

## RESEARCH OUTPUT AND CITATION IMPACT OF CSIR-NATIONAL GEOPHYSICAL RESEARCH INSTITUTE, HYDERABAD, INDIA (2010-2019): A SCIENTOMETRIC ANALYSIS

*Adepu Sridhar*

*S.Yadagiri*

*D.V. Ramana*

**Mr. Adepu Sridhar**

Technical Officer (Library),  
CSIR-National Geophysical  
Research Institute (NGRI),  
Hyderabad- 500 007, Telangana,  
INDIA.

Email: sridhar0632@gmail.com

**Corresponding Author**

**Dr. S.Yadagiri**

Assistant Professor,  
University Library, Osmania  
University,  
Hyderabad- 500 007, Telangana,  
India.

Email: sygiri1@yahoo.co.in

**Dr. D.V.Ramana**

Chief Scientist,  
CSIR-National Geophysical  
Research Institute (NGRI),  
Hyderabad- 500 007, Telangana,  
India

Email: dvr@ngri.res.in

This paper analyses the different scientometric parameters to emphasize the publication growth of CSIR-National Geophysical Research Institute, Hyderabad. The data was analysed by various aspects of research output based on Web of Science database for the study period 2010-2019. The study identified a total of 1465 publications which were published on Earth Science subject domain by CSIR-NGRI during the study period 2010-2019. The data is analysed by different scientometric parameters, i.e. Annual distributions of publications, country-wise contribution of articles, annual growth, relative growth rate (RGR) and doubling time, most preferred national/International journals, most productive research areas, prolific authors, Impact factor of Journals, and highly cited articles and citation analysis for the period 2010-2019. The study observes that the scientific community of CSIR-NGRI have to increase the productive output year by year and select the journals which are having the high impact factor for publication and disseminating the results.

**Keywords:** CSIR-National Geophysical Research Institute (NGRI); Scientometrics; Web of Science; Annual Growth Rate (AGR); Relative Growth Rate (RGR); Doubling Time (Dt); Impact Factor; Research Productivity; Earth Sciences; Hyderabad.

## INTRODUCTION

The CSIR-NGRI is a premier research laboratory of the Council of Scientific and Industrial Research which was established in the year 1961 with the mission to carry out basic and applied research encompassing the broad disciplines of Earth Sciences i.e. Geology, Geophysics and Geochemistry. Over the last 60 years, the Institute has evolved into a centre of excellence with multidisciplinary of earth science research programs based on the mission of the CSIR. The Institute's focus in R & D areas such as Deep Earth Structure and Process, Exploration of Hydrocarbon, Geochemistry, Geochronology, Mineral and Groundwater, Earthquake Hazards and Theoretical Geophysics & Engineering Geophysics. The

institute is having the national and international collaboration with educational and R & D institutes with the interest of earth science research. CSIR-NGRI library is having the prominent collection of earth sciences in the country and providing the digital library services to their researchers 24\*7. The library having books, e-journals, databases, back volumes and technical reports in the field of earth sciences to serve the researchers of the institute.

According to Ivancheva (2008) “Scientometrics becomes a very perspective research field in the general studies of science, providing powerful and effective instruments for analyses and evaluations in the sphere of science as a significant accelerator of the economic growth and social prosperity, helping to realise the Lisbon strategy for establishing a knowledge-based society.”

## REVIEW OF LITERATURE

The study of scientometric is now growing rapidly, and there are numerous studies that have been undertaken to measure or analyse the performance and observe the trends of publications on different R &D institutes. Some of the related studies in R&D institutes and findings.

Jeyshankar (2015) evaluates the research publication trend among scientists of Indira Gandhi Centre for Atomic Research (IGCAR) Kalpakkam during the period 1989-2013. The Primary data were collected from SCOPUS database. The study revealed that majority (96.26%) of the researchers preferred to publish their research papers in joint authorship only and

the degree of author collaboration ranges from 0.84 to 0.99 and its mean value is 0.95. It also revealed that IGCAR scientists preferred to publish their work in the Journal of Nuclear Materials and Transactions of the Indian Institute of Metals. The top three collaborative institutions with IGCAR are Indian Institute of Technology, Chennai, Bhabha Atomic Research Centre, Mumbai and Anna University, Chennai.

Another study by Satish Kumar (2018) analysed the research productivity of Scientists of Aryabhata Research Institute of Observational Sciences (ARIES), Nainital. The data was collected and analysed from the Web of Science (WoS) database for the period of 15 years from 2001-2015. 574 research papers have been published over 15 years of time. ARIES's scientists are highly collaborating with USA. Out of 10 collaborating countries 07 are from developed countries and 03 countries are from Asia; and those are too leading researcher's countries among Asian countries. Tata Institute of Fundamental Research (TIFR) was the top most collaborating Institutions with 15.85 %. The Average impact factor of its top 10 journal publications (69.51 %) is 3.289 with H-Index 25. ARIES has also published two research articles in the highly prestigious Journal 'NATURE' in 2008. A similar study by Garg et al. (2006) analysed Scientometric profile of Indian agricultural research as seen through Science Citation Index Expanded. A total of 16,891 publications published by Indian scientists during 1993–2002. Dairy and Animal science were the two subfields together constitute about half (49%) of the total output. Remaining 51% of the output

is scattered in other six sub-fields. Agricultural universities contributed 7659 (~45%) of the total publication output, followed by ICAR that contributed 3792 (~22%) publications. Thus, these two agencies contributed about two-third of the total output. Remaining, one-third output came from academic institutions (~11%) and institutions under the Central Government Research Agencies (~11%). Remaining 11% output came from other agencies. 61% of the research papers in domestic journals while remaining 39% were published in journals published from abroad. Most of the prolific authors are from the highly productive institutions.

Lee (2003) analysed a scientometric study of the research performance of the Institute of Molecular and Cell Biology (IMCB) in Singapore during the study period 1987-1996. The author found that IMCB produced 395 research papers, 33 book chapters, 24 conference papers, and 4 monographs, graduated 46 PhDs and 14 MScs, and filed 10 patents. In its quest to become world-class, IMCB researchers have been very selective in where they publish. 95.6% of the articles were published in ISI journals. The articles received an average of 25 to 35 citations per article, and the percentage of uncited articles is 11.6%. Four articles received more than 200 citations, and 18 received between 100 to 200 citations. Pradhan and Ramesh (2018) examine a study on scientometric analysis of research publications of six Indian Institutes of Technology (IIT, Delhi, IIT, Kharagpur, IIT, Madras, IIT, Bombay, IIT, Kanpur & IIT, Roorkee during the period of 2006-2015. Data was obtained from the Scopus database and the authors observe that the research

publications have grown from 5378 in 2006 to 8405 in 2015, but in an inconsistent way and the citations of six IITs is strongly connected to the mainstream science as more than four-fifth of the papers were cited in international literature. Sunaina et al. (2017) observe the Scientometric Analysis of the Research Output of Physics and Astronomy of Guru Nanak Dev University during 2006-2015. The authors analyse that the university has published 652 papers in physics and astronomy. The University had registered the average citation impact per paper of 7.01 per cent and 6 publications received 51 to 100 citations. Among the Indian universities, University stood at 23rd rank in term of publications output (652) and h-index (29), 16th rank in average citation per paper (7.01 per cent) and 18th rank in share of high cited papers (1 per cent) and 19th rank in terms of international collaborative papers (27.45 per cent) during 2006-15. Around 68.71 per cent publications of the University in physics and astronomy were in national collaboration between GNDU and several other Indian organisations.

Another study by Rekha et al. (2012) analysed Research and citation impact of publications of the Nuclear Physics Division at Bhabha Atomic Research Centre. The authors found a total of 5627 citations from 257 publications published during 2003-2008 by the Nuclear Physics Division at Bhabha Atomic Research Centre using Web of Science database as the source data. The average number of citations per year was 703.38 and the average number of citations per publication was 21.89. The highest number of citations received was 1155 in 2007. Citation time-lag was zero for 76 (29.57%) papers, one year for 92 (35.80%) papers and two

years for 19 (7.39%) papers. The core citing authors were: A. Lebedev (449) followed by D. D' Enterria (396), S. Mioduszewski (392). The core journals citing Nuclear Physics Division publications were: Physical Review-C (1148 citations), Journal of Physics - G (663 citations), Nuclear Physics - A (618 citations).

## **OBJECTIVES OF THE STUDY**

The main objective of this study is to evaluate the progress of research at CSIR-NGRI using the published data from the Web of Science to measure the growth and examine the citation analysis of the different parameters of the publications.

The specific objectives of the study are to:

1. analyse the annual distribution of Articles;
2. find out the contribution of International Collaboration of Publications;
3. calculate the Annual Growth Rate, Relative Growth Rate (AGR) and Doubling Time of publications;
4. identify the top prolific authors and high productivity subject areas of publications;
5. study the Impact factor of top productive journals; and
6. Perform the citation analysis for the study period 2010-2019

## **METHODOLOGY AND DATA SOURCE**

The present study deals with the Research output and citation impact of CSIR-National Geophysical Research Institute during the last ten years. The study is based on scientometric analysis and the data for this study was collected from the “Web of Science” a multidisciplinary

platform developed by Institute for Scientific Information (ISI), now maintained by Clarivate Analytics Group. WoS provides a comprehensive citation search which navigates the full citation network. The database supports 256 disciplines covering Science, Social Science, Arts and Humanities.

The present study is limited to the research output of CSIR-NGRI for the past ten years 2010-2019. The following search string was used for collecting the data (Basic Search as “Natl Geophys Res Inst” and the search field as ADDRESS) Selected TimeSpan to custom year range and Limited to Publication Year 2010 to 2019. A total of 1465 publications were recorded during the study period which includes Articles, Proc.papers, editorial materials, meeting abstracts, reviews etc. There were 271 open access publications and remaining were other access type publication. The data was collected and analysed as per the objectives of the study. Each publication recorded with complete bibliographical details such as Title, Year, type of document, geographical distributions, etc. have been downloaded from the WoS database. The data was tabulated in MS Excel for its simple frequency calculation.

## **DATA ANALYSIS AND INTERPRETATION**

The selected parameters were analysed for the present study i.e. Year wise publications, Annual growth rate, Relative growth rate and Doubling time of publications, Country-wise distribution of articles, most preferred national and international source titles, most productive research areas, impact factors of journals, identifying the highest author profiles and,

citations pattern. The following tables and figures briefly describe the results.

### **Publications' Profile of CSIR-NGRI**

The table 1 shows the complete statistics of CSIR-NGRI publications during the period 2010-

2019. The table clearly describes that an average of above one paper per scientist is publishing an article per year. The scientific strength is decreasing year by year and it is clearly reflecting on the growth of publications of the Institution.

**Table 1: Publications' Profile of CSIR-NGRI**

<b>Year</b>	<b>Strength of the Scientists</b>	<b>Total Publications</b>	<b>Average papers per scientists</b>
2010-11	147	148	1.01
2011-12	137	151	1.10
2012-13	127	169	1.33
2013-14	119	165	1.39
2014-15	112	168	1.50
2015-16	102	138	1.35
2016-17	99	125	1.26
2017-18	96	142	1.48
2018-19	101	139	1.38
2019-20	101	120	1.19
		1465	

### **Year-wise growth of Publications**

The table 2 shows the year-wise distribution of publications of CSIR-NGRI during the study period 2010-2019. The total publications output recorded was 1465, including 716 articles (48.87 %) of International collaboration publications, an average of 71 articles per year during the period. The table reveals that there are huge fluctuations in the growth of publications as well as in the Annual Growth Rate. From 2010-2014 it is observed a fair growth of publications every year. From 2015 onwards the publications growth rate is dropping except in 2017. The maximum publications, i.e. 169 (11.54%) recorded in the year 2012, followed by 168 (11.47%) in 2014

and the minimum, i.e. 120 (8.19 %) of publications recorded in the year 2019 and 125 (8.53 %) in 2016 also. There has been an existent decrease in publications. The total year-wise distribution of publication details are shown in table 2.

The table 2 also shows that the Annual Growth Rate of the total publications calculated year wise during the study period (2010-2019). It is seen in table 1, that there is a huge fluctuation trend of growth in the study period. The AGR has decreased from 11.92 in 2012 to -2.36 in 2013 and followed up to -17.85 in 2015, and it was increased to 13.60 in 2017 and again decreased to -13.66 in 2019. Since there is a fluctuations in

number of publications year by year, as shown in figure 2. The reason for the variation is that there is no constant growth of publications every year,

the total AGR data, as shown in table 2 and figure 1 and the AGR is calculated on the formula given by Kumar and Kaliyaperumal (2015) as follows.

**Table 2: Year-wise growth of Publications**

Sl. No.	Year	Articles	Percentage	AGR	ICP	% ICP
1	2010	148	10.10	0.00	47	6.56
2	2011	151	10.31	2.02	62	8.66
3	2012	169	11.54	11.92	75	10.47
4	2013	165	11.26	-2.36	61	8.52
5	2014	168	11.47	1.81	92	12.85
6	2015	138	9.42	-17.85	73	10.20
7	2016	125	8.53	-9.42	92	12.85
8	2017	142	9.69	13.60	67	9.36
9	2018	139	9.49	-2.11	82	11.45
10	2019	120	8.19	-13.66	65	9.08
	<b>Total</b>	<b>1465</b>	<b>100.00</b>		<b>716</b>	<b>100.00</b>

ICP=International Collaboration of Publications, AGR=Annual Growth Rate

$$AGR = \frac{\text{End Value} - \text{First Value}}{\text{First Value}} \times 100$$

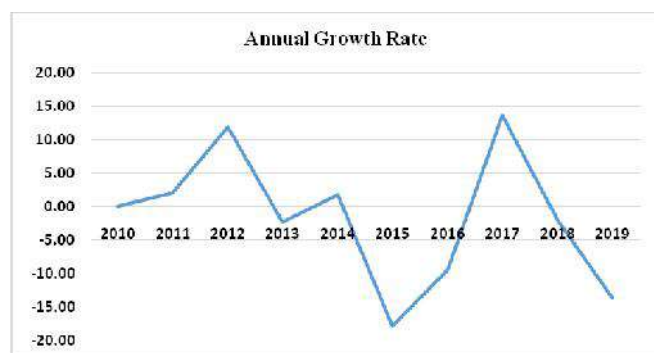


Figure 1 Year-wise Annual Growth Rate

### Relative Growth Rate (RGR) and Doubling Time (Dt) of Publications

The RGR defines an increase in a number of documents/articles per unit of time. The mean Relative Growth Rate (RGR) over the specific period of an interval can be calculated from the

following equation derivated by Mahapatra (1985).

$$\text{Relative Growth Rate (RGR)} = \frac{\text{Log } e W2 - \text{Log } e W1}{T2 - T1}$$

Where R=Mean relative growth rate over the specific period of interval

*Log e W1* - log of the primary number of publications

*Log e W2* - log of the ending number of publications

(The *Log e W1* & *W2* values are taken from the online logarithm calculator

[https://www.rapidtables.com/calc/math/Log\\_Calculator.html](https://www.rapidtables.com/calc/math/Log_Calculator.html)

*T2-T1*- the Unit difference between the initial and final time (The year can be taken here as the unit of time), *Dt*- Doubling time

**Table 3 Relative Growth Rate (RGR) and Doubling Time (Dt) of publications**

Sl. No.	Year	Articles	Cumulative Sum	Loge W1	Loge W2	RGR	Dt
1	2010	148	148	-	4.99	-	-
2	2011	151	299	4.99	5.70	0.71	0.98
3	2012	169	468	5.7	6.14	0.44	1.58
4	2013	165	633	6.14	6.45	0.31	2.24
5	2014	168	801	6.45	6.68	0.23	3.01
6	2015	138	939	6.68	6.84	0.16	4.33
7	2016	125	1064	6.84	6.96	0.12	5.77
8	2017	142	1206	6.96	7.09	0.13	5.33
9	2018	139	1345	7.09	7.20	0.11	6.30
10	2019	120	1465	7.20	7.28	0.08	8.66
	<b>Total</b>	<b>1465</b>				<b>0.229</b>	

The table 3 shows the year-wise calculation of RGR, the values are found between 0.71 and 0.08. It reveals that there are up and downs in the values of Relative Growth Rate. The highest value of RGR corresponds to 2011 (0.71), whereas the lowest value of RGR (0.08) for the year 2019. The Mean Relative Growth Rate (R) observed was 0.229 over the specific period of 10 years.

**Doubling time (Dt) :** The data reveals that there is a direct equivalence existing between the Relative Growth and the Doubling Time. If the contribution numbers of a subject doubles, during the study period, then the variation between the logarithm of the numbers at the beginning and at the end of the period must be the logarithms of the number 2. If a natural logarithm is used for this, the difference is a value of 0.693 (Beaie and Acol, 2009). The Doubling time for each specific period of interval and for articles/pages can be measured by the following formula.

$$\text{Doubling time (Dt)} = \frac{0.693}{\text{RGR}}$$

The table 2 shows that it has a similar trend of RGR. The Dt. ranges from 0.98 to 8.66. A year-wise increase is seen during the period of the study, and the Dt has shown a year-wise increase from 0.98 to 5.77 for the period 2011-2016 and slight decreased i.e. 5.33 in 2017, thereafter, again increased as 6.30 and 8.66 in 2018 and 2019 respectively.

#### **Top ten Country-wise distribution of Articles**

As a Premier Research Institute of Earth Sciences in the country, the CSIR-NGRI is more collaborative to do similar research with many foreign countries. The scientific output, with collaboration at the International level, is gradually increased during the study period. The CSIR-NGRI has International Collaboration of Publications with 62 foreign countries during the study period 2010-2019. The table 4 depicts the

top ten country-wise distribution of publications and Sum of Citations and Average Citations from the marked period 2010-2019. The maximum, i.e. 116 publications were contributed by the United States of America with Sum of Citation as 2039 at average of 17.58 per article, followed by the

Peoples Republic of China (80 publications) with Sum of Citation as 1557 at average of 19.46 per article and 67 publication contributed by Japan Sum of Citations as 1521 at average of 22.70 respectively.

**Table 4: Country-wise distribution of articles (an International collaboration of articles)**

Sl. No.	Countries/Regions	No. of Publications	Total times Cited	Avg. citations	h-index
1	USA	116	2039	17.58	24
2	Peoples R China	80	1557	19.46	20
3	Japan	67	1521	22.70	21
4	Australia	62	1062	17.13	17
5	Germany	54	1081	20.02	17
6	France	43	858	19.95	18
7	Canada	37	920	24.86	17
8	Russia	37	334	9.03	10
9	England	19	311	16.37	11
10	South Africa	16	255	15.94	8

### Most Preferred National and International Source Titles

The Researchers want to publish their output in a standard and peer-reviewed Journals only. The researches see the quality of the journal and prefer to publish in high Impact Factor Journals in their subject discipline. CSIR-NGRI Scientific community also generate huge earth sciences data to publish their relevant domain journals at the national and international level with high Impact factor journals. The table 5 reveals the top 15 National and International Journals preferred to publish by the CSIR-NGRI researchers during the period 2010-2019. The highest publications published at the International level in *Journal of*

*Asian Earth Sciences* (total of 79 publications) with average citation 10.54 per article, followed by *Environmental Earth Sciences* (47 publications) with average citations 4.52 per article. In National Journals *The Journal of The Geological Society of India* having the highest publications, i.e.154 with 4.06 average citations, followed by *Current Science* having 99 publications with 3.65 average citations. The significant observations are that the subjects of the top 5 journals are earth sciences and allied areas. The highest Impact factors for the most preferred journals during the period according to JCR-2019 are *Geochimica Et Cosmochimica Acta* (IF 4.258) and *Precambrian Research* (IF



**Table 5: Preferred Journals**

Sl. No.	Title of the Journal	No. of Articles	Percentage of articles %	Total Times Cited	Avg. Citations per item	Impact Factor (JCR 2018 )
1	Journal of the Geological Society of India	154	10.53	626	4.06	0.994
2	Current Science	99	6.77	361	3.65	0.756
3	Journal of Asian Earth Sciences	79	5.4	833	10.54	2.762
4	Journal of Earth System Science	52	3.55	235	4.52	1.104
5	Environmental Earth Sciences	47	3.21	606	12.89	1.871
6	Tectonophysics	44	3	528	12	2.764
7	Bulletin of the Seismological Society of America	42	2.87	368	8.76	2.289
8	Arabian Journal of Geosciences	41	2.8	277	6.76	1.141
9	Geophysical Journal International	40	2.73	481	12.03	2.777
10	Precambrian Research	35	2.39	772	22.06	3.834
11	Geochimica Et Cosmochimica Acta	30	2.05	96	3.2	4.258
12	Journal of Geophysical Research Solid Earth	27	1.84	370	13.7	3.585
13	Marine and Petroleum Geology	26	1.77	396	15.23	3.538
14	Natural Hazards	26	1.77	110	4.23	2.319
15	Pure and Applied Geophysics	26	1.77	129	4.96	1.466

3.834) from the study period 2010-2019. The data is well depicted in table 5.

### Most Productive Research Areas

The CSIR-NGRI focuses the research in highly complex structure of Earth system and its

interlinked subsystems. The table 6 shows the top highly productivity subjects in the field of Earth Sciences, which are contributing major publications role during the period 2010-2019. It is observed that the highest number i.e. 725 of articles from the subject Geology at the

**Table: 6 Most Productive Research Areas**

Rank	Research Areas	No. of Publications (%)	Sum of times Cited	Avg. citations per item
1	Geology	725 (49.58)	7280	10.04
2	Geochemistry geophysics	412 (28.18)	4255	10.33
3	Science technology other topics	173 (11.83)	1094	6.32
4	Water resources	139 (9.05)	17741	12.53
5	Environmental sciences ecology	104 (7.11)	1425	13.7

percentage of 49.58 %, followed by Geochemistry, Geophysics contributing to 412 articles at 28.18 %.

### Impact Factors of Journals

The study observes and examines the Impact factors of published Journals and Articles. The CSIR-NGRI has published overall 1465 publications (including of articles, Proc.papers, meeting abstracts, reviews, etc.) during the study period 2010-2019. The CSIR-NGRI having the major contribution as Journal publications. The

total of 1436 articles were published in 234 Science Citation Index journals (SCI) during the period and having the Impact Factors  $e^{-0}$  d $^{-1}$  to  $e^{-43}$  (Calculated from Journals Citation Report 13 (JCR-2019 released by Clarivate Analytics, WoS). The study observes a maximum of 417 articles (29.03 %) which have been published in 63 national and international journals with an Impact Factor range of  $e^{-2}$  d $^{-3}$ , followed by 366 articles (25.48%) with an impact factor of journals  $e^{-1}$  d $^{-2}$ . The study reveals that majority CSIR-NGRI Researchers are interested in

**Table 7: Impact Factors of Journals (JCR-2019)**

IF Range (JCR 2018)	Total Journals	%	Total Articles	%
0 - 1	34	14.52	312	21.72
1 - 2	62	26.49	366	25.48
<b>2 - 3</b>	<b>63</b>	<b>26.92</b>	<b>417</b>	<b>29.03</b>
3 - 4	39	16.66	185	12.88
4 - 5	17	7.26	108	7.52
5 - 6	6	2.56	12	0.83
6 - 7	3	1.28	22	1.53
7 - 8	2	0.85	2	0.14
8 - 9	1	0.42	1	0.07
9 - 10	2	0.85	3	0.2
10 - 11	2	0.85	4	0.27
11 - 12	1	0.42	1	0.07
12 - 13	0	0	0	0
13 - 14	0	0	0	0
14 - 15	1	0.42	2	0.14
<b>43</b>	<b>1</b>	<b>0.42</b>	<b>1</b>	<b>0.07</b>
	<b>234</b>	<b>100.00</b>	<b>1436</b>	<b>100.00</b>

publishing their articles in e" 0 d" 5 IF Journals. It is also observed that the CSIR-NGRI contributed an article in *NATURE* Journal published in 2015, which is having the highest IF 43.07. The table 7 and figure 2 shows the overall IF range publications output of CSIR-NGRI.

### Citations Analysis

The table 8 highlights the CSIR-NGRI citations report during the period of 2010-2019. A total of 1465 publications are published, and the total sum of citations are 14,563. The average citations per article are 10.06, and the h-index of CSIR-NGRI research publications are 47.

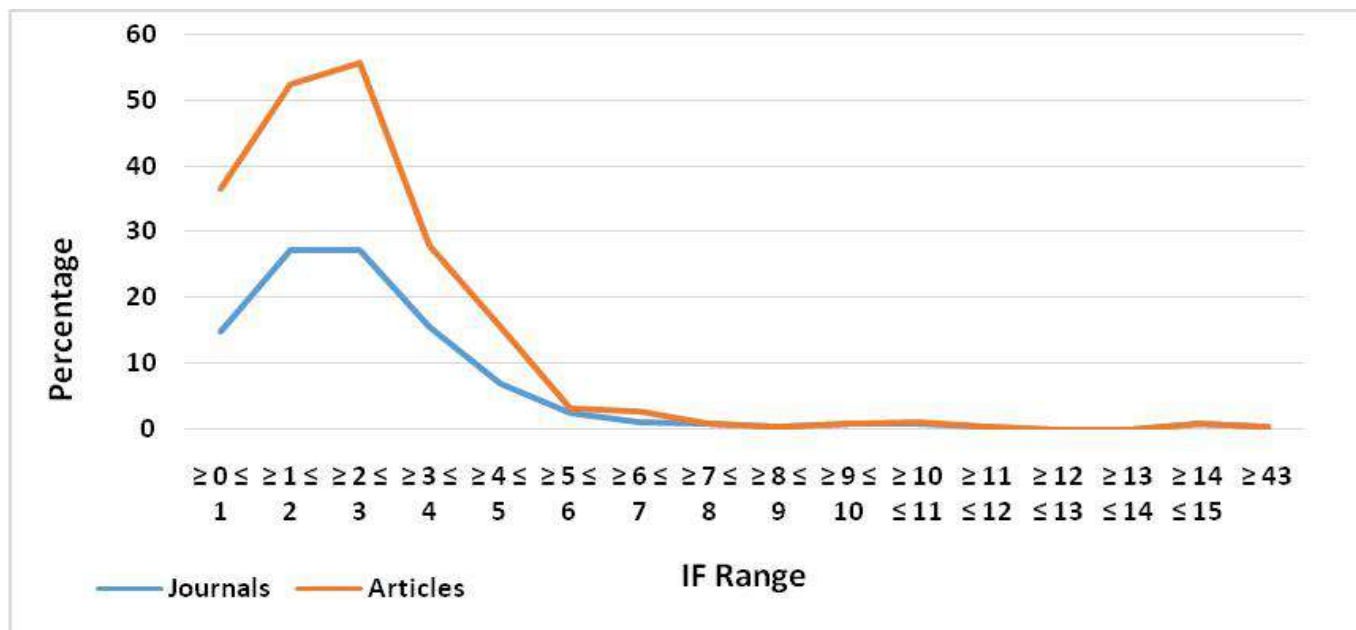


Figure 2: Impact Factor of Journals (JCR-2019)

Table 8: Citation Report (as on 26-02-2020)

Sl. No.	Citations details	Total
1	Total Publications during 2010-2019 (Articles, Proc. Papers, meeting abstracts, reviews etc.)	1465
2	Total Citations	14735
3	without self-citations	11761
4	Citing documents	8720
5	Citing articles without self citations	7828
6	Average Citations per item	10.06
7	<i>h-index</i>	47

**Table 9: Top Five Highly Cited Articles**

Sl. No.	Title	Authors	Source Title	IF 2018	Pub. Year	Tot. Citations	Avg. citations per Year (2010-2019)
1	The boundary between the Indian and Asian tectonic plates below Tibet	Zhao, Junmeng; Yuan, Xiaohui; Liu, Hongbing; Kumar, Prakash; Pei, Shunping; Kind, Rainer; Zhang, Zhongjie; Teng, Jiwen; Ding, Lin; Gao, Xing; Xu, Qiang; Wang, Wei	Proceedings of The National Academy of Sciences of the United States of America	9.58	2010	206	18.73
2	Assessment of heavy metal contamination in soils at Jajmau (Kanpur) and Unnao industrial areas of the Ganga Plain, Uttar Pradesh, India	Gowd, S. Srinivasa; Reddy, M. Ramakrishna; Govil, P. K.	Journal of Hazardous Materials	7.65	2010	201	18.27
3	Determining the interaction between groundwater and saline water through groundwater major ions chemistry	Mondal, N. C.; Singh, V. P.; Singh, V. S.; Saxena, V. K.	Journal of Hydrology	4.405	2010	128	11.64
4	Tibetan plate overriding the Asian plate in central and northern Tibet	Zhao, Wenjin; Kumar, Prakash; Mechie, James; Kind, Rainer; Meissner, Rolf; Wu, Zhenhan; Shi, Danian; Su, Heping; Xue, Guangqi; Karplus, Marianne; Tilmann, Frederik	Nature Geoscience	14.48	2011	122	12.2
5	An exotic Mesoarchean microcontinent: The Coorg Block, southern India	Santosh, M.; Yang, Qiong-Yan; Shaji, E.; Tsunogae, T.; Mohan, M. Ram; Satyanarayanan, M.	Gondwana Research	6.478	2015	110	18.33

## DISCUSSIONS AND CONCLUSION

The study reflects that CSIR-NGRI is one of the premier Institutes at the global in the field of Earth Sciences. The study found some of the significant insights. The average of above one paper per scientist is publishing an article per year due to the scientific strength is decreasing year by year and it is clearly reflecting on the growth of publications and as well as in the annual growth

rate. The International collaboration of articles are increasing year by year, which clearly indicates that the scientific community sharing their research work and views among their group and generating the research output by the group of author publications. It is observed that most of the researchers interested to publishing the papers at the national level due to their intend to publish as early, which creates their profile at low level, and lacking their research to fill the gaps of the

earlier studies. It is also observed that most of the research articles are publishing e” 0 d” 5 Impact Factor Journals, which need to be more focused to publish high impact factor journals at the international level of publishing.

### ACKNOWLEDGEMENTS

Our sincere thanks to the Director, CSIR-NGRI, Hyderabad for giving an opportunity to publish a paper in Library and Information Science journal apart from the regular scientific publications.

### REFERENCES

1. Beaie, S. T., & Acol, P. (2009). *Population and demographic measures: Concepts and definitions for basic MDG indicators*. Kingston Georgetown, Guyana: Bureau of Statistics.
2. CSIR-National Geophysical Research Institute. Retrieved February, 20, 2020 from <https://www.ngri.org.in/>
3. Garg, K. C., Kumar, S., & Lal, K. (2006). Scientometric profile of Indian agricultural research as seen through Science Citation Index Expanded. *Scientometrics*, 68(1), 151-166. [https://www.rapidtables.com/calc/math/Log\\_Calculator.html](https://www.rapidtables.com/calc/math/Log_Calculator.html)
4. Ivancheva, L. (2008). Scientometrics today: A methodological overview. *COLLNET Journal of Scientometrics and Information Management*, 2(2), 47-56.
5. Jeyshankar, R. (2015). Research productivity of the scientists of Indira Gandhi Centre for Atomic Research (IGCAR) Kalpakkam (Chennai): A scientometric analysis. *Library Philosophy and Practice*.
6. Journals Citations Report. Retrieved February 23, 2020 from [https://www.researchgate.net/publication/334443103\\_Clarivate\\_Journals\\_with\\_Impact\\_Factors\\_2019](https://www.researchgate.net/publication/334443103_Clarivate_Journals_with_Impact_Factors_2019)
7. Kaliyaperumal, K. (2015). A scientometric analysis of mobile technology publications. *Scientometrics*, 105(2), 921-939.
8. Lee, C. (2003). A scientometric study of the research performance of the Institute of Molecular and Cell Biology in Singapore. *Scientometrics*, 56(1), 95-110.
9. logarithm Online calculator. Retrieved February 25, 2020 from
10. Mahapatra, M. (1985). On the validity of the theory of exponential growth of scientific literature. In Proceedings of the 15th IASLIC conference, Bangalore (pp. 61-70).
11. Pradhan, B., & Ramesh, D. B. (2018). Scientometric analysis of research publications of six Indian Institutes of Technology. *Annals of Library and Information Studies*, 65(1), 50-56.
12. Satish Kumar (2018). Scientometric study of Research productivity of ARIES, Nainital. *Library Philosophy and Practice*, 1-14.
13. Web of Science. Retrieved February 25, 2020 from <https://apps.webofknowledge.com/>

