

Authorship Pattern On Agronomy Research In India: A Scientometric Analysis

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ABSTRACT

The present study provides valuable information on Agronomy research output from 2001 to 2020 in Agronomy. The data were retrieved from the Web of Science database and include year-wise authorship contribution, authorship pattern, and Degree of collaboration. The results show that the highest publication was 1057 in 2015. The lowest number of publications is recorded in the year 2006, recording only 316 publications of Agronomy. The lowest number of publications is recorded in the year 2006, recording only 316 publications of Agronomy. The highest number of publications was 1375 (10.63%) in 2020, followed by 1002 (7.75%) papers in 2015 and 868 (6.71%) papers in 2016 and 2017. The lowest number of publications was recorded in 2006, with only 277 (2.14%) publications on Agronomy. It could be observed that three authors contributed papers occupy the first position (22.18%) regarding the total number of papers published during the analysis period. Out of 12,936 articles, a single author has contributed 4.51 percent, 17.90 percent of articles were published by two authors (2316), 22.19 percent of articles were published by three authors (2871), 19.50 percent of the contributions were published by four authors (2523), 13.48 percent of the gifts were published by five authors (1744), 7.85 percent of the facilities were published by six authors (1015), 4.97 percent of articles were produced by seven authors (643) group, 3.03 percent of reports were from eight authors (392) group, 2.13 percent of papers were contributed by nine authors (276) group, 4.43 percent of articles were donated by ten and above authors (573) group respectively. The Degree of collaboration was 0.91 during the study period 2001 to 2020 out of 12,936 literature published, 95% of them or published under the joint author of publications in Agronomy research output.

KEYWORDS: Scientometrics, Bibliometrics, Agronomy, Authorship Pattern

INTRODUCTION

Agriculture is responsible for providing virtually all the food and much clothing for the world population, increasing enormously. A primitive form of agriculture was shifting cultivation, in which people working with the crudest of tools cut down a part of the forest, burned the undergrowth, and started new garden sites after a few years when these plots lost fertility, choked with grass or brush or became heavily infested with soil-borne pests. Cultivators to shift to a new site. This system would support a sparse population where abundant land was available. Under shifting cultivation, land abandoned became degraded. Subsequent subsistence farming followed necked fallow rotation. After that, legume rotation was adopted. Under mixed farming comprising field crops and animals, field grass husbandry was adopted, and the same field was used for cropping and grazing.

Agronomy may be listed as Planning, programming, and executing measures for maximum utilization of land, temperature, humidity, transport and marketing facilities, Choice of crop varieties adaptable to the particular climate, proper field management by tillage, preparing field channels and bunds for irrigation and drainage, checking soil erosion, adoption of multiple cropping, timely application of appropriate and balanced nutrients to the crop in sequence and improvement of soil fertility, choice of quality seeds, seed material and maintenance of requisite plant density per unit, adopting of reasonable and exacting management practices including intercultural operations to get maximum benefit, adopting of suitable method and time harvesting of crop reduce field damage and to release land for succeeding crop and efficient utilization of residual moisture, plant nutrients, and other management practices.

The scientometric method is used regularly to assess research and exercise to determine funding allocation to Research Institute. The methods used for Scientometric measurement contexts measure from the authorship pattern of the individual authors, Keyword Analysis, measuring Impact Factor, overlap in the database and increasingly Internet. The concept of the study is similar to citation analysis, where the general Hypothesis is that used to separate articles by the number of times an article is cited; those that are rarely mentioned have more of an impact on the academic community. In the same way as the author's in-depth analysis of articles related to the author's productivity, authorship patterns, country-wise articles contribution, critical word basics depth of subject area are some of the essential factors that can be used to differentiate a journal of greater importance to scholars.

RELATED STUDY

Malik and Malik (2021)¹ conducted a study in Ethnobotany Research. The research data were collected from the databases Scopus, Web of Science, Google Scholar, and ResearchGate. The scientometric tools CReXplorer, VOSviewer, and Perish, were used for mapping. A total of 1767 publications authored were published in 369 different subject titles. 16.98 % of publications were printed in Ethnobotany, followed by 13.92 % of publications in Ethnobotany of the Himalayas. Of the total publications, 67.91 % are book chapters, followed by Journal articles 274. Out of 1200 book chapters, a maximum of 966 were published in 2020. It has collaborated with authors from fifty-five countries.

Bhoomaiah et al. (2020)² examined the research in White spot syndrome virus research. The study maps the White spot research publications output from 1998 to 2017 using the Web of Science (WoS) database. A total of 1786 data were subjected to the analysis, covering various parameters like growth, rank and global publications, research collaborations rank, and global publications. India accounted for 17.24 % of the international WSSV publications share publications. The Indian researchers had networked with 23 collaborating partners across the world. The lead collaborating country accounted for 18.51% of the total papers with international collaboration. The study also provides a quantitative analysis of the leading institutions and individual researchers, significantly contributing to the WSSV research in India.

Tripathi and Garg (2016) conducted a scientometric analysis of the publication output of India in cereal crops research as reflected by its coverage in **Scopus** international database from 1965 to 2010. The study indicates that the highest number of papers, 40 %, were published on rice, followed by wheat 29%. The Agricultural universities and institutions under the aegis of the Indian Council of Agricultural Research (ICAR) were the most productive. Most papers were published in the Indian Journal of Agricultural Sciences, followed by the Indian Journal of Agronomy. Indian Agricultural Research Institute. The primary research was focused on genetics and plant breeding, followed by agronomic aspects. The authorship pattern reveals that co-authored papers accounted for 94 % of total output.

Gupta, Baidwani, and Kaur (2016) conducted a scientometric study on Vitamin D deficiency research and examined 536 Indian publications. The research data was collected from the **Scopus database** during 2006-15. The global publications share on Vitamin D deficiency came from several countries. The top 10 most productive countries accounted for 73.67% of global publications and 99.22% of international citations from 2006 to 2015. Of the total Indian publications, 530 appeared in several journals, of which the top 15 journals contributed 31.72% share of India's output. The top 13 highly cited papers registered 50 to 479 citations and contributed 1535 citations, leading to the average citation per paper of 118.08. There is an urgent need to frame a national policy in this area, undertake more R&D and recognize vitamin D deficiency as a public health problem and allocate more healthcare funds.

Kolle et al. (2015) conducted a study in the bibliometric analysis of published works in the IJPM published between 2005 and 2014. The data were collected from the **Web of Science** database. The results reveal a global trend in increased research on pest management. Four authors contributed more than 10% of the articles to the journal from 2005 to 2014. A total citation count of 1,566 was recorded, and the average citation per article was 3.92. The three most developed countries contributed more than 44% of the pieces, the United States of America, the United Kingdom, and Australia. McCullough, Deborah G is the most cited author for the period. The research results will be helpful for researchers and scientists as they depict the trends in and bibliometric characteristics of articles published in IJPM for the period under study.

Tripathi, Sharma, and Garg (2015) analyzed India's publication output on cereal crops as reflected by its coverage in Indian Science Abstracts (ISA) and CAB Abstracts from 1965 to 2010. The result indicates that the highest number of papers (43.80%) was published on rice, followed by wheat (24.28%). Most of the documents were published in Indian journals with low impact factors. The highest number of papers was published in the Indian Journal of Agricultural Sciences, followed by the Indian Journal of Agronomy, Madras Agricultural Journal, and Journal of Maharashtra Agricultural University. Indian Agricultural Research Institute, Tamil Nadu Agricultural University, Coimbatore, and Punjab Agricultural University, Ludhiana contributed about 7% of the papers each. The primary research was focused on 'genetic and plant breeding' (28.2%), followed by 'agronomic aspects' (27.9%) and pest, diseases, and pest control (19.7%). The authorship pattern reveals that co-authored papers accounted for 90% of total output.

Tripathi and Garg (2014) conducted a scientometric study of the scientific output of India in crop science research as reflected by the coverage of scientific production in three different databases **SCOPUS**, **CAB** Abstracts, and **ISA**, during the period 2008-2010. The analysis indicates that most papers were published on rice and wheat crops. Agricultural universities and institutions under the Indian Council of Agricultural Research (ICAR) were the most productive institutions. Most of the papers were published in Indian journals with low impact factors. Environment and Ecology, the Indian Journal of Agricultural Sciences, and Research on Crops were the most preferred journals used by the Indian scientists. The primary research is focused on genetics and plant breeding, followed by soil climate and environmental aspects, and agronomic characteristics. The authorship pattern reveals that co-authored papers accounted for 72 percent of total output.

Sagar et al. (2014) conducted a study on agriculture research publications output in India from 1993 to 2012. The research data were retrieved from the source database based on the **Web of Science**. The study's objective was to perform a scientometric analysis of all agriculture research publications by Indian scientists. The parameters studied include growth of publications and citations, domain-wise distribution of publications and sources, activity index, international collaboration, highly productive institutions, highly preferred journals, and highly cited magazines. The results show that the 22615 publications were published in Agriculture from 1993 to 2012, and these publications received 98954 citations. The highest number of publications in 1917 (8.48 %) were published in 2008. The highest number of sources, 8714 (8.81 %), were received in 2007. The highest average citations per publication, 8.29, were in 2002.

Gunasekaran and Balasubramani (2012) analyzed the artificial intelligence research output carried out from the year 1973 - to 2011. The different parameters, including authorship pattern, growth, rank with the global publication, institutions contribution, and most productivity journals, were analyzed. **Scopus** citation database has been used to retrieve the data for 39 years (1973-2011) by using the keywords "Artificial," "Intelligence," and "Neural networks." India's research output profile was compared with other countries' help of scientometrics technique.

During the study period, 228 papers were published by the authors. The analysis report shows that India ranks in 1st position among the top 17 countries with 219 (96.05%) papers. The Indian research output delivered slightly decreased in 1973 and gradually increased every year.

Raja and Balasubramani (2011) this study analyzes plasmodium falciparum research publication in India measured from Histcite software and other tools. The research data were retrieved from the Web of Science database. Until today, no quantitative study at the global or country level on epilepsy research literature has been carried out. The results show the growth of Indian literature in plasmodium falciparum deposition and make the quantitative assessment of the research in terms of year-wise research output, geographical distribution, nature of collaboration, characteristics of highly productive institutions, and the channel of communication used by the scientists.

THE MAIN OBJECTIVES OF THE PRESENT STUDY ARE

- To examine the publications output of Agronomy research during 2001-20.
- To identify the most prolific author in the field of Agronomy research.
- To examine the nature of the authorship pattern in the Agronomy research.
- To study the single, multi-authored papers and determine the Degree of collaborations.
- To identify the year-wise authorship pattern of Agronomy research.

METHODOLOGY

This study is based on the publication data retrieved from the Web of Science (WoS) database for the last 20 years, from 2001 to 2020. In the study field of Agronomy research, 12936 publications were published during the study period 2001-2020. The search was performed using the basic search in the name of the Agronomy with Web of Science Core database, and with all probabilities and bibliographical details retrieved were about 12936 research papers. Detailed analysis of the year-by-year rates of publication was done using Excel.

DATA ANALYSIS AND INTERPRETATION

Year-wise distribution of research output on Agronomy research

Table – 1 Year-wise distribution of research output on Agronomy research

Sl.No	Publication Year	No of Records	%
1	2001	365	2.82
2	2002	357	2.76
3	2003	356	2.75

4	2004	348	2.69
5	2005	298	2.30
6	2006	277	2.14
7	2007	367	2.84
8	2008	726	5.61
9	2009	557	4.31
10	2010	643	4.97
11	2011	622	4.81
12	2012	726	5.61
13	2013	819	6.33
14	2014	700	5.41
15	2015	1002	7.75
16	2016	868	6.71
17	2017	868	6.71
18	2018	830	6.42
19	2019	832	6.43
20	2020	1375	10.63
		12936	100.00

Table – 1 clearly shows that during the period 2001 to 2020, 12,936 publications were published at the Indian level during the study period. The highest number of publications was 1375 (10.63%) in 2020, followed by 1002 (7.75%) papers in 2015 and 868 (6.71%) papers in 2016 and 2017. The lowest number of publications is recorded in 2006, with only 277 (2.14%) publications on Agronomy.

AUTHORSHIP PATTERN IN AGRONOMY RESEARCH OUTPUT

Table – 2 Author wise distributions of publications

Year	Single Author	Two Authors	Three Authors	Four Authors	Five Authors	Six Authors	Seven Authors	Eight Authors	Nine Authors	Ten and above Authors	Total

2001	30	100	109	60	35	17	8	2	1	3	365
2002	27	100	94	68	25	18	13	4	3	5	357
2003	12	96	97	71	30	20	11	4	3	12	356
2004	27	90	90	62	36	21	11	3	2	6	348
2005	27	60	86	48	40	16	8	7	3	3	298
2006	15	48	57	64	46	21	8	13	3	2	277
2007	11	65	95	69	55	24	18	14	6	10	367
2008	35	156	217	153	95	22	20	8	8	12	726
2009	29	111	145	122	71	30	15	11	5	18	557
2010	30	118	133	153	102	36	22	17	9	23	643
2011	34	113	141	132	94	41	23	13	7	24	622
2012	21	126	171	153	94	58	32	19	14	38	726
2013	21	127	164	181	137	67	55	20	17	30	819
2014	19	125	133	158	92	71	41	20	16	25	700
2015	36	144	210	201	149	82	63	37	22	58	1002
2016	35	138	155	172	138	85	49	26	22	48	868
2017	20	136	168	166	131	79	46	39	34	49	868
2018	16	123	168	145	107	81	63	35	31	61	830
2019	23	102	163	148	116	87	65	37	34	57	832
2020	115	238	275	197	151	139	72	63	36	89	1375
Total	583	2316	2871	2523	1744	1015	643	392	276	573	12936

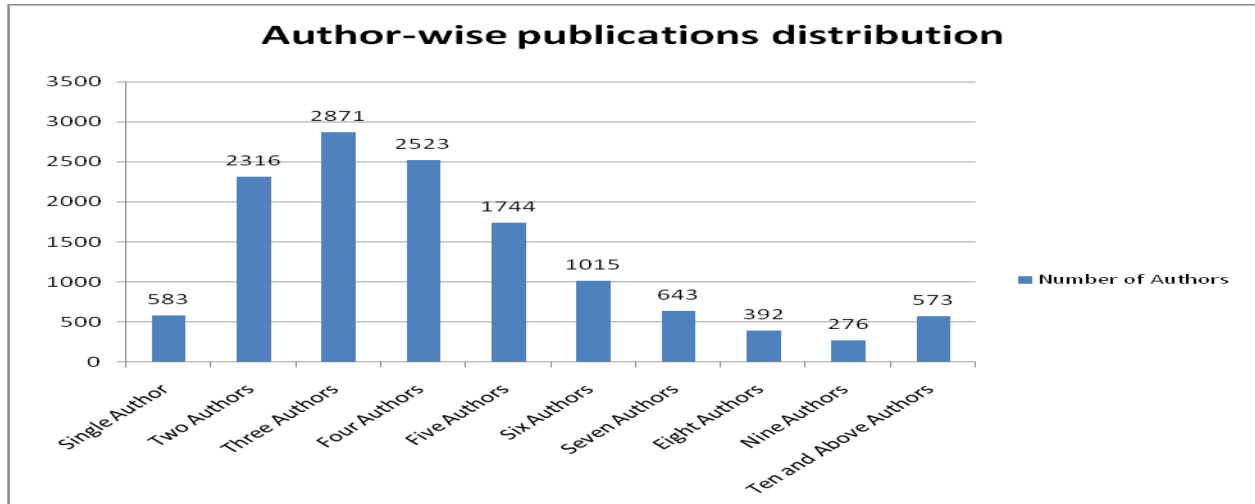


Figure . 1 Authorship pattern of publications distributions

Table-2 indicates the authorship pattern in Agronomy research output. It could be observed that three authors contributed papers occupy the first position (22.18%) regarding the total number of articles published during the analysis period. Four authors collaborated commentaries rank the second in order (19.50%) concerning the total number of papers recorded in the study. Two authors collaborated pieces come third in order (17.90%) regarding total output noted during the study period. Five authors collaborated papers take the fourth position in the hierarchy (13.48%) in sharing and Agronomy research output during the analysis period. Six authors collaborated pieces take the fifth position in order (7.85%). They contributed 17 articles in 2001, and it went up to 139 by the end of the year 2020. Seven authors collaborated papers occupy the sixth position in order (4.97%) in sharing total research output in Agronomy during the analysis period. The single author contributed to the period of analysis. A single author contributed eight papers in 2001, and it propelled to 72 by the end of the year 2020 in its output, but the shortfall of contribution in 2005, 2006, and 2009 is the crucial reason behind it.

AUTHORSHIP PRODUCTIVITY

Table – 3 Authorship pattern of research productivity

Authorship Pattern	No of Contribution	%	No of Authors	%
1	583	4.51	583	1.07
2	2316	17.90	4632	8.49
3	2871	22.19	8613	15.78
4	2523	19.50	10092	18.49

5	1744	13.48	8720	15.98
6	1015	7.85	6090	11.16
7	643	4.97	4501	8.25
8	392	3.03	3136	5.75
9	276	2.13	2484	4.55
10	573	4.43	5730	10.50
Total	12936	100	54581	100

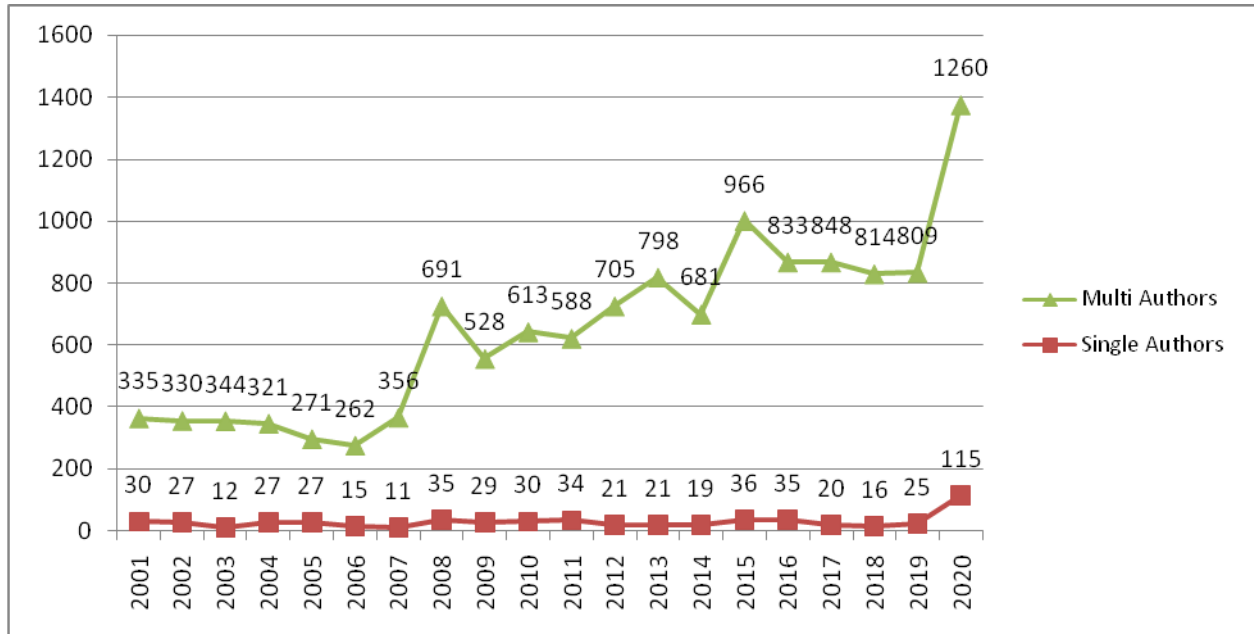
Table – 3 below the authorship pattern of contributions. Out of 12,936 articles, a single author has contributed 4.51 percent, 17.90 percent of articles were published by two authors (2316), 22.19 percent of articles were published by three authors (2871), 19.50 percent of the contributions were published by four authors (2523), 13.48 percent of the gifts were published by five authors (1744), 7.85 percent of the donations were published by six authors (1015), 4.97 percent of articles were produced by seven authors (643) group, 3.03 percent of articles were from eight authors (392) group, 2.13 percent of reports were contributed by nine authors (276) group, 4.43 percent of papers were contributed by ten and above authors (573) group respectively.

SINGLE VS MULTIPLE AUTHORED RESEARCH OUTPUT

Table – 4 Single Vs Multiple author research output

Year	Single Author			Multiple Authors			Total
	No of Output	%	Total No of Output	No of Output	%	Total No of Output	
2001	30	8.22	123	335	91.78	1601	365
2002	27	7.56		330	92.44		357
2003	12	3.37		344	96.63		356
2004	27	7.76		321	92.24		348
2005	27	9.06		271	90.94		298
2006	15	5.42		120	262		94.58

2007	11	3.00		356	97.00		367
2008	35	4.82		691	95.18		726
2009	29	5.21		528	94.79		557
2010	30	4.67		613	95.33		643
2011	34	5.47		588	94.53		622
2012	21	2.89		705	97.11		726
2013	21	2.56		798	97.44		819
2014	19	2.71		681	97.29		700
2015	36	3.59	131	966	96.41	3738	1002
2016	35	4.03		833	95.97		868
2017	20	2.30		848	97.70		868
2018	16	1.93		814	98.07		830
2019	23	2.76		809	97.24		832
2020	115	8.36	209	1260	91.64	4564	1375
Total	583	4.51	583	12353	95.49	12353	12936



Single Vs Multiple author research output

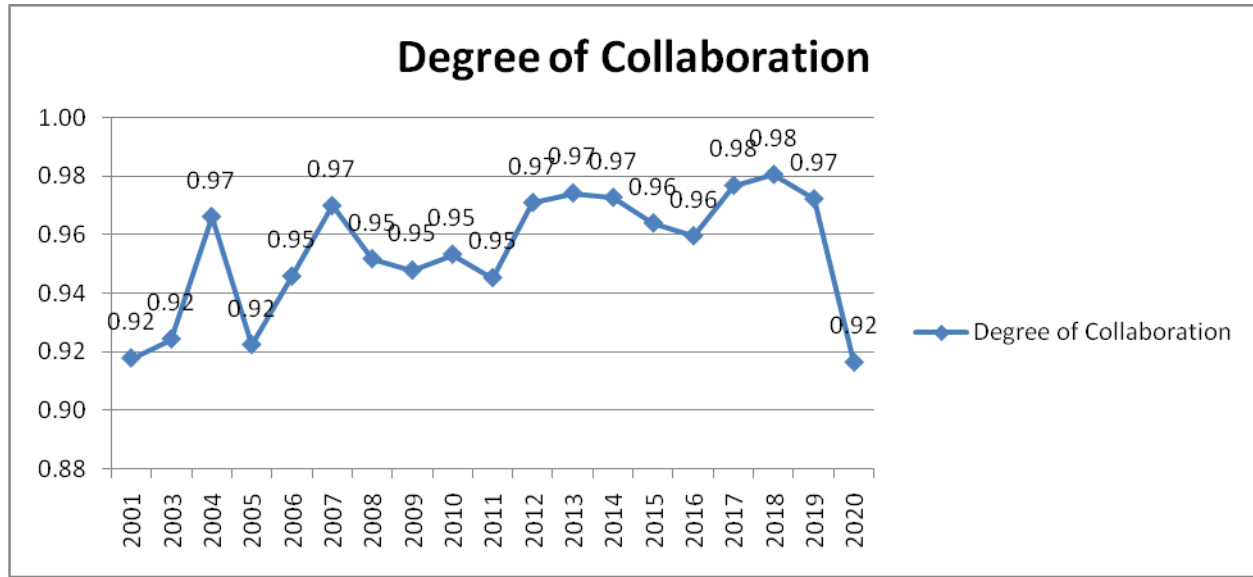
Table- 4 the proportion of single-author Vs. Multi-authored papers in research publications for the analysis during the study period on Agronomy publications. It could be noted that out of the total 12,936 journals, only 4.51 percent have single authored distribution. The rest, 95.49 percent of them, are multi-authored distribution on Agronomy. The study period is divided into four periods. The first period covers 2001-2005, the second covers 2006- 2010, the third covers 2011-2015, and the fourth covers 2016-2020. Overall, the single author contributed papers constitute 4.51 percent of the total publications. For this table, multiple authors have been noticed over the years. It is evident that multi-authored papers contributed to (1601) of total output in 2001-2005 and it has declined to (2450) in the second period 2006-2010, and it further has escalated to (3738) in the third period 2011-2015, and it has declined to (4564) in the fourth period 2016-2020 At the overall level, the multi-authored papers contribute to (12353) of the total output.

DEGREE OF COLLABORATION

Table 5 – Year-wise distribution of Degree of collaboration

Year	Single Author		Multiple Authors		Total	Degree of Collaboration	Mean in DC
	No of Output	%	No of Output	%			
2001	30	9.59	335	90.41	365	0.92	0.94

2002	27	8.12	330	91.88	357	0.92	
2003	12	4.21	344	95.79	356	0.97	
2004	27	8.05	321	91.95	348	0.92	
2005	27	9.40	271	90.60	298	0.91	
2006	15	6.14	262	93.86	277	0.95	
2007	11	3.54	356	96.46	367	0.97	
2008	35	4.96	691	95.04	726	0.95	
2009	29	5.57	528	94.43	557	0.95	
2010	30	4.98	613	95.02	643	0.95	
2011	34	5.63	588	94.37	622	0.95	
2012	21	3.44	705	96.56	726	0.97	
2013	21	2.81	798	97.19	819	0.97	
2014	19	2.71	681	97.29	700	0.97	
2015	36	3.69	966	96.31	1002	0.96	
2016	35	4.72	833	95.28	868	0.96	
2017	20	2.88	848	97.12	868	0.98	
2018	16	2.41	814	97.59	830	0.98	
2019	23	3.00	809	97.00	832	0.97	
2020	115	8.87	1260	91.13	1375	0.92	0.96
Total	583	4.92	12353	95.08	12936		0.95



Year-wise distribution of Degree of collaboration

It is inferred from table - 5 that at the aggregate level, the Degree of collaboration is 0.91 during the study period 2001 to 2020 out of a total of 12,936 literature published, 95% of them published under the joint author of publications in Agronomy research output. The period-wise analysis indicates that its level is somewhat less in the first period [2001-2010: 0.94], and it has shown an increasing trend during the period [2011-2020: 0.96]. This reveals the high prevalence of collaborative research in Agronomy. Based on this study, the Degree of collaboration $C = 0.95$, i.e., 95 percent of collaboration authors' articles were published during the study periods. Hence, the eighth Hypothesis is tested from this analysis.

CONCLUSION

Very few studies on Agronomy research have been conducted research output, especially from a scientometric standpoint with both qualitative and quantitative techniques. The present study provides valuable information on Agronomy research from 2001 to 2020 in Agronomy Research. The data were collected from the Web of Science. This study includes year-wise authorship contributions, authorship pattern, prolific author, and Degree of collaboration. The results show that the highest publication was 1057 in 2015. The lowest number of publications is recorded in the year 2006, recording only 316 publications of Agronomy. The lowest number of publications is recorded in the year 2006, recording only 316 publications of Agronomy. The highest number of publications was 1375 (10.63%) in 2020, followed by 1002 (7.75%) papers in 2015 and 868 (6.71%) papers in 2016 and 2017. The lowest number of publications was recorded in 2006, with only 277 (2.14%) publications on Agronomy. It could be observed that three authors contributed papers occupy the first position (22.18%) regarding the total number of papers published during the analysis period. Out of 12,936 articles, a single author has contributed 4.51 percent, 17.90 percent of articles were published by two authors (2316), 22.19 percent of articles were published by three authors (2871), 19.50 percent of the contributions were published by four authors (2523), 13.48 percent of the donations were published by five

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REFERENCES

1. Malik, B.A., Malik, Z.A. (2021). Rainer will Bussmann's scholarly impact: A scientometric review, *Ethnobotany Research and Applications*, 21, art. no. 14,.
2. Bhoomaiah, D., Krishnan, P., Kantharajan, G., Sangeeta, B., Rajendran, K.V.(2020). A scientometric assessment of research on white spot syndrome virus (WSSV) in India vis-a-vis the world (1998–2017), *Aquaculture*, 520, art. no. 734672,.
- 3 Tripathi, H.K., Garg, K.C. (2016). Scientometrics of cereal crop science research in India as seen through SCOPUS database during 1965-2010. *Annals of Library and Information Studies*, 63 (3), pp. 222-231
4. Gupta, R., Gupta, B.M., Baidwani, K., Kaur, J. (2016). A scientometric assessment of Indian publications on vitamin D deficiency during 2006-15. *Journal of Young Pharmacists*, 8(4), pp.302-309.
5. Kolle, S.R., Shankarappa, T.H., Manjunatha Reddy, T.B., Muniyappa, A (2015). Scholarly Communication in the International Journal of Pest Management: A Bibliometric Analysis from 2005 to 2014. *Journal of Agricultural and Food Information*, 16 (4), pp. 301-314.
6. Sagar, A., Kademani, B.S., Bhanumurthy, K. (2014). Agriculture research in India: A scientometric mapping of publications. *DESIDOC Journal of Library and Information Technology*, 34 (3), pp. 206-222.
7. Tripathi, H.K., Garg, K.C. (2014). Scientometrics of Indian crop science research as reflected by the coverage in Scopus, CABI, and ISA databases during 2008-2010. *Annals of Library and Information Studies*, 61 (1), pp. 41-48.
8. Gunasekaran, M., Balasubramani, R. (2012). Scientometric analysis of artificial intelligence research output: An Indian Perspective. *European Journal of Scientific Research*, 70 (2), pp. 317-322.

9. Raja, S., Balasubramani, R. (2011). Plasmodium falciparum research publication in India: A scientometric analysis. *European Journal of Scientific Research*, 56 (3), pp. 294-300.
