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Research Trends of ICAR-IARI Scientists: A Scientometric Analysis

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Abstract

The purpose of the study is to analyze the research publication of the Indian Agricultural Research Institute published from 1989 to 2020. The study focuses on axes like publication growth, document type, country, journals, authors and trending topics. A total of 8764 publications visible through the Web of Science database as per January 2021 consider for the study. Bibexcel, Bibliometrix R-packages and MS Excel are the data analysis tools. The major findings show that Articles are the most published form of research works and the USA is the most collaborative country. Most of the top productive journals are Indian journals. The keyword identifies explore that most of the research works are going on wheat, and rice in IARI.

Keywords: Scientometric Study, Indian Agricultural Research Institute, Research Trends, Publication Growth, Collaborative Countries

Introduction

The Indian Council of Agricultural Research (ICAR) is an autonomous association under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India. Previously known as Imperial Council of Agricultural Research, it was set up on 16 July 1929 as an enrolled society under the Societies Registration Act, 1860 in compatibility of the report of the Royal Commission on Agriculture. The Council is the apex body for coordinating, directing and overseeing exploration and research and education in agriculture including agriculture, fisheries and animal sciences in the whole country.² There are four Deemed Universities under ICAR such as Indian Agricultural Research Institute, National Dairy Research Institute, Indian Veterinary Research Institute and Central Institute on Fisheries Education.

ICAR-Indian Agriculture Research Institute is established in 1905 at Pusa, Bihar. It is commonly known as Pusa institute. Based on its academic excellence it upgraded with the status of Deemed University in 1958. Currently, the Institute has 20 divisions 5 multi-disciplinary Centers situated in Delhi, 8 regional stations, 2 off-season nurseries, 3 All India coordinated research projects with headquarters at IARI and 10 national Centers functioning under the all India coordinated research projects. The Indian Agricultural Research Institute is the country's premier national Institute for agricultural research, education and extension. It has the status of a 'Deemed-to-be-University' under the UGC Act of 1956, and awards M.Sc. and Ph.D. degrees in various agricultural disciplines. The growth of India's agriculture during the past nearly 100 years, is closely linked with the researches done and technologies generated by the Institute. The Green Revolution stemmed from the fields of IARI. Development of high yielding varieties of all major crops which occupy vast areas throughout the country, generation and standardization of their production, techniques, integrated pest management and integrated soil-water-nutrient management have been the hallmarks of the Institute's research. As per the research mandate of the Institute to conduct basic and strategic research with a view to understand the processes, in all their complexity, and to undertake need-based research, that lead to crop improvement and sustained agriculture productivity in harmony with environment to provide national leadership in Agricultural Research, Extension and Technology assessment and transfer by developing new concepts and approaches and serving as a national referral point for quality and standards. ¹

Review of Literature

Shanmugam and Ulaganathan (2020) have made a scientometric study of Indian Agricultural Research Institute based on Indian Citation Index. The study mainly focuses on the number of publications and citations. Khadeeja and others (2019) evaluated the research trends of Kamaun University based on the research publications indexed in Scopus database. Fluctuation in number of publications found during the study period of 2000-2019. A scientometric study conducted by Ramalingam and Nishavathi (2018) assess the research output of All India Institute of Medical Research based on Scopus bibliographical databases and annual reports of All India Institute of Medical Research available on internet. The publication shows an increasing trend and also have sufficient citation for publications so the study concluded that All India Institute of Medical Research play a critical role in the medical field by its qualitative and quantitative research output. Kumar (2018) evaluated the research publication of ARIES Nainital published in the Web

of Science database during 2001-2015. The research publications were published in high impact factor journals. Patel and Thakur (2018) conducted a study based on the research publications of National Environmental Engineering Research Institute. The number of publication shows decrease in trend and multi authorship pattern dominated. Sagar and others (2013) analyzed the global agricultural research output qualitatively and quantitatively. The study revealed that India has only 7.96% of global share in the Agricultural research at global level.

Objectives

A study of a thirty two years of publication is enough to understand the research performance of an institution. The present study intends to capture an overall view of the research performance of the Indian agricultural Research Institute by analyzing the research works. The research question can be derived as the how the research works are progressing with time?, how the collaboration works varies over countries? and what are the trend topics?. The objectives of the present study are following:

1. To find out the publication trend of IARI scientists over time,
2. To identify the different document types chosen by the IARI scientist to publish their research works,
3. To list out the countries which conduct highly collaborative works with IARI scientists,
4. To explore the most productive journals of IARI publications,
5. To identify the productive research area of IARI publications and
6. To find out the trend topics of IARI research works.

Methodology

The research publication of Indian Agricultural Research Institute collected from the Web of Science database in January 2021. The research publications considered for the study published during 1989 to 2020. A total of 8764 records were downloaded using the search string Organization enhanced = “Indian Agricultural Research Institute” and time span=1989-2020. Bibexcel, Bibliometrix R-packages and MS Excel were used to analyze the data and VOS Viewer used to visualize the results.

Results

Publication growth trend

The Indian Agricultural Research Institute published 8764 research works in Web of Science database within the 32 years from 1989 to 2020. In 1989, 144 records were published which then decreased to 99 the very next year (Figure 1). Then it attains more number of publications than 1989 only after 11 years in 2001 (155 publications). After that the number of publication shows increasing trend with some fluctuation and in 2020 it reaches 673 (Figure 2). In 1989 it was 144 and in 2020 it reaches 673. 2019 is the most productive year with 682 publications and 1997 is the least productive year with 90 publications.

Figure 1: Year v/s Number of Publication from 1989-2004

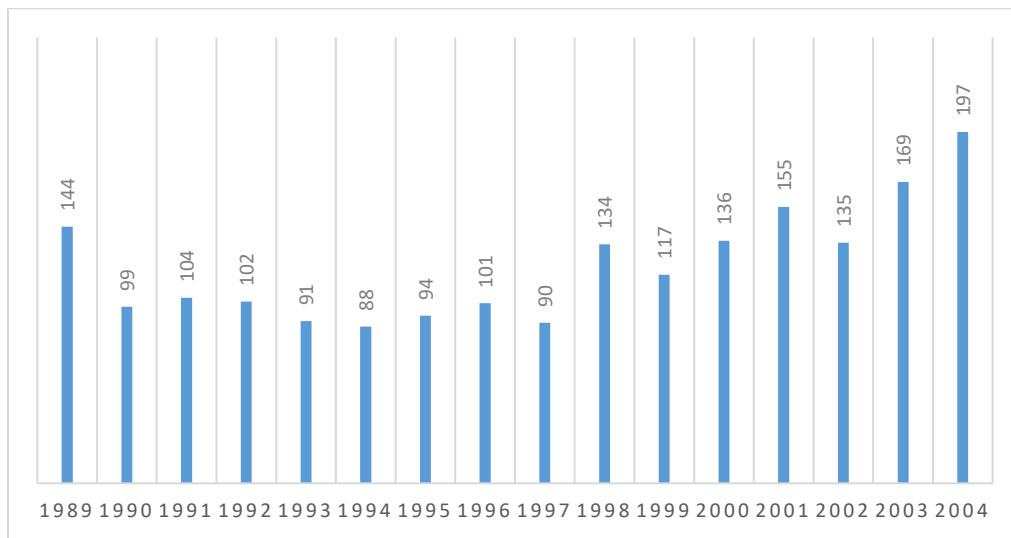
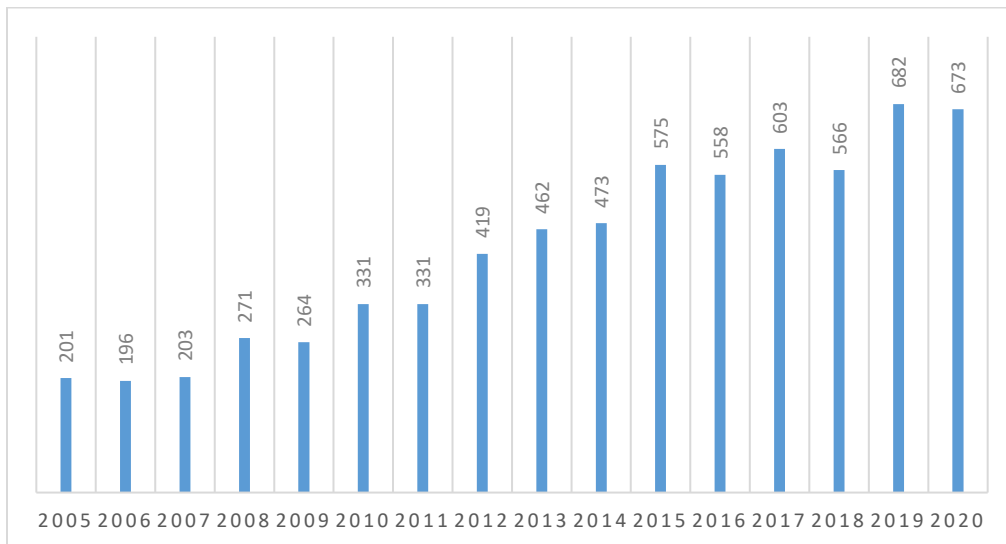


Figure 2: Year v/s Number of Publication from 2005-2020



Publication Trend among Types of Documents

The total 8764 records were published in 16 various types of publications (Table 1). Majority of the research works are published in the form of Article (88.65%). Review is at the second position with 348 publications followed by Note with 175 publications. Other 13 document type such as Early Access, Letter, Editorial Material, News Items etc. are sharing only 5.39% of total publications.

Table 1: Document Type of Research Publications

Document Type	No. of Publications	% of 8764
Article	7769	88.65
Review	348	3.97
Note	175	2.00
Meeting Abstract	76	0.87
Early Access	61	0.70
Letter	38	0.43
Editorial Material	78	0.89
News Item	102	1.16
Proceedings Paper	56	0.64
Correction	32	0.37
Book Chapter	16	0.18
Biographical-Item	8	0.09
Retracted Publication	2	0.02
Retraction	1	0.01
Data Paper	1	0.01
Discussion	1	0.01
Total	8764	100

Collaborative Trend among Countries

In the research publication of IARI, the authors come from 90 countries. The collaborative country is counted from the author's affiliation in a record. There are three countries with more than 100 publications, which are USA, Australia and UK. Five countries have more than 50 publications, 35 countries have more than 10 publications, 24 countries have more than one publications and 23 countries have only single publication. USA (317 publications), Australia (142 publications) and UK (129 publications) are three top collaborative countries (Figure 3). The collaborative works between different countries are varying over time (Figure 4). Concentrating on the top collaborative countries, in the beginning in 1989 the IARI scientist conducted collaborative researches with scientist of United States only. The collaboration work with USA

has been regular from the year 2004. Collaboration with UK appeared from 1992 and Australia from 1996. USA have high collaborative work yearly instead 2018 in which Australia have high collaboration.

Figure 3: Collaborative Countries

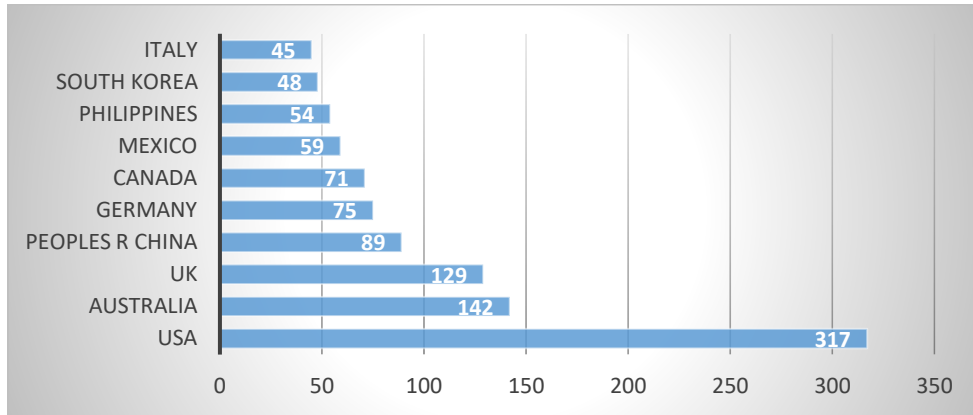
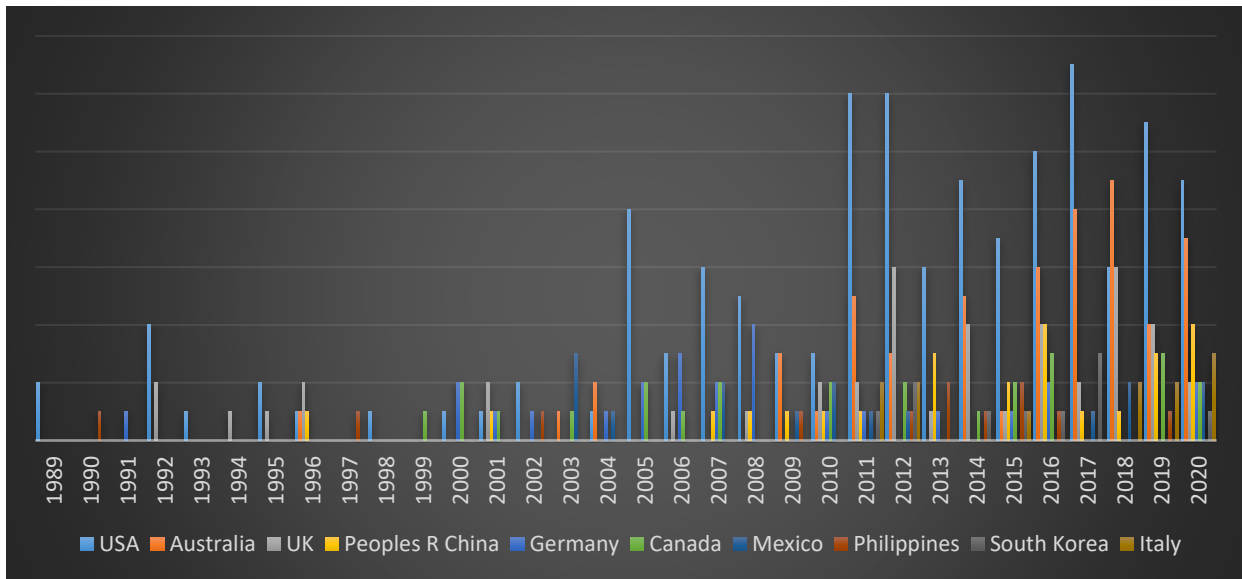


Figure 4: Country Collaboration over year



Publication Trend among Journals

The scientists of IARI have published their research works in 932 different journals and among those top 10 journals are tabulated in Table 2 and Figure 5. The highest number of publications are from Indian Journal of Agricultural Sciences with 1273 publications, Current Science with 332 publications and Indian Journals of Horticulture with 308 publications. In

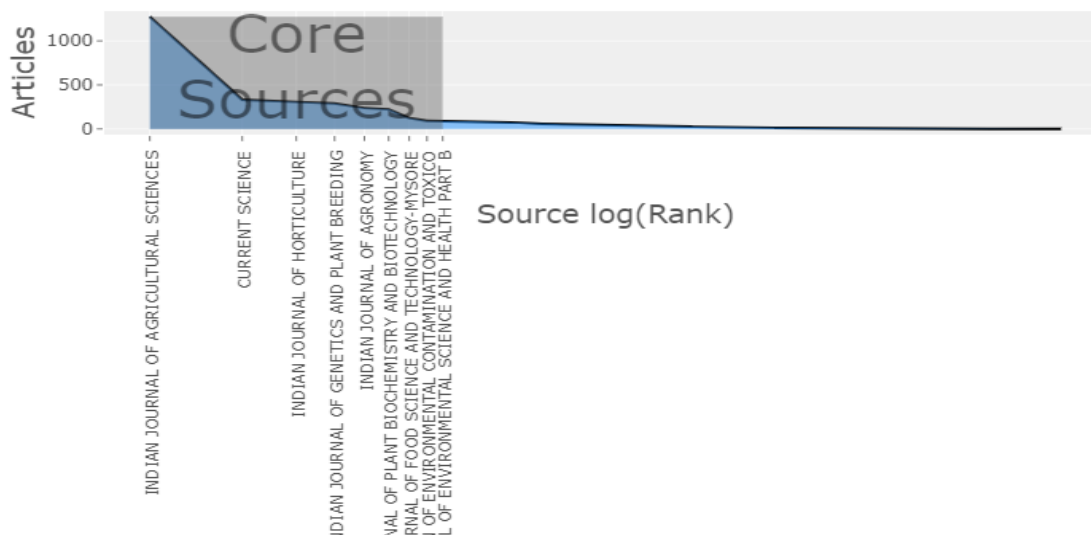
addition Current science and Indian Journal of Agricultural Science are having highest total global citation score 4497 and 2313 respectively. Those journals having less number of publications are also have good number of citation this shows the quality of the journal.

Table 2: Highly Productive Journals

Sources	Articles	TLCS	TGCS
Indian Journal of Agricultural Sciences	1273	65	2313
Current Science	332	299	4497
Indian Journal of Horticulture	308	343	415
Indian Journal of Genetics And Plant Breeding	290	557	797
Indian Journal of Agronomy	238	653	624
Journal of Plant Biochemistry and Biotechnology	224	593	1629
Journal of Food Science and Technology-Mysore	124	483	1680
Bulletin of Environmental Contamination and Toxicology	92	2	1107
Journal of Environmental Science and Health Part B-Pesticides Food Contaminants and Agricultural Wastes	89	300	931

TLCS-Total Local Citation Score TGCS-Total Global Citation Score

Figure 5: Highly Productive Journals



Trend among Research Area

Out of the total 89 research areas which categorize the research output, the top 10 research areas are listed in Table 3. Agriculture is the top research area with 3780 publications, Plant science with 1949 publications and Environmental Science and Ecology with 750 publications.

Table 3: Top 10 Research Area

Research Area	No. of Records
Agriculture	3780
Plant Sciences	1949
Environmental Sciences & Ecology	750
Biotechnology & Applied Microbiology	639
Science & Technology - Other Topics	604
Genetics & Heredity	584
Biochemistry & Molecular Biology	574
Food Science & Technology	392
Chemistry	377
Entomology	268

Trends among keywords

Keywords represents the essence of the document which enables to understand the main area of the research work. The top ten All Keywords, Author Keywords and Keyword Plus of the research publications of IARI scientist are shown in table 4. Among All Keywords Wheat is the most occurred keyword with 625 occurrences, 3785 Total link strength followed by Yield with 581 occurrences and 3466 Total link strength and Growth with 515 occurrences and 3038 total link strength. Consider the Author Keywords, Wheat is also in highest position with 387 occurrences followed by Rice with 256 occurrences and Yield with 170 occurrences. In the Keyword Plus, Growth is the most frequently used keyword with 473 occurrence, followed by Yield with 432 occurrences and Identification with 380 occurrences.

Table 4: Most Frequent Keywords

All Keyword	Occurrences	Total Link Strength	Author Keyword	Occurrences	Total Link Strength	Keyword Plus	Occurrences	Total Link Strength
Wheat	625	3785	Wheat	387	982	Growth	473	2207
Yield	581	3466	Rice	256	574	Yield	432	2030
Growth	515	3083	Yield	170	486	Identification	380	1743
Rice	458	2782	Maize	161	456	Plants	316	1495
Identification	394	2279	Genetic Diversity	157	356	Expression	297	1427

years. Article form of research publications are dominating and USA found the most collaborated country with IARI. Indian Journal of Agricultural Sciences, Current Science and Indian Journal of Horticulture are the three most productive journals. The research trend reveals that Agriculture is the most productive research area followed by Plant Science and Environmental Sciences & Ecology. Overall Indian journals are in top of productive journals. The keyword identifies explore that most of the research works are going on wheat, and rice in IARI.

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