

SCIENTOMETRIC SKETCH OF INDIAN AGRICULTURE LITERATURE

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Abstract: - *The article explores the pattern of national and international collaboration of India in the field of Agriculture. Data was taken from Web of Science database by online search. The present study is concentrated on Indian Agricultural literature produced during a period of 15 years i.e. 2001-2015. More than four authored papers were 41.79% out of the total contribution. The collaboration pattern of contributions at national level is 63.10% whereas only 36.90% was at the international level. 54.26% of papers were the result of collaboration with Italy, followed by Netherlands with 29.37%. The countries like Germany, Israel, England, Canada, Australia, Mexico, Austria, Japan etc. had lesser collaboration with India. Agriculture is the most productive area with 30.42% papers, followed by Computer Science with 16.76% papers. Majority of articles 6.23% published in the journal Indian Journal of Animal Sciences, then 4.52% of articles in Indian Journal of Agricultural Sciences, followed by Current Science journal with 2.74%, Indian Veterinary Journal with 2.34% and Indian Journal of Horticulture with 2.27%. Most cited journal in the field of agricultural was Official Methods of Analysis with 59 cited articles.*

Keywords : Agriculture, Collaboration, Scientific collaboration, India, Scientometrics

1. Introduction

Agriculture has been playing an important role in the development of India. It is considered as the backbone of Indian financial system. In the old era, through proper planning strategies put forwarded by ancient rulers the sector agriculture took a better position in socio-economic field. The research and development activities in

agriculture paved a new dimension for the development. One of the important developments green revolution resulted food self-sufficiency and rural welfare. In the area of agricultural research India collaborating with developed countries USA, UK, Australia, Canada, Japan, European countries. It helps in developing and strengthening the agricultural research in India. The

international agencies FAO, UNDP, UNESCO, World Bank acts as funding agencies. The International Agricultural Research centers under the consultative group on International Agricultural Research (CGIR) System contributed a major share to agricultural research in India. (Borthakur and Singh, 2012). The present study analyzing the literature output in the field of agriculture during 2001-2015 produced by India.

2. Web of Science

Web of Science is an online scientific citation indexing service provided by Thomson Reuters. It gives access to multiple databases. Web of Science provides a single destination to access the most reliable, integrated, multidisciplinary research. It contains data from 1900 to present and updates weekly (Web of science, 2018). Now it is managed by Clarivate Analytics.

3. Review of Literature

Gomathi and Rubinandhini (2017) carried out a bibliometric analysis on the Alzheimer's research output. The web of science database was sourced for data during 2006 to 2015. A total of 1257 records were retrieved and analyzed growth literature, relative growth rate, exponential growth rate, authorship pattern, language, type of documents etc. The study disclosed that average growth rate had a positive value and an increasing trend for the coming years. Jeyasekar and Saravanan (2014) conducted a scientometric study on forensic science literature from the year 1975

to 2011. The growth of literature, authors' productivity, the top ranking source journal and the country-wise productivity were analyzed. The SCOPUS database was used for obtaining data. The 13626 number of results were retrieved. FBI Laboratory is the only forensic science laboratory in the top ten affiliating institutions.

Tripathi and Garg (2014) analyzed the scientific output of India in the discipline of crop sciences as reflected in SCOPUS, CAB Abstracts and ISA databases during 2008-2010. The analysis revealed that highest numbers of papers were published on rice and wheat crop. Diaz and Sanchez (2012) carried out an analysis to find out the Cuban agricultural science output, impact and performance of Cuban authors dedicated to research in the agricultural sector during the period 2005-2009 in the SCOPUS database. It is shown that the most productive researchers agree with the most cited. Sharma (2009) evaluated a total of 2603 research articles published by the scientists of CPRI during 1991 to 2007. Majority of the scientists preferred to publish research papers in joint authorship (82.67%) having 0.82 degree of collaboration. There was no uniform pattern of literature growth.

4. Objectives of the study

The objectives of the study are:

- ❖ To identify the prominent areas of research in Agriculture.
- ❖ To identify national and international collaboration.
- ❖ To determine the authorship pattern of publications

- ❖ To find out the degree of collaboration of publications.
- ❖ To identify the most productive journals having the papers related to Agriculture.
- ❖ To find out the cited journals.

5. Data source and Methodology

Data was collected from Web of Science database by online search. The present study is concentrated on Agricultural literature contributed by India during a period of 15 years i.e. 2001-2015. A total of 3211 records were retrieved as Indian output. The data was entered into excel data sheet analyzed using scientometric techniques.

6. Data analysis and Interpretation

6.1 Collaboration Pattern

Table 1 depicts the collaboration pattern of contributions at national and international level. 63.10% was the national level collaboration of contributions whereas only 36.90% was the international level collaboration. The graphical representation of collaboration pattern is in the figure. 1.

Table 1. Collaboration Pattern

Collaboration Pattern	No. of papers	%
National Collaboration	2026	63.10
International Collaboration	1185	36.90

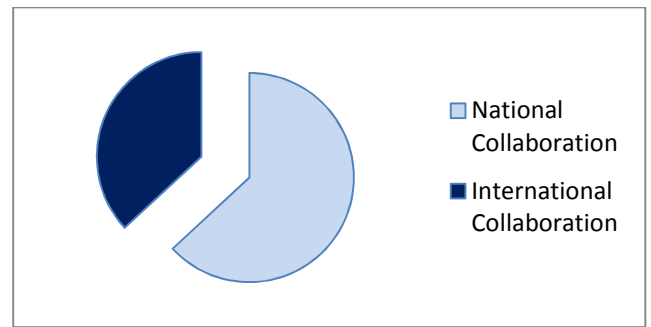


Figure.1 Collaboration Pattern

6.2 International Collaboration

Table 2 portrays the International Collaboration pattern of contributions from various countries. 54.26% of papers were the result of collaboration with Italy, followed by Netherlands with 29.37%, then 14.01% papers were the product of collaboration with USA and only 11.98% was the collaboration of France. The countries like Germany, Israel, England, Canada, Australia, Mexico, Austria, Japan etc had lesser collaboration with India.

Table 2. International Collaboration

Rank No.	Country	No. of Papers	%
1	Italy	643	54.26
2	Netherlands	348	29.37
3	USA	166	14.01
4	France	142	11.98
5	Germany	56	04.73
6	Israel	52	04.39
7	England	47	03.97

8	Canada	36	03.04
9	Australia	26	02.19
10	Mexico	25	02.11
11	Austria	25	02.11
12	Japan	23	01.94
13	Switzerland	22	01.86
14	Belgium	21	01.77
15	Spain	19	01.60

6.3 Authorship Pattern

Table 3. Authorship Pattern

Authorship Pattern	No. of Papers	%
Single author	191	5.95
Two authors	451	14.05
Three authors	641	19.96
Four authors	586	18.25
More than four authors	1342	41.79

Table 3 shows the authorship pattern of contributions. Out of 3211 papers, 5.95% were single authored followed by 14.05% of two authored papers, three authored papers were 19.96% and four authored papers were 18.25%. More than four authored papers were 41.79% of the total contribution. The authorship pattern is diagrammatically presented in figure.2.

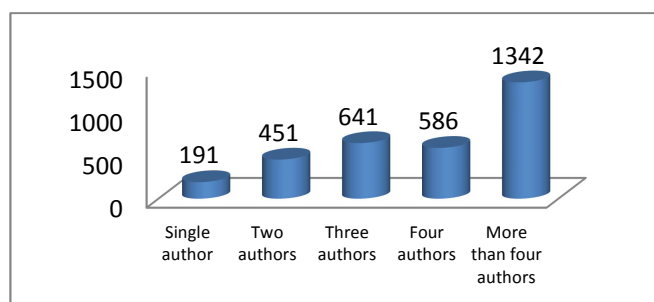


Figure.2 Authorship Pattern

6.4 Degree of collaboration in Agriculture Literature

K Subramanyam (1983) developed a formula to determine the degree of collaboration it is defined as the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a certain period of time. It is expressed as where;

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

Where C = degree of collaboration in a discipline.

Nm = number of multi-authored research papers in the discipline.

Ns = number of single authored research papers in the discipline.

In the present study

Nm = 1749, Ns = 92. Therefore $C = \frac{3020}{3020+191} = 0.94$

Thus degree of collaboration in Indian Agriculture literature is 0.94 which clearly points out that the dominance of multiple authorship patterns.

6.5 Areas of Research

Table 4. Major Research Areas

Research Area	No. of Papers	%
Agriculture	977	30.42
Computer Science	538	16.76
Plant Sciences	257	8.00
Veterinary Sciences	197	6.14
Engineering	177	5.51
Cardiovascular System & Cardiology	141	4.39

Science & Technology-Other Topics	138	4.30
Environmental Sciences & Ecology	115	3.58
Biotechnology & Applied Microbiology	110	3.43
Biochemistry & Molecular Biology	108	3.36
Food Science & Technology	96	2.99
Genetics & Heredity	89	2.77
Fisheries	84	2.65
Water Resources	70	2.18
Physics	67	2.09
Microbiology	60	1.87
Chemistry	57	1.78
Reproductive Biology	52	1.62
Oncology	48	1.50
Materials Science	39	1.22

Table 4 indicates that the majority of the studies (30.42%) carried out in the pure discipline “Agriculture” itself. The allied areas were Computer Science with 16.76% papers, then Plant Sciences with 8.00% and Veterinary Sciences with 6.14%. In the area of Engineering contains 5.51% papers, Cardiovascular System & Cardiology with 4.39%, Science & Technology-Other Topics with 4.30% and Environmental Sciences & Ecology with 3.58%. The research areas like Biotechnology & Applied Microbiology, Biochemistry & Molecular Biology, Fisheries, Water Resources, Physics, Microbiology, Materials Science, Reproductive

Biology, Oncology, Chemistry etc. had lesser productivity.

6.6 Journal-wise distribution

Table 5. Journal-wise distribution

Rank No.	Journal	No. of Papers	%
1	Indian Journal of Animal Sciences	200	6.23
2	Indian Journal of Agricultural Sciences	145	4.52
3	Current Science	88	2.74
4	Indian Veterinary Journal	75	2.34
5	Indian Journal of Horticulture	73	2.27
6	Indian Journal of Genetics And Plant Breeding	43	1.34
7	Journal of Food Science and Technology-Mysore	36	1.12
8	Tropical Animal Health and Production	33	1.03
9	Indian Journal of Traditional Knowledge	32	1.00
10	Journal of Environmental Biology	24	0.75
11	Journal of Agrometeorology	23	0.72
12	Circulation	22	0.69
13	Plos One	21	0.65
14	Scientia Horticulturae	18	0.56
15	Agricultural Water Management	18	0.56

Table 5 depicts the Journal-wise distribution; majority of articles 6.23% published in the journal Indian Journal of Animal Sciences, then 4.52% of articles in Indian Journal of Agricultural Sciences, followed by Current Science journal with 2.74%, Indian Veterinary Journal with 2.34% and Indian Journal of Horticulture with 2.27%. The journals like Indian Journal of Genetics and Plant Breeding, Journal of Food Science and Technology-Mysore, Tropical Animal Health and Production, Indian Journal of Traditional Knowledge, Journal of Environmental Biology etc. had very least number of papers.

6.7 Cited Journals

Table 6.Cited Journals

Cited Journal	No. of cited papers
Official Methods of Analysis	59
Indian Journal of Animal Sciences	27
Circulation	22
Current Science	17
New England Journal of Medicine	16
Aquaculture	16
Crop Science	16
Indian Journal of Agricultural Sciences	14
Science	13
Agronomy Journal	13
Journal of Animal Science	13
Journal Dairy Science	12
Therigenology	12
Applied and Environmental	12

Microbiology	
Theoretical and Applied Genetics	12

Most cited journal in the field of agricultural was Official Methods of Analysis with 59 cited articles , followed by Indian Journal of Animal Sciences with 27 cited articles , Circulation with 22 cited articles and Current Science with 17 cited articles (Table 6). The journals such as New England Journal of Medicine, Aquaculture and Crop Science had 16 cited articles. Indian Journal of Agricultural Sciences had 14 cited articles. The journals; Science, Agronomy Journal and Journal of Animal Science had 13 cited articles and the journals like Journal Dairy Science, Therigenology, Applied and Environmental Microbiology and Theoretical and Applied Genetics received citation for 12 articles only

7. Conclusion

More than four authored papers were 41.79% out of the total contribution. This shows the rapid increase in interdisciplinary and multidisciplinary areas of research in the field of Agriculture. The collaboration pattern of contributions at national level is 63.10% whereas only 36.90% was at the international level. 54.26% of papers were the result of collaboration with Italy, followed by Netherlands with 29.37%. The countries like Germany, Israel, England, Canada, Australia, Mexico, Austria, Japan etc. had lesser collaboration with India. %. The policy makers and planners in the field of agriculture should

concentrate on policy matters for enhancing international collaboration. Agriculture is the most productive area with 30.42% papers, followed by Computer Science with 16.76% papers, then Plant Sciences with 8.00% and Veterinary Sciences with 6.14%. In the area of Engineering contains 5.51% papers, Cardiovascular System & Cardiology with 4.39%, Science & Technology. The research areas like Biotechnology & Applied Microbiology, Biochemistry & Molecular Biology, Food Science & Technology Genetics & Heredity, Fisheries, Water Resources, Physics, Microbiology, Materials Science, Reproductive Biology, Oncology, Chemistry etc. had lesser productivity. Majority of articles 6.23% published in the journal Indian Journal of Animal Sciences, then 4.52% of articles in Indian Journal of Agricultural Sciences, followed by Current Science journal with 2.74%, Indian Veterinary Journal with 2.34% and Indian Journal of Horticulture with 2.27%. Most cited journal in the field of agricultural was Official Methods of Analysis with 59 cited articles, followed by Indian Journal of Animal Sciences with 27 cited articles.

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