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Contributions of Bidhan Chandra Krishi Viswavidyalaya to agricultural research: a bibliometric study

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Details of published papers of Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur, W.B were retrieved from the CAB Abstracts for a 15-year period from 1993-2007. A total of 2807 papers were identified and analysed on seven different parameters. The results show that there has been a topsy-turvy growth in the research publication during the period. Journals in which papers have been published by BCKV have been ranked on the basis of number of papers with their NAAS rating. The authorship pattern shows the trends towards collaborative research.

Introduction

India is essentially an agricultural country with over 3/4th of its population living in rural areas and depends on agriculture and related occupations. Agriculture contributes nearly half of the national income and provides employment to about 70 percent of the working population in India[1]. Agriculture is also the main economic activity of the state of West Bengal and 70 percent of the state's population depends on it.

Revered William Carey initiated agricultural research and other related activities in Bengal by establishing Agri-Horticultural Society in 1820. Agricultural education in Bengal started in 1898 at Civil Engineering College, forerunner of the Bengal Engineering and Science University, Howrah[2]. The Government of West Bengal established the State College of Agriculture affiliated to the University of Calcutta in 1952, which was housed in a hired building popularly known as 'Ranikuthi'. The foundation stone of the own building of the college at Haringhata was laid down by the then Prime Minister of India, Pandit Jawaharlal Nehru. The College was shifted to Haringhata in July, 1958 and came under the jurisdiction of University of Kalyani from 1st November 1960. The Bidhan Chandra Krishi Viswavidyalaya (BCKV) was established on 1st September 1974 after being bifurcated from University of Kalyani with one college at Coochbehar, North Bengal and another Bengal Veterinary College at Belgachia, Kolkata. The University has its main campus at Mohanpur, Nadia with three regional research stations. There are three independent faculties – Faculty of Agriculture, Faculty of Horticulture and Faculty of Agricultural Engineering. All the faculties, agricultural extension programmes and directorate of research, work together towards the growth and development of agricultural education and research.

Literature review

Bibliometric and scientometric studies on different areas of knowledge have been carried out by many authors for various purposes. Some of these studies measure the growth and trend of research in different areas of knowledge. A search in study of Indian Science Abstracts (ISA) and Indian Library Science Abstracts (ILSA) databases for the period 2005 to 2009 retreived a number of papers on scientometrics analysis of various subjects. A few studies have been carried out in the area of agricultural sciences and allied disciplines are reviewed here.

Ramesh, Ramana and Hussain[3] have analyzed the papers published on 'Oryza' from 1986-1995 to find out different areas of work and their relationship. Surayanarayana[4] has analyzed the papers and the citations published in the journal Tobacco Research for the period 1987-1997 to find out year-wise

distribution, collaborative research, authorship pattern and so on. Arunachalam and Balaji[5] have compared the fish research in China with that of India. Ramesh and Nagaraju[6] have made a bibliometric study on International Journal of Tropical Agriculture to find out year-wise distribution of papers, authorship pattern and collaborative research. Hasan and Singh[7] have carried out a bibliometric study on Himachal Journal of Agricultural Research by using different parameters. Krishna and Kumar[8] have examined the subject distribution, authorship pattern and trends of research on agricultural and veterinary sciences. Kumar and Kumar[9] have carried out the productivity study of scientists of National Research Centre for Soyabeen. Kumbar, Harinarayana and Tejaswini[10] have studied the authorship pattern and collaborative research in agricultural sciences. Ezhilrani, Surianarayanan and Kanthimathi[11] have described the authorship pattern and collaborative research by analyzing selected journals on aquaculture. Hasan and Singh[12] have portrayed the agricultural research in Himachal Pradesh by analyzing Agricola, AGRIS, CAB and FSTA database. Mohan[13] has mapped seaweed research in the global perspective. Sharma[14] has furnished the trends of research publication of the scientists of Central Potato Research Institute. The present paper is an attempt to study the contribution of BCKV in agricultural research.

Objectives of the study

- To find out volume of work published by BCKV during 1993-2007;
- To identify journals used to publish the work and rank these journals;
- To furnish country-wise distribution of journals;
- To find out department-wise quantum of publications;
- To draw authorship pattern; and
- To describe specific area-wise distribution of research publications.

Methodology

The papers indexed in the CD-ROM version of CAB Abstracts from 1993 to 2007[15] have been selected for this study. CAB-CD, compiled by the Commonwealth Agricultural Bureau International (CABI), covers all aspects of agriculture, forestry and allied disciplines[16]. The database contains over 3 million bibliographic records with abstracts in English from papers published in 74 languages. It uses WinSPIRS 4.01 software of Silver Platter. All the references were downloaded from the database by searching with a combination of keywords that include Bidhan Chandra Krishi Viswavidyalaya, BCKV; Mohanpur, Nadia and period 1993 to 2007. The fields downloaded are TI-Title; AU-Author; AD-Address of the author; SO-Source publication; PB-Publisher; PT-Publication Type and CD-CABI Code Heading. The resultant fields with their bibliographic information in the text format were then standardized and transferred to the spreadsheet for analysis[17]. Before the analysis, the duplicate records were deleted.

Analysis and discussion

Journal articles, conference publications, books and book chapters, reports etc., published in the 15-year period from 1993 to 2007 have been considered for the study. The researchers of BCKV are found to have contributed a total of 2807 research publications which have been analyzed as below.

Chronological distribution of published literature

The number of papers in reviewed journals, conferences and books indicate the growth of the discipline. Table 1 shows the year-wise research contributions of BCKV in various documentary sources of information as reflected in CAB-CD from 1993 to 2007.

It can be seen from Table 1 that out of total 2807 research publications, there are 2670 journal articles, 91 conference publications, 42 books/book chapters and one report. Three publications are classified as 'miscellaneous'. It is seen from the Table 1 that journal articles constitute 95.11 percent of the total publications followed by conference publications, which constitute 3.24 percent. Figure 1 indicates a topsy-turvy growth of research publications during the period of study. The years 1993 and 2006 have witnessed the minimum (146 papers) and maximum (231 papers) number of publications respectively. Figure 2 shows the cumulative growth of publications in 5-year intervals. The 1st five years had 795 papers, the 2nd five years had 972 papers and the 3rd five years had the highest number with 1040 papers.

Table 1—Year-wise distribution of research publications from 1993 to 2007

Year	Journal articles	Conference proceedings	Books/ Book chapter	Reports	Misc.	Total
1993	144	2	0	0	0	146
1994	153	0	0	0	0	153
1995	143	23	0	1	1	168
1996	151	1	0	0	0	152
1997	174	0	2	0	0	176
1998	146	1	2	0	0	149
1999	176	1	3	0	0	180
2000	212	2	5	0	1	220
2001	202	8	3	0	0	213
2002	200	1	8	0	1	210
2003	183	5	1	0	0	189
2004	179	30	0	0	0	209
2005	217	5	2	0	0	224
2006	228	1	2	0	0	231
2007	162	11	14	0	0	187
Total	2670	91	42	1	3	2807

Journals used to publish research work

Publication in refereed/peer-reviewed journals is one of the indicators of the research contribution of the scholars. The journals used by the researchers to publish their research work are shown in Table 2. National Academy of Agricultural Sciences (NAAS), New Delhi has assigned credits to scientific journals corresponding to the grade as recommended by the Journal Rating Committee of the Academy.

As can be seen from Table 2, the researchers have used 210 journals (155 Indian journals and 55 foreign journals) Among 155 Indian journals, 20 or more papers of BCKV have been published in 20 journals. The remaining 135 journals have been used to publish 611 papers. Among 55 non-Indian journals, 3 or more papers have been published in 13 journals. The rest of the 42 non-Indian journals been used to have publish 54 papers. Among Indian journals, *Environment and Ecology* (Rank 2.0) has the highest number of BCKV publications with 642 papers (25.27 percent). Among foreign journals, *Bulletin of Environmental Contamination and Toxicology* (Rank 7.6) has the highest number of publications of 18 papers (13.84).

Distribution of papers by country of origin

The researchers of BCKV have used 210 journals published from 16 different countries of the world to publish their research work of which 155 journals are of Indian origin in which 2540 papers (95.13 percent) have been published. Among foreign journals, USA occupies the highest position with 40 papers (1.50 percent) followed by UK with 29 papers (1.09 percent) (Table3).

Categorization of journals by NAAS Rating

National Academy of Agricultural Sciences, New Delhi has rated 1608 journals by assigning marks from 1 to 10. Non-impact factor journals have been assigned a place from 1 to 6 marks, while journals with impact factor have assigned a place from 6.1 to 10 marks. Table 4 shows the distribution of journals based on NAAS rating of scientific journals 2007.

It is seen from Table 4 that 79 journals have not been covered in the NAAS rating of scientific journals 2007 which is 37.62 percent of the total journals used by the researchers to publish their work. Nine hundred and seventy two papers are published in these journals, which is 36.40 percent of the total journal output. Four percent papers have been published in journals with the rating between 1 and 1.9. This is followed by 27.23 percent with the rating between 2 and 2.9; 11.87 percent with the rating between 3 and 3.9; 10.37 percent with the rating between 4 and 4.9; 0.37 percent with the rating between 5 and 5.9; 3.63

Table 2—List of journals used to publish research work (Rank of journal was based on number of papers published)

Journals of Indian origin

Rank	Indian Journal	Publisher	City & state	NAAS Rating 2007		No. o Papers
				JrnID	Rating	
1	*Environment and Ecology*	MKK Publication	Kalyani, W.B.	E045	2.0	642
2	*Journal of Interacademicia*	Asutosh Sarkar	Kalyani, W.B	-	N	393
3	*Horticultural Journal*	Society for Advancement of Horticulture	Mohanpur, W.B.	-	N	107
4	*Journal of Mycopathological Research*	Indian Mycological Society	Kolkata, W.B.	J216	4.0	95
5	*Indian Agriculturist*	Agricultural Society of India	Kolkata, W.B.	I011	3.0	90
6	*Crop Research Hisar*	Agricultural Research Information Centre	Hisar, U.P.	-	N	77
7	*Indian Journal of Agricultural Sciences*	Agricultural Research Communication Centre	Karnal, Haryanana	I022	7.2	59
8	*Journal of the Indian Society of Soil Science*	Indian Society of Soil Science	New Delhi	-	N	51
9	*Orissa Journal of Horticulture*	Orissa Horticultural Society	Bhubaneswar, Orissa	-	N	46
10	*Indian Veterinary Journal*	The Veterinary Association	Chennai, T.N.	I096	6.5	45
11	*Indian Journal of Agronomy*	Indian Society of Agronomy	New Delhi	I024	6.0	44
12	*Indian Journal of Animal Health*	West Bengal Veterinary Association	Kolkata, W.B.	I025	3.0	44
13	*Journal of Crop and Weed*	Crop and Weed Science Society	Kolkata, W.B.	-	N	42
14	*Indian Journal of Genetics and Plant Breeding*	Indian Society of Genetics & Plant Breeding	New Delhi	I051	4.0	33
15	*Research on Crops*	Gaurav Society of Agricultural Research Information Centre	Hisar, U.P.	-	N	33
16	*Advances in Plant Sciences*	Academy of Plant Sciences	Muzaffarnagar, Bihar	-	N	30
17	*Annals of Agricultural Research*	Indian Society of Agricultural Science	New Delhi	A117	1.0	29
18	*Journal of Entomological Research*	Malhotra Publishing House	New Delhi	J110	2.0	25
19	*Journal of Potassium Research*	Potash Research Institute of India	Gurgaon, U.P.	J257	3.0	24
20	*Indian Journal of Nematology*	Nematological Society of India	New Delhi	I063	3.0	20
	135 other Indian journals					611
	Total 155 Journals					2540

Journals of foreign origin

Rank	Non- Indian Journal	Publisher	Country	NAAS Rating 2007		No. o Papers
				JrnID	Rating	
1	*Bulletin of Environmental Contaminationand Toxicology*	New York, Springer-Verlag GmbH	USA	B115	7.6	18
2	*Tropical Agriculture*	St Augustine, University of the West Indies Press	West Indies	T046	6	8
3	*Chemosphere*	Oxford, Elsevier Science Ltd	UK	C042	8.8	7
4	*International Journal of Nematology*	Luton, Afro-Asian Society of Nematologists	UK	I128	5	6
5	*International Rice Research Notes*	Makati City, International Rice Research Institute (IRRI)	Philippines	I144	3	6

Contd—

Table 2—List of journals used to publish research work (Rank of journal was based on number of papers published)

Journals of Indian origin

—*Contd*

Rank	Indian Journal	Publisher	City & state	NAAS Rating 2007		No. of Papers
				JrnID	Rating	
6	*Journal of Agricultural and Food Chemistry*	Washington, American Chemical Society	USA	J016	8.7	6
7	*Biology and Fertility of Soils*	Heidelberg, Springer-Verlag GmbH	Germany	B058	8.3	5
8	*Journal of Agronomy and Crop Science*	Berlin, Blackwell Wissenschafts-Verlag GmbH	Germany	J020	8.1	4
9	*Journal of Food Agriculture and Environment*	Helsinki, World Food Ltd	Finland	-	N	4
10	*Journal of Vegetable Crop Production*	Binghamton, Food Products Press	USA	J304	3	3
11	*Journal of Vegetable Science*	Binghamton, Food Products Press	USA	J305	8.7	3
12	*Nematologia Mediterranea*	Bari, Istituto per la Protezione delle Piante	Italy	N015	3	3
13	*Pest Management Science*	Chichester, John Wiley & Sons	UK	P014	8.3	3
	42 other non-Indian Journals					54
	Total 55 Journals					130

N: denotes journal not covered in NAAS Ranking List 2007 JrnID- Journal Identification denoted in the Ranking List

Table 3—Country wise publication of journals (arranged by the number of papers)

Sl. no.	Publication country	No. of journals	No. of papers	% (Total papers 2670)
1	India	155	2540	95.13
2	USA	11	40	1.50
3	UK	15	29	1.09
4	Germany	7	15	0.56
5	West Indies	1	8	0.30
6	Italy	3	6	0.22
7	Philippines	1	6	0.22
8	Netherlands	4	5	0.19
9	Finland	1	4	0.15
10	Pakistan	3	4	0.15
	Other 6 countries	9	13	0.49
	Total journal papers		2670	
	Non-journal papers		137	
	Grand total	210	2807	

percent with the rating between 8 and 8.9. It has been found that only 1 paper has been published in the journal, namely Global Change Biology having the NAAS rating 10.0. It further shows that the researchers have used 48 journals having the impact factor to publish 255 papers, which have occupied 9.55 percent of the total journal articles.

Department-wise distribution of publications

The R&D activities of the BCKV have been undertaken by the collective efforts of all the Faculties: Faculty of Agriculture (17 Departments), Faculty of Horticulture (5 Departments), Faculty of Agricultural Engineering (4 Departments), Directorate

Table 4—Classification of journals on the basis of NAAS rating

Sl. no.	Journal rating	No. of journals	% (Total journals=210)	No. of papers	% (Total papers= 2670)
1	0.00	79	37.62	972	36.40
2	≥1.0 - <2.0	21	10.00	112	04.19
3	≥2.0 - <3.0	12	05.71	727	27.23
4	≥3.0 - <4.0	29	13.81	317	11.87
5	≥4.0 - <5.0	17	08.10	277	10.37
6	≥5.0 - <6.0	04	01.90	10	00.37
7	≥6.0 - <7.0	03	01.43	97	03.63
8	≥7.0 - <8.0	25	11.90	110	04.12
9	≥8.0 - <9.0	19	09.05	47	01.76
10	≥9.0 - <10.0	00	00.00	00	00.00
11	≥ 10.0	01	00.48	01	00.04
12	Non-journal papers			137	
		210		2807	

Table 5—Department wise distribution of papers

Faculties and Research Councils	Departments	No. of papers
Faculty of Agriculture	Agronomy	436
	Agricultural Chemistry and Soil Science	310
	Agricultural Entomology	266
	Plant Pathology	255
	Genetics	145
	Agricultural Economics	62
	Agricultural Extension	54
	Others	268
Faculty of Horticulture	Fruits and Orchard Management	117
	Vegetable Crops	63
	Spices and Plantation Crops	60
	Others	251
Faculty of Agricultural Engineering		26
Directorate of Research and various projects		250
Veterinary Sciences		100
Others		144
		2807

of Research, Directorate of Farms, Directorate of Extension Education and others. It is observed that some records do not contain the detailed affiliation of the authors, which have created difficulties in compiling and analyzing the data with respect to department-wise publication of papers. Table 5 shows the department-wise distribution of papers.

It is seen from Table 5 that the Faculty of Agriculture has the highest publications with 1796 papers followed by the Faculty of Horticulture (491 papers), Research Centres including projects (250 papers), Veterinary Sciences (100 papers) and Faculty of Agricultural Engineering (26 papers).

Authorship pattern

Agricultural research is multidisciplinary in nature and it calls for team research of scholars and experts not only from different branches of agricultural sciences but also from the other branches of science and allied disciplines. Study of authorship pattern is an important indicator of collaborative research. The more participation of researchers in a specific work indicates the interdisciplinary nature of the subject. Table 6 shows the participation of number of scholars towards the collaborative research activities as reflected in the study.

Table 6 shows that joint authors have contributed the highest number of research papers (1077), which is

38.37 percent of the total output. This is followed by three authors (30.53 percent), four authors (16.14 percent) and five authors or more (7.37 percent). Single authors have contributed 213 papers, which is 7.59 percent of the total research output. Figure 3 shows the trends towards collaborative research as reflected in the study.

Specific area-wise distribution of research publications

The CAB Abstracts offers a search field CABI Code Headings (CD) containing keywords of individual paper. Analyzing this field unfolds the quantum of research work in a specified area of agricultural sciences being undertaken by the researchers of BCKV. In order to find out the specified subject area of research work, 141 records at random were selected, which is 5 percent of the total research publications. The CABI Code Headings of these research papers and their numbers of occurrence have been found. Seventy five different CAB Headings of have been identified with their number of occurrences. The quantum of research publications in specific area of agriculture being undertaken by the researchers of BCKV having more than 100 occurrences have been shown in the Table 7.

Table 7 shows that out of 75 specific areas of research work, 20 thrust areas have more that 100 occurrences. Amongst them, plant production has the highest occurrence of 1089 publications (38.80 percent). Field crops and horticultural crops have occupied the 2nd (804 papers) and 3rd (662 papers) respectively. The research work in the area of weeds and noxious plants has produced 115 papers, which is 4.10 percent of the total research publications.

Table 6—Authorship pattern

Sl. no	No. of authors	No. of publications	% (Total publications = 2807)
1	Two authors	1077	38.37
2	Three authors	857	30.53
3	Four authors	453	16.14
4	Single author	213	07.59
5	Five authors or more	207	07.37
		2807	100.00

Table 7—Specific area-wise distribution of research publications

	Specific area of research work in agricultural science	No. of occurrences	% [N=2807]
1	Plant-Production	1089	38.80
2	Field-Crops	804	28.64
3	Horticultural-Crops	662	23.58
4	Fertilizers-and-other-Amendments	608	21.66
5	Plant-Breeding-and-Genetics	578	20.59
6	Plant-Physiology-and-Biochemistry	289	10.30
7	Crop-Produce	247	8.80
8	Soil-Chemistry-and-Mineralogy	236	8.41
9	Plant-Pests	204	7.27
10	Pesticides-and-Drugs-Control	197	7.02
11	Food-Composition-and-Quality	193	6.88
12	Plant-Cropping-Systems	188	6.70
13	Plant-Nutrition	184	6.56
14	Agricultural-Economics	182	6.48
15	Viral-Bacterial-and-Fungal-Diseases-of-Plants	181	6.45
16	Soil-Water-Management-Irrigation-and-Drainage	153	5.45
17	Soil-Biology	144	5.13
18	Plant-Composition	127	4.52
19	Non-food-Non-feed-Plant-Products	124	4.42
20	Weeds-and-Noxious-Plants	115	4.10

Conclusions

The CAB Abstracts of Commonwealth Agricultural Bureau International (CABI) is a specialized information tool suitable to study the research productivity in the area of agriculture and associated disciplines. Although the researchers of the Viswavidyalaya have produced good number of research publications every year but no uniform pattern of literature growth has been observed. The publication pattern indicates that the researchers are careful in publishing their research results in specialized journals, mostly of Indian origin. As in other branches of science and technology, the collaborative research as indicated by the large number of multi-authored papers is seen.

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