doi: 10.56093/ijans.v88i2.79229.
16. Ogundari, K. A meta-analysis of the impact of agricultural extension services. *China Agric. Econ. Rev.*, 2022, 14(2), 221-241. doi: 10.1108/CAER-07-2021-0130.
17. Rasheed, S. V. Agricultural extension in India: Current status and ways forward, round table consultation on agricultural extension, Beijing, 2012. https://www.aesanetwork.org/wp-content/uploads/2018/08/sulaiman_ag_extension_india.pdf (Accessed on 14 July 2022).
18. Singh, A.K.; Chauhan, J.; Singh, L. & Burman, R.R. Future extension education perspective in India. *Indian Res. J. Ext. Edu.*, 2009, 9(3), 9-14.
19. Malanski, P.D.; Dedieu, B. & Schiavi, S. Mapping the research domains on work in agriculture. A bibliometric review from Scopus database. *J. Rural Stud.*, 2021, 81(1), 305-314. doi: doi.org/10.1016/j.jrurstud.2020.10.050.
20. Paul Mansingh, J.; Makarla, R.; Nisha, A.; Anbarasan, P. & Endris, E.A. Bibliometric analysis of information communication technology research in agricultural extension. *PalArch's J. Archaeol. Egypt/Egyptol.*, 2020, 17(7), 4070-4085.
21. Ribeiro, M.I.; Fernandes, A.J.; Lopes, I.M. & Fernandes, A.P. A bibliometric analysis about the use of ICT in the agricultural sector. In *Advanced Research in Technologies, Information, Innovation and Sustainability: First International Conference*, 25-27 November 2021, La Libertad, Ecuador. 2021. pp. 589-599.
22. Glanzel, W. Bibliometrics as a research field: A course on theory and application of bibliometric indicators, 2003, Hungarian Academy of Science. https://nsdl.niscpr.res.in/bitstream/123456789/968/1/Bib_Module_KUL.pdf (Accessed on 10 April 2023).
23. Borgman, C.L. & Furner, J. Scholarly communication and bibliometrics. *Annu. Rev. Inf. Sci. Technol.*, 2005, 36(1), 2-72. doi:10.1002/aris.1440360102.
24. Li, R. Research trends of blended language learning: A bibliometric synthesis of SSCI-indexed journal articles during 2000-2019. *ReCALL*, 2022, 34(3), 309-326. doi: 10.1017/S0958344021000343.
25. Ballew, B.S. Elsevier's Scopus database. *J. Electron. Resour. Med.*, 2009, 6(3), 245-252. doi: 10.1080/15424060903167252.
26. Agarwal, A.; Durairajanayagam, D.; Tatagari, S.; Esteves, S.C.; Harlev, A.; Henkel, R.; Roychoudhury, S.; Homa, S.; Puchalt, N.G.; Ramasamy, R. & Majzoub, A. Bibliometrics: Tracking research impact by selecting the appropriate metrics. *Asian J. Androl.*, 2016, 18(2), 296. doi: 10.4103/1008-682X.171582.
27. Sah, U.; Kumar, N.; Saxena, H.; Dubey, S.K.; Iquebal, M.A.; Bhat, S. & Singh, S.K. Validation of farmer to farmer extension model for dissemination of quality seeds of pulse crops: Experiences from Bundelkhand Region of Uttar Pradesh. *Indian J. Ext. Educ.*, 2018, 54(2), 176-182.
28. Persson, O.; Danell, R. & Schneider, J.W. How to use Bibexcel for various types of bibliometric analysis. *Celebrating scholarly communication studies: A Festschrift for Olle Persson at his 60th Birthday*, 2009, 5, 9-24.
29. Van Eck, N.J. & Waltman, L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 2010, 84(2), 523-538. doi: 10.1007/s11192-009-0146-3.
30. Sinha, A.; Priyadarshi, P.; Bhushan, M. & Debbarma, D. Worldwide trends in the scientific production of literature on traceability in food safety: A bibliometric analysis. *Artificial Intelligence in Agriculture*, 2021, 5, 252-261. doi: 10.1016/j.aiia.2021.11.002.
31. Banerjee, A.V.; Banerji, R.; Duflo, E.; Glennerster, R. & Khemani, S. Pitfalls of participatory programs: Evidence from a randomised evaluation in education in India. *Am. Econ. J. Econ. Policy*, 2010, 2(1), 1-30. doi: 10.1257/pol.2.1.1.
32. Simpson, B.M. & Burpee, C.G. Adaptation under the "New Normal" of climate change: The future of agricultural extension and advisory services, 2014, [https://www.agrilinks.org/sites/default/files/resource/files/MEAS%20Discussion%20Paper 203](https://www.agrilinks.org/sites/default/files/resource/files/MEAS%20Discussion%20Paper%20203.pdf). (Accessed on 22 July 2022).
33. Ragasa, C. Improving gender responsiveness of agricultural extension. In *Gender in Agriculture*, edited by A.R. Quisumbing, R. Meinzen-Dick, T. Raney, A. Croppenstedt, J. Behrman & A. Peterman. Springer, Dordrecht, 2014, 411-430. doi: 10.1007/978-94-017-8616-4_17.
34. Sajesh, V.K. & Suresh, A. Public-sector agricultural extension in India: A note. *Review of Agrarian Studies*, 2016, 6(1), 116-131.
35. Hulland, J. Conceptual review papers: Revisiting existing research to develop and refine theory. *AMS Review*, 2020, 10(1-2), 27-35. doi: 10.1007/s13162-020-00168-7.

