

Research and Development of Soil Science in India: A Quantitative Study

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Abstract - *This study analyses the Research and development of soil science in India. The data collected from CAB Direct Online Databases for the recent years (2004-2014). The total of 8565 records retrieved were analysed using excel worksheets. During the study period the publications were steadily increased except the year 2006 and 2013. Most of the Indian soil science research scientist were used to publish their research papers in journal articles only with 94% of total publication. "Indian Journal of Agricultural Sciences" was the top most preferred journal for publication of soil science research in India. "Kumar, A" has top most contributed author with 161 articles. The Karnataka state is the top most producer of soil science research papers in India with 1059 papers in the study period.*

Keywords: Soil Science, CABICODE, year wise distribution, preferred journal,

1. INTRODUCTION:

The significance of soil is best explained by describing its function in three ways. First, soil serves ecological functions that support life on earth, including supporting plant growth, recycling and storing carbon and nutrients, and purifying air and water. These functions are often served through interactions between the earth's crust, soil, and atmosphere. Second, soil supplies anchorage, water, and nutrients to the plant and oxygen to roots. Soil answers these plant needs because it is a three-phase matrix of solid particles with water and air in the pores between the particles. When the soil is healthy, roots can explore these pores to find the water and nutrients needed by the plant. Third, people inhabit the soil surface and have both agricultural and non-agricultural uses for soil. Agricultural uses include the production of food, fiber, timber and ornamental plants. Engineering and non-agricultural uses include recreation, building or foundations and roadbeds, and waste disposal. Soil also provides a source of building material. Properties suitable for engineering uses, such as a low shrink-swell potentials often differ from those needed for agriculture.²

There is a renewed interest in both soil and soil related research due to the urgency of 21st century challenges, including climate change, land-use change, agricultural production, food security, environmental protection, ecosystem services, and energy production. This increased interest in soil science research reflects broadening of the classical agricultural focus to multi-disciplinary approach towards global environmental and societal challenges. Sustaining these emerging interests requires further advancement in inter-disciplinary (among various soil science disciplines) and trans-disciplinary (among disciplines outside of soil science) research collaboration, with emphasis on addressing key research needs. To have outcomes relative to priority needs of the 21st century, the existing model of conducting research within specific disciplinary boundaries should give way to research efforts focused on strategic and priority societal needs.³

2. LITERATURE REVIEW:

Tripathia⁴ et al. (2015) have carried out scientometric analysis of the crop science research performed in India 1965-2010 with a gap of five years is the first study where data by crops has been analyzed. The analysis indicates that highest number of papers (43.80%) was published on rice, followed by wheat (24.28%). Agricultural universities and institutions under aegis of Indian Council of Agricultural Research (ICAR) were most productive. The study has identified most active institutions engaged in agricultural research, areas of research in crop science, journals used for communication and the impact of the crop science research output. Anil Sagar⁵ et al.(2014) studied the growth of Agriculture output, its distribution in different domains, communication pattern of Indian Agriculture scientists, citation pattern of the research output, highly productive institutions, activity profile and the impact of their research output as seen through citations as per web of science during 1993-2012 . Nabi Hasan and Sewa Singh⁶ (2007) have studied mapping of literature of a discipline over a period of time depicts the changes in the cognitive structure and composition of the discipline. For this study, the authors identified all the publications on Himachal Pradesh, indexed in the CD-ROM edition of AGRICOLA, AGRIS, CAB and FSTA databases. The databases were searched for records, published on discipline for the year 1990-1994, using Boolean operator “OR . Arunachalam⁷ (1998) has studied 51761 Indian agriculture publications from 1990-1994. Plants of economic importance was the leading area of research in India. In his macroscopic study on agricultural research in India, he identified all papers from India indexed in the CD-ROM edition of CAB Abstracts 1992, which uses SPIRS, the proprietary software of SilverPlatter.

3. OBJECTIVES:

The main objectives of this study is to analyze the research and development of Indian Soil science research, as reflected in its publications output during 2004-2014.

- To Identify the total number of publications on Soil Science research during 2004-2014.
- To examine the growth pattern of soil science literature.
- To study the preferred type of communication by soil scientist.
- To find out the top most source journal for communication.
- To know the highly contributed author in soil science research.
- To identify the most productive states in India.

4. METHODOLOGY:

This study is based on the Indian research and development of soil science retrieved from the CAB Direct Online Databases for the recent years (2004-2014). The search strategy/keywords used to retrieve the data on soil science are “Soil”, “Soil Science”.The total of 8565 records retrieved were analysed using excel worksheets.

5. ANALYSIS:

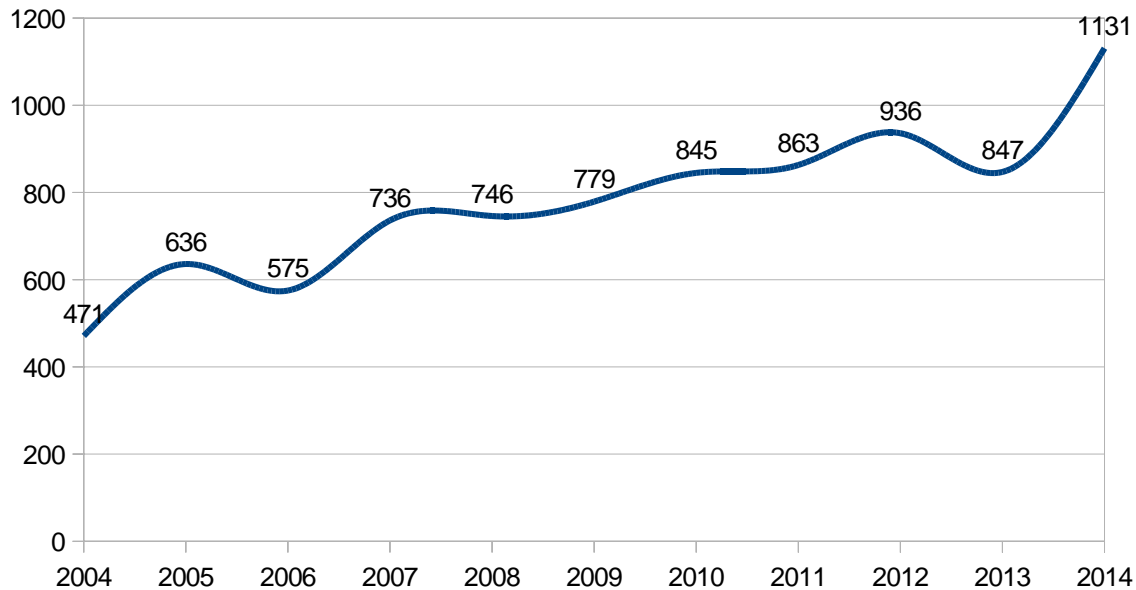
5.1 Year-wise distribution of Publications:

The total of 8565 research publications was published in the field of soil science retrieved from CAB Direct Online database during the period 2004-2014. The highest number of 1131 papers with (13.4%) were published in the year 2014. Followed by 10.9% with (936) papers were published in 2012. During the study period the publications were steadily increased except the year 2006 and 2013. The Lowest number of publication were 471 in the period of 2004. The growth of soil science research publication during the period 2004-2014 is illustrated in figure.1.

Table-1 Indian research publication on soil science distributed by year as seen from CAB Directory 2004-2014

S. No	Publication Year	Number of papers	Percentage
1	2004	471	5.5
2	2005	636	7.4
3	2006	575	6.7
4	2007	736	8.6
5	2008	746	8.7
6	2009	779	9.1
7	2010	845	9.8
8	2011	863	10.1
9	2012	936	10.9
10	2013	847	9.8
11	2014	1131	13.4
	Total	8565	100

Fig.-1 Indian research publication on soil science distributed by year



5.2. preferred type of communication

Table-2 preferred type of communication

S. No	Document type	Distribution	Percentage
1	Journal article	8051	94
2	Conference proceedings	331	3.8
3	Book Chapter	132	1.58
4	Correspondence	39	0.49
5	Bulletin	7	0.08
6	Annual report	3	0.03
7	Miscellaneous	2	0.02
Total		8565	100

Journal articles, conference publications, books chapter, Bulletin, reports etc., published in the period from 2004-2014 have been considered for the study. The total of 8565 research publications which have been analysed. Most of the Indian soil science research scientist were used to publish their research papers in journal articles only with 94% of total publication. indicating that these are the main mode for scientific communication in soil science. Followed by 3.8% of scientist published their research in conference proceedings. 1.58 % of the soil scientist published in the book chapter. Proceeding papers and book chapters were two other important modes to publish their research.

5.3. List of preferred journals

Table 3-List of journals used to publish research work

S. No	Source Title	No. of articles
1	Indian Journal of Agricultural Sciences	678
2	Asian Journal of Soil Science	436
3	Karnataka Journal of Agricultural Sciences	425
4	International Journal of Agricultural Sciences	388
5	Current Science	347
6	Journal of the Indian Society of Soil Science	335
7	Advances in Plant Sciences	249
8	Mysore Journal of Agricultural Sciences	216
9	Journal of Crop and Weed	194
10	Trends in Biosciences	180
	Total	

The above table shows that 'Indian Journal of Agricultural Sciences' is the top most preferred journal by the researchers in the field of soil science which was published 678 papers. Followed by 'Asian journal of Soil Science' second place with 436 papers published. 'Karnataka journal of Agricultural Sciences' Third place with 425 research papers published.

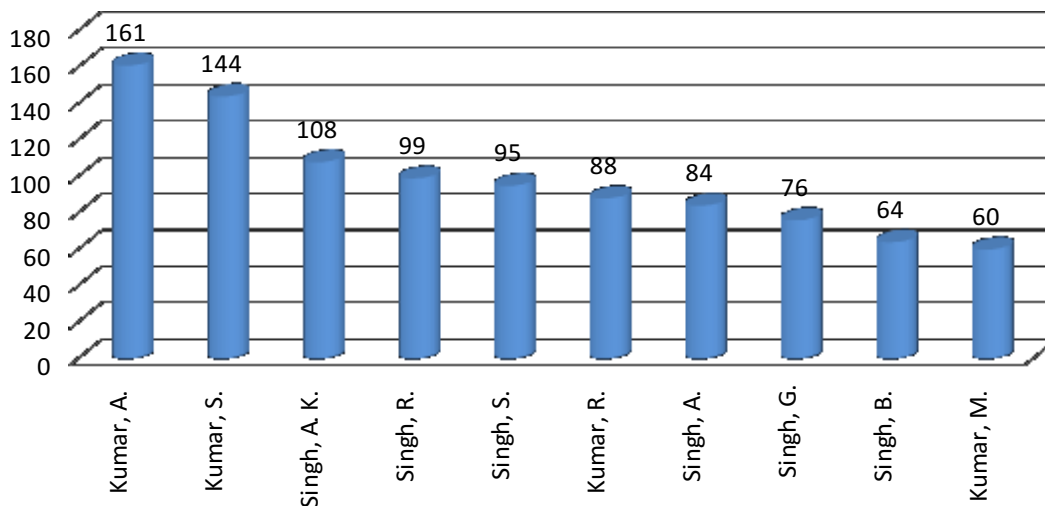
5.4. Top most contributed authors

Table-4 Highly contributed author

S. No	Author	No. of contribution
1	Kumar, A.	161
2	Kumar, S.	144
3	Singh, A. K.	108
4	Singh, R.	99
5	Singh, S.	95
6	Kumar, R.	88
7	Singh, A.	84
8	Singh, G.	76
9	Singh, B.	64
10	Kumar, M.	60

The table-4 shows that top 10 highly contributed researchers in Indian soil science Kumar, A has top most contributed author with 161 articles. Kumar, S. was second most contributed researcher with 144 articles. Followed by Singh, A.K third level contributed 108 articles. Figure. 2 shows highly contributed authors.

Fig-2 Highly contributed authors in soil science during 2004-2014



5.5.LIST OF SUBJECTS

The CAB has come out with CABICODE to indicate the broad subject areas within which the record fall, and consist of five characters; two identical alphabetic characters and three digits. CABICODES enable searchers to locate general subject categories which are not easy to retrieve using descriptors alone, and save time and money by helping them to exclude irrelevant information from their searches. The top 10 CABICODES in this study covered are listed table-5. This indicates the priority area of research undertaken by the Indian scientists on soil science research. In this study topmost priority area in research is “Plant production” with 4143 contributions. Followed by “Field Crops” research is 3525.

Table 5- Specific area wise distribution of research publications

CABI CODE	Subject Code	No. of contribution
FF100	Plant Production	4143
FF005	Field Crops,	3525
JJ700	Fertilizers and other Amendments	3073
JJ200	Soil Chemistry and Mineralogy	2280
FF003	Horticultural Crops, (New March 2000)	1905
JJ100	Soil Biology	1869
JJ800	Soil Water Management (Irrigation and Drainage), (Revised June 2002)	1365
JJ600	Soil Fertility	1325
JJ300	Soil Physics	1220
PP200	Water Resources	1207

5.6.MOST PRODUCTIVE STATES

Table-6 State wise distribution of publication

S. No	Geography Wise Distribution	No. of contribution
1	Karnataka	1059
2	Tamil Nadu	742
3	Uttar Pradesh	719
4	Maharashtra	550
5	West Bengal	538
6	Gujarat	372
7	Rajasthan	363
8	Andhra Pradesh	350
9	Punjab	276
10	Haryana	261

The above table -6 shows that Karnataka is the topmost producer of soil science research papers in India with 1059 papers. Followed by Tamilnadu contributed 742 papers. Uttar Pradesh is the third place with 719 papers. The top 10 states contributed papers are arranged based on the number of papers contributed.

6. FINDINGS

Indian research publication on soil science retrieved from the CAB Direct Online Databases for the recent 11 years (2004-2014) in which the highest number of 1131 papers with (13.4%) were published in the year 2014.

1. The total of 8565 research publications which have been analysed . The 94% of Indian soil science research scientist were used to publish their research papers in ‘Journal articles’ only.
2. 3.8% of total publications scientist published their research in ‘Conference proceedings’ which is the second most mode of communication in their research.
3. The 'Indian Journal of Agricultural Sciences' is the top most preferred journal by the researchers in the field of soil science which was published 678 papers.
4. The highly contributed researchers in Indian soil science was “Kumar,A.” In which he is the top most contributed author with 161 articles.
5. In this study topmost priority area in research is ‘Plant production’ with 4143 contributions. Followed by ‘Field crops’ with 3525 contributions.
6. The Karnadaka state was the top most producer of soil science research papers in India with 1059 papers. Followed by Tamilnadu contributed 742 papers.

7. CONCLUSION:

Soil Science has thrived because of inter-disciplinary co-operation and shown how soils frequently play roles as the keystone of environmental systems, both natural and managed, and contributed significantly to local, regional and global environmental management. In the future soil science will play a major role in addressing the complex nature of land use, climate change impacts on soils and agriculture, environmental, and biodiversity challenges. The study has identified most of the researchers were used the journals for research communication. The most preferred areas of the scientist was 'Plant production'. Karnataka state was the major producer of research output on soil science in India.

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