

## FOREST MANAGEMENT RESEARCH IN INDIA: A SCIENTOMETRIC STUDY

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### ABSTRACT

*Forest management is a branch of forestry dealing with overall administrative, legal and social aspects. The study covers a scientometric analysis on publication of Forest management research papers in India during 1990-2016. This study revealed that 997 papers have been published on forest management on 336 journals from 71 countries. The maximum literature on this subject is published in the form of articles and reviews. The highest number of papers was published in 2014, i.e. 107. The other parameters studied include RGR, Doubling time, degree of collaboration, country-wise distribution of publications, core journals in the subject etc.*

**Keywords:** *Scientometrics, Bibliometrics, forest management, forest conservation.*

**Abbreviations:** *TLCS-Total Local Citation Score, TGCS-Total Global Citation Score, TCR-Total Cited Reference, TLCS/t – TLCS/time*

### 1. INTRODUCTION

The forest is a natural system that can supply products and services. The working of this system is influenced by the natural environment: climate, soil, topography etc, and also by human activity. The actions of humans in forests constitute forest management. Thus Forest Management is branch of Forestry concerned with overall administrative economics, legal and social aspects.

### 2. LITERATURE REVIEW

Kirti Joshi, Avinash Kshitij and K.C. Garg<sup>1</sup> examined the pattern of publication output, geographical distribution and highly cited papers of about 1 lakh publications of forest mycology from 1987-2008. Pacitasso, Marco<sup>2</sup> studied the temporal trends in the number of publications of forest health and tree diseases and the study revealed that there was a slow increase in the proportion of forest related papers. Garg et al<sup>3</sup>. (2014) analysed 32,574 papers published by USA, UK, China, India and Brazil in the field of

Management can be based on conservation, economics, or a mixture of the two. Some forests have been and are managed to obtain traditional forest products such as firewood, fiber for paper, and timber, with little thinking for other products and services. Nevertheless, as a result of the progression of environmental awareness, management of forests for multiple uses is becoming more common.

‘plant genetics and breeding’ research during 2005–2009 indicates that USA produced the highest number of publications followed by China. Anil Sagar, Basavaraj Shivappa, Karanam Bhanumurthy<sup>4</sup> (2013) attempts to highlight the growth and development of dark energy literature and studied the quantitative and qualitative assessment by way of analyzing various features of research output based on WoS, collected 5858 publications and analysed the exponential growth rate, degree of collaboration, key journals etc.

### 3. OBJECTIVES OF THE STUDY

1. To find out year wise publication of article in forest management.
2. To analyse the Relative Growth Rate and Doubling Time of publications.
3. To identify the authorship and collaboration pattern of authors.
4. To find out country wise distribution of article.
5. To find out most prolific authors and most productive institutions.

### 4. METHODOLOGY

The data for the study was retrieved from Web Of Science database. This analysis on Forest Management research is based on HistCite. Histcite is an analytical and visualization tool, it helps to identify highly productive and highly cited authors in any area of research, top and high impact journals, highly cited papers based on Local Citation Rate Scores (LCS)

and Global Citation Scores (GLS) etc. LCS is the number of times a paper is cited by other papers in the local collection, GCS is the number of times a paper is included in the collection cited in Web Of Science. The study period was 1990-2016. A total of the 997 records were downloaded and analysed.

### 5. RESULTS AND DISCUSSION

#### 5. 1. Year-wise distribution of documents

Table 1 shows the year wise distribution of documents published on forest management in India during the period 1990-2016. A total of 997 records were published during this period. The average number of publication produced by year was 38.35%.The highest number of publication is received during the year

2014 and lowest number of publication in 1991 with one publication. Chart 1 gives the year wise growth of publication on Forest Management. It can be clearly visualized from the chart that the growth of literature was very low in the years 1990-1992 and it was peaked in 2009, 2012 and 2014.

Table 1. Year-wise distribution of documents

Publication Year	Records	Percent	TLCS	TGCS
1990	2	0.2	0	1
1991	1	0.1	0	4
1992	3	0.3	3	24
1993	7	0.7	9	86
1994	9	0.9	9	60
1995	13	1.3	16	126
1996	13	1.3	22	317
1997	17	1.7	32	452
1998	17	1.7	25	428
1999	6	0.6	4	173
2000	19	1.9	38	374
2001	22	2.2	29	347
2002	24	2.4	33	500
2003	23	2.3	23	293
2004	34	3.4	55	576

2005	38	3.8	54	723
2006	31	3.1	32	581
2007	51	5.1	36	921
2008	48	4.8	45	579
2009	79	7.9	57	883
2010	68	6.8	72	1937
2011	73	7.3	33	488
2012	77	7.7	45	614
2013	75	7.5	17	417
2014	107	10.7	27	320
2015	74	7.4	8	74
2016	66	6.6	3	8

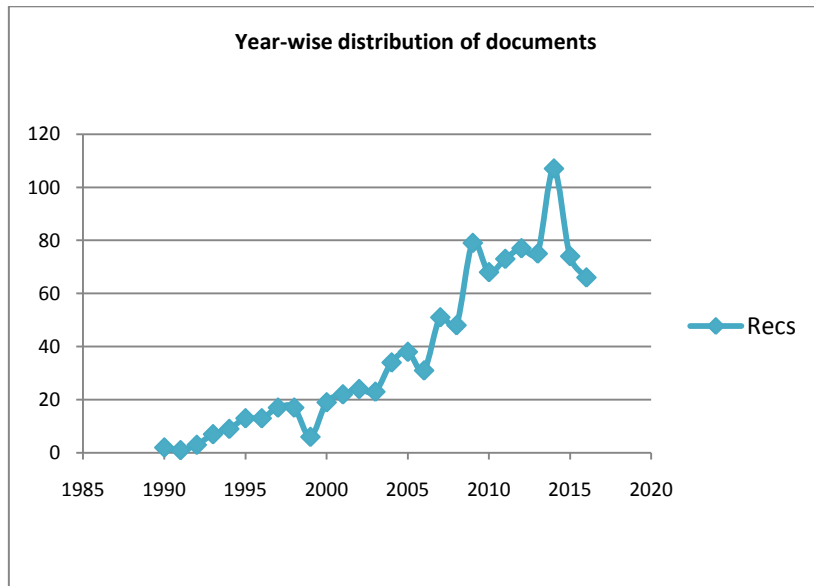


Fig.1. year-wise distribution of documents

**5.2 Relative Growth Rate and Doubling Time**

Relative Growth Rate is the increase in number of articles or pages per unit of time. The mean RGR over a period

of interval can be calculated from the following equation.

$$R(1-2) = \frac{W2-W1}{T2-T1}$$

Where, 1-2 is the mean relative growth rate over the specific period of interval. W1 is the log of initial number of articles; logW2 is the log of final number

of articles after a specific period of interval and T2-T1 is the unit difference between the initial time and the final time,

$$\text{Doubling Time (Dt)} = 0.693/R$$

Table 2 indicates the sequential distribution of RGR and Doubling Time of Forest Management research from 1990-2016.

Table 2. Relative growth rate and doubling time

Publication Year	Number of articles	cum	W1	W2	rgr	Dt
1990	2	2	0.000	0.693	0.693	1.000
1991	1	3	0.693	1.099	0.405	1.709
1992	3	6	1.099	1.792	0.693	1.000
1993	7	13	1.792	2.565	0.773	0.896
1994	9	22	2.565	3.091	0.526	1.317
1995	13	35	3.091	3.555	0.464	1.493
1996	13	48	3.555	3.871	0.316	2.194
1997	17	65	3.871	4.174	0.303	2.286
1998	17	82	4.174	4.407	0.232	2.983
1999	6	88	4.407	4.477	0.071	9.813
2000	19	107	4.477	4.673	0.195	3.545
2001	22	129	4.673	4.860	0.187	3.706
2002	24	153	4.860	5.030	0.171	4.062
2003	23	176	5.030	5.170	0.140	4.948
2004	34	210	5.170	5.347	0.177	3.924
2005	38	248	5.347	5.513	0.166	4.167
2006	31	279	5.513	5.631	0.118	5.884
2007	51	330	5.631	5.799	0.168	4.128
2008	48	378	5.799	5.935	0.136	5.103
2009	79	457	5.935	6.125	0.190	3.651
2010	68	525	6.125	6.263	0.139	4.996
2011	73	598	6.263	6.394	0.130	5.323
2012	77	675	6.394	6.515	0.121	5.722
2013	75	750	6.515	6.620	0.105	6.577
2014	107	857	6.620	6.753	0.133	5.196
2015	74	931	6.753	6.836	0.083	8.367
2016	66	997	6.836	6.905	0.068	10.118

It indicates that, the RGR is decreased from 0.693 to 0.068. Correspondingly, the DT of the publications gradually increased from 1 in 1990 to 10.118 in 2016.

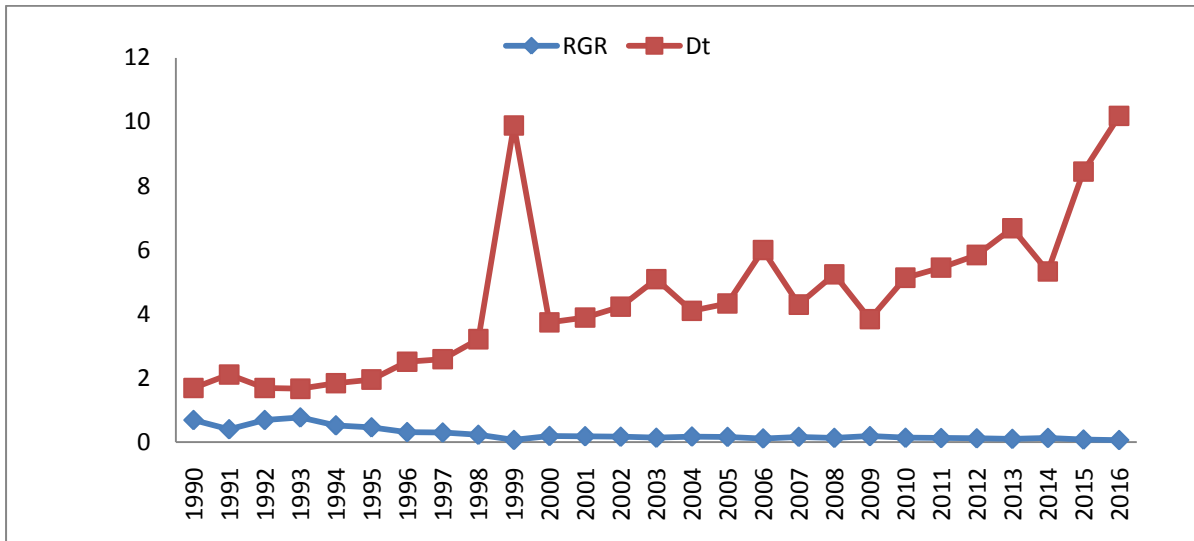


Figure 2. Relative Growth Rate and Doubling time for research output

**5.3 Country wise Publication**

In the present study there were 71 other countries collaborated with India. Out of which 15 countries have published more than 10 collaborative papers with India. Table 2 provides a list of top 20 collaborative countries. USA was the main

collaborating partner for India during 1995 to 2016 in Forest Management with 127 publications (TLCS 156, TGCS 3690) followed by UK with 52 publications (TLCS 46, TGCS 46) and Australia with 52 publications (TLCS 11, TGCS 1562).

Table 3. Country wise distribution of documents

Country	Records	Percent	TLCS	TGCS
India	958	96.1	686	10665
USA	127	12.7	156	3690
UK	52	5.2	46	1876
Australia	30	3	11	1562
Unknown	25	2.5	29	275
Germany	23	2.3	4	365
Canada	22	2.2	20	1447
Netherlands	20	2	19	1321
Peoples R China	16	1.6	8	379
Belgium	15	1.5	13	593
France	15	1.5	15	1288
Nepal	15	1.5	11	209
South Africa	15	1.5	11	1167
Switzerland	15	1.5	22	1234
Brazil	11	1.1	3	135
Japan	10	1	5	287
Italy	9	0.9	17	1268
Indonesia	8	0.8	8	271
Malaysia	8	0.8	7	262
Philippines	8	0.8	8	366

### 5.4 Type of Documents

Table 4 shows the document wise distribution of publication. It is observed that 89.5% (892) of the publication was in

the form of articles. 6.42% review (64) and 2.2% proceedings paper.

Table 4. Distribution of Publication by document type

Document Type	Records	TLCS	TGCS
Article	892	669	9169
Review	64	44	1525
Article; Proceedings Paper	22	8	332
Editorial Material	9	2	124
Book Review	3	0	0
Review; Book Chapter	3	3	141
Note	2	1	15
Correction	1	0	0
Meeting Abstract	1	0	0

### 5.5 Most Prolific Authors

Among the prominent authors of Forest management research in India, top 20 authors were listed in this table. Out of

which top 15 authors were published more than 10 papers during 1995-2016.

Table 5 Top 20 authors

Author	Records	TLCS	TLCS/t	TGCS	TGCS/t
Maikhuri RK	21	44	2.9	365	27.6
Nagendra H	20	53	6.95	608	82.48
Rao KS	20	55	3.34	438	30.44
Reddy CS	17	19	4.73	54	12.95
Saxena KG	17	50	3.02	353	24.29
Kumar A	15	2	0.37	54	10.59
Roy PS	15	10	0.76	136	15.93
Singh M	15	13	1.17	125	11.88
Ravindranath NH	14	10	1.35	44	10.32
Shaanker RU	13	21	2.75	102	18.39
Dadhwal VK	12	11	2.38	63	11.38
Jha CS	12	12	3.67	43	11.68
Joshi PK	12	5	0.6	136	23.92
Singh R	12	6	1.72	23	5.38
Hussain SA	11	17	1.67	310	37.94
Badola R	10	17	1.67	307	37.19
Kumar S	10	0	0	91	9.64
Raghubanshi AS	10	15	2.07	149	16.99

### Authorship Pattern

The authorship pattern in forest management research varies from solo research to collaborative research. Joint

authorship ranks first in the research output followed by single authored papers.

Table 6. author collaboration

No. of authors	No.of articles	% of articles
Single	123	12.34
Two	250	25.07
Three	218	21.86
Four	172	17.25
five <	233	23.37

### Degree of Collaboration

According to Subramanyam(1983) formula the degree of Collaboration is

$$C = \frac{Nm}{Nm+Ns}$$

Where C= Degree of Collaboration

Nm= number of multi-authored papers in the discipline

Ns = Number of single authored papers in the discipline

Here Nm = 874

Ns = 123

$$C = 874/123+874$$

$$=0.876$$

### 5.6 Top 20 journals

Table 6 lists the top 20 journals that have published the largest number of papers on Forest Management from India.

Current Science, Biological Conservation and Forest Ecology and Management are the top three journals.

Sl. No	Journal	Records	Percent	TLCS	TLCS/t	TGCS	TGCS/t
1	Current Science	76	7.6	61	6.21	560	52.72
2	Biological Conservation	23	2.3	38	5.38	361	53.78
3	Forest Ecology and Management	23	2.3	48	4.48	405	35.17
4	International Forestry Review	23	2.3	18	1.44	55	4.66
5	Biodiversity and Conservation	22	2.2	19	2.03	213	21.92
6	Environment Monitoring and Assessment	22	2.2	21	4.46	121	20.77
7	Tropical Ecology	21	2.1	12	3.62	71	16.72
8	Journal of the Indian Society of Remote Sensing	19	1.9	6	0.79	69	10.27
9	International journal of Sustainable Development and World Ecology	18	1.8	26	1.49	86	7.43
10	PLOS One	18	1.8	0	0.00	258	42.93
11	Environmental Management	17	1.7	10	1.03	108	12.32
12	Forest Policy and Economics	17	1.7	14	1.75	134	15.80
13	Indian Journal of Traditional Knowledge	16	1.6	3	0.43	34	4.46
14	Research and Development	14	1.4	11	0.80	126	9.15
15	Agriculture Ecosystems & Environment	13	1.3	18	1.36	291	23.02
16	Environmental Conservation	13	1.3	34	2.82	233	19.75

17	Agroforestry Systems	12	1.2	24	1.74	214	17.20
18	Journal of Environmental Management	12	1.2	5	0.44	129	16.46
19	Journal of Forstry Research	11	1.1	0	0.00	11	3.08
20	AMBIO	10	1.0	20	1.09	146	8.35

Table 7. top 20 journals

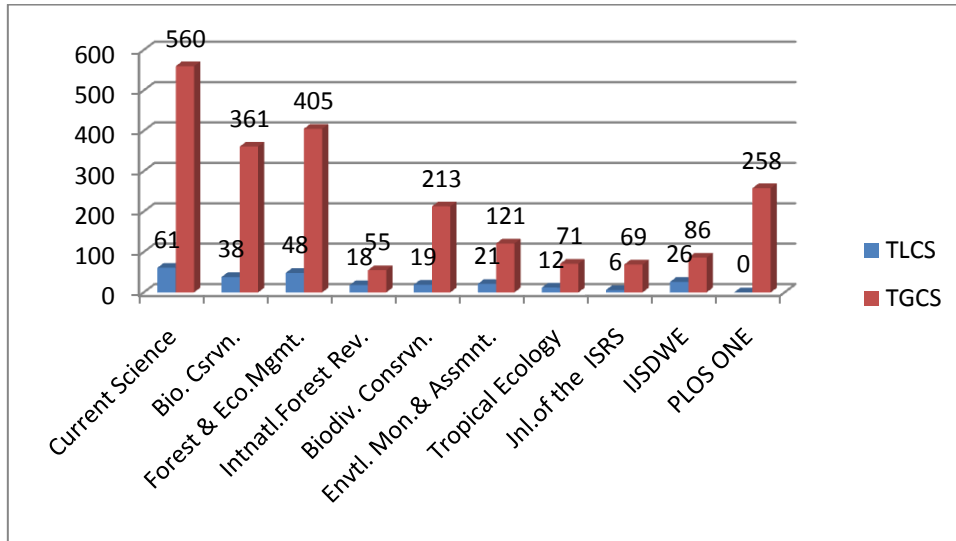


Fig.3.Top 10 journals Vs TLCS and TGCS

**5.7 Top 20 Institutions**

Table 7 lists the prolific institutions working on Forest Management Research in India arranged in descending order of number of papers published. Two institutions based on Uttarakhand, viz. Wildlife Institute India and G.B. Pant

Institute of Himalayan Environment & Development are the leading Indian Institutions in Forest Management Research. The top three institutions have each published 50 or above papers during this period.

Table 7. Most prolific institutions in forest management

Institution	Records	Percent	TLCS	TGCS
Wildlife Institute of India	58	5.8	65	694
GB Pant Institute of Himalayan Environment&Development	56	5.6	88	721
Indian Institute of Science	50	5	34	785
Ashoka Trust Research Ecology&Environment	40	4	65	585
Indian Institute of Technology	35	3.5	8	218
Jawaharlal Nehru University	28	2.8	57	636
Banaras Hindu University	22	2.2	21	334
University of Delhi	22	2.2	15	329
Indian Institute of Forest Management	20	2	17	102
National Remote Sensing Agency	20	2	21	173
Pondicherry University	20	2	16	141
Kerala Forest Research Institute	17	1.7	9	89
National Conservation Federation	17	1.7	16	213



Salim Ali Centre for Ornithology& Natural History	16	1.6	11	70
Indiana University	15	1.5	45	488
HNB Garhwal University	14	1.4	12	126
ATREE	13	1.3	27	283
Indian Institute of Remote Sensing	13	1.3	11	126

**5.8 Cited Reference wise publication**

The below table shows the list of most cited literature in the field of Forest Management. Champion, H.G. came on

the first position, ie 86 times his article cited by others.

Cited References	Records	Percent
Champion H.G., 1968, REVISED SURVEY FOREST	86	8.6
Myers N, 2000, NATURE, V403, P853, DOI 10.1038/35002501	51	5.1
Walkley A, 1934, SOIL SCI, V37, P29, DOI 10.1097/00010694-193401000-00003	26	2.6
Ostrom E., 1990, GOVERNING COMMONS EV	21	2.1
Menon S, 1997, CURR SCI INDIA, V73, P134	20	2
Batjes NH, 1996, EUR J SOIL SCI, V47, P151, DOI 10.1111/j.1365-2389.1996.tb01386.x	19	1.9
Jha CS, 2000, CURR SCI INDIA, V79, P231	19	1.9
SINGH JS, 1984, AMBIO, V13, P80	19	1.9
Anderson J. M., 1993, TROPICAL SOIL BIOL F	18	1.8
SIMPSON EH, 1949, NATURE, V163, P688, DOI 10.1038/163688a0	18	1.8

**6. CONCLUSION**

This study explores the characteristics of forest management research in India during 1990-2016 based on the Web of Science database. This study evidenced that the highest number of publications is in the year 2014 with 107 records having a Global citation score of 320 and Local citation score of 27. The RGR is decreased from 0.693 to 0.068 but Doubling Time of the publications gradually increased from 1 to 10.118.

Totally 71 countries collaborated with India among which USA tops the list with 127 publications. Top institutions include Wildlife Institute of India and G.B. Pant Institute of Himalayan Environment & Development. These institutions published 50 or above papers during the period. The findings of the present study will be beneficial to the researchers of forest management and forest related subjects.

**7. REFERENCE**

- 1) Kirti Joshi, Avinash Kshitij and Garg, K.C, "Scientometric Profile of global fungal research", Annals of Library and Information Studies, vol. 5,130-139.
- 2) Pacittaso, Mario, "Scientometrics of Forest and tree diseases: An Overview", Forests, 7(1),3390.
- 3) Garg , K.C.etal," Plant genetics and breeding research: Scientometric profile of selected countries with special reference to India ", Annals of Library and Information Studies, vol. 58,184-197 .
- 4) Anil Sagar, Basavaraj Shivappa, Karnam Bhanumurthy, "Darl energy: a Scientometric mapping of publications", Journal of Scientometric Research, 2(1), 15-29.