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Publishing trends of Indian horticulture scientists: A case study of the doctoral dissertations during 1991-2010

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This paper describes the results of a citation study of cited horticulture literature appended in eighty doctoral dissertations submitted to the Bidhan Chandra Krishi Viswavidyalaya (BCKV) and Uttar Banga Krishi Viswavidyalaya (UBKV), West Bengal, India from 1991 to 2010. The main objective of this study is to examine the contribution of scientists to journals and books, the most prolific authors and self-citations of supervisors and research scholars. 10,845 citations were appended in dissertations, of which, 8437 (77.796%) were journal articles and 1327 (12.236%) were books. Journal articles and books cited by the scientists have been considered for this study. Scientists mainly use foreign journals and books for their research work than those of India. They prefer to publish their research work in Indian journals and books. In journal articles team research is on the increase, but in book citations there is decreasing trend towards multiple authorships.

Key words: BCKV, UBKV, doctoral dissertations, Indian horticulture scientists, publication output.

INTRODUCTION

After the independence of India much importance has been given to education and research in the development of the country, and a large number of universities, research and development institutions and IITs were established. Bidhan Chandra Krishi Viswavidyalaya (BCKV) came into being in West Bengal, India in 1974. Since February 2001, BCKV has undergone a number of major structural changes. Its North Bengal campus at Cooch Behar along with three Northern Regional Stations at Kalimpong, Cooch Bihar and Dinajpur has emerged into a new Agricultural University, Uttar Banga Krishi Viswavidyalaya (UBKV), to cater more intensively to the needs of agriculture in North Bengal districts. These two agricultural universities are engaged in the pursuit of excellence in research and education in

agriculture and its related fields. The literature of any field emerging from the research publications is the best indicator of the trends in that field. Doctoral dissertations reflect the scholarly communication process.

Evaluating the publication output of institutional research highlights the contribution of individual scientists and the collective contribution of the institution as a whole. Supervisor's publishing output is often used as an index of departmental and institutional prestige and is strongly associated with an individual supervisor's reputation, visibility, and advancement in the academic reward structure. Publication output of researchers contributes their performance to mainly scholarly research journals and books also.

545 journals containing 8437 articles citations and 511

books containing 1327 citations collected 80 doctoral dissertations awarded by the BCKV and UBKV, West Bengal, India during 1991 to 2010. 86 supervisors and 80 research scholars are closely involved in order to publish these dissertations. In this line, the present study therefore explored and evaluated publishing trends of supervisors and research scholars at BCKV and UBKV and their contribution to these journal citations and book citations.

REVIEW OF RELATED STUDIES

Several bibliometric studies have so far attempted to look at indicators as required for understanding the status of Science and Technology in India. They had focused on developing indicators on institutional productivity, scattering of research across India and foreign journals, quality of research, and nature of collaboration. These studies have been carried out by Garfield (1983), Gurg and Dutt (1992), Raghuran (1996), Arunachalam et al. (1998), Arunachalam (2002), King (2004) and Gupta and Bala (2011). Many bibliometric and citation studies have been conducted on theses in different disciplines in different literature like Kushkowski et al. (2003) in Education; Shahab (2009) in Multi-disciplines; Lal (1989) in Agriculture; Gooden (2001), Srivastava (2002), Vallmitjana and Sabate (2008) in Chemistry; Hazarika (2005) in Forestry; Doraswamy and Pulla Reddy (2001) in Geography; Nandi and Bandyopadhyaya (2011) in Mathematics; Ranjan and Sudhier (2007) in Physics; Subramanyam (1983) in Social Science; Raman and Varghese (2011) in Soil Science; Ahmad and Haridasam (2006) in Veterinary Science; Biswas and Enamul Haque (2008) in Veterinary Science and Animal Husbandry and Banatepanvar et al. (2013) in Zoology.

Purpose of the study

1. to find out the contribution of horticulture scientists to journals and books
2. to identify the authors' contribution, most prolific authors and co-authorship and credit study of journals and books
3. to determine the self citations of supervisors and researchers
4. to examine publication preference to journals and books in Indian and abroad
5. to find out the list of Indian journals and books and foreign journals and books preferred for publications

METHODOLOGY

To develop a data set for this study, a total of 80 doctoral dissertations awarded during 1991-2010 were selected. The scholars of

the 80 dissertations have cited 545 journals comprising 8,437 citations and 511 books comprising 1,327 citations in their dissertations. The sampling procedure for the study was purposive since data were collected specifying a target period, 1991-2010. The sample also represented the total population of the dissertations. So, no sample was taken. The total number of data sources was 80 dissertations. The 80 dissertations provided 10,845 citations. The size of the population was regarded as large enough to make proper conclusions.

Title pages and reference lists were photocopied from all the dissertations and provided each data source with a sequential number. The method of data collection was data extraction through citation analysis. The following data from the title pages were captured on a MS-Excel worksheet: (a) title, (b) supervisor, (c) research scholar, (d) date of submission. Subsequently, citations were extracted from the reference sections of each of the dissertation. The following citations data were extracted from the dissertations: (e) bibliographic forms, (f) number of journals and books citations, (g) number of authors, (h) self-citation. All the data collected (a-i) were captured on MS-Excel worksheets.

All the citations belonging to journals and books were classified and analyzed according to the purpose of the study using MS-Excel worksheets. Frequency distributions tables along with percentage of citations were obtained using the MS-Excel.

RESULTS AND DISCUSSION

Analysis of data is the significant step in research process. It is the link between raw data and significant results leading to conclusions. This process of analysis has to be result oriented and aims at setting objectives. The research scholars of the 80 doctoral dissertations have cited 545 journals comprising 8437 citations and 511 books comprising 1327 citations. All these citations were analyzed according to the purpose of the study.

Bibliographic form wise distribution

Table 1 presents types of resources used by the horticulture scientists in their doctoral dissertations during 1991-2010. It shows that the scientists are mainly using Journals 8437 (77.796%) for collecting the required information. Books occupied the second place with 1327 (12.236%), followed by conference proceedings 512 (4.721%) and theses 158 (1.458%). Together both Journals and Books constitute 90.032% of total resources cited. Next to the theses is bulletins figuring 122 (1.125%), followed by reports 120 (1.107%).

Citations to bibliographic forms that are accounted for less than 0.140 percent are grouped under 'Others' category.

This category includes citation to Handbooks, Monographs, Course Materials, Manuals, Leaflets, Working Papers, Abstracts Magazines, Reviews, Souvenir, Pamphlets, Patents and Standards. This category constitutes only 0.663% of the total citations cited by the research scholars.

Table 1. Bibliographic form wise distribution.

S/N	Bibliographic form	No of citations	% of citations	Cum. citations	% of cum. citations
1	Journal articles	8437	77.796	8437	77.796
2	Books	1327	12.236	9764	90.032
3	Conference Proceedings	512	4.721	10276	94.753
4	Theses and Dissertations	158	1.458	10434	96.211
5	Bulletins	122	1.125	10556	97.336
6	Reports	120	1.107	10676	98.443
7	Yearbooks	42	0.387	10718	98.830
8	News Letters	39	0.360	10757	99.190
9	Web Resources	16	0.147	10773	99.337
10-22	Other 13 types of resources used by the research scholars	72	0.663	10845	100.000
Total		10845	100.000	10845	100.000

Table 2. Comparison of cited documents.

S/N	Cited documents	Indian citations	Foreign citations	Total citations
1	Journals	191(35.046%)	354(64.954%)	545
	Contribution to journals	41(83.673%)	8(16.327%)	49(8.991%)
2	Journal articles	3562(42.219%)	4875(57.781%)	8437
	Contribution to journal articles	194(80.833%)	46(19.167%)	240(2.845%)
3	Books	511(38.507%)	816(61.493%)	1327
	Contribution to books	73(86.905%)	11(13.095%)	84(6.330%)

Contribution of scientists to cited articles and books

Measuring research output is an essential part of any public policy aimed at fostering high quality research. Scientific institutions stimulate scientists to enhance research output. A similar initiative is made in this study to explore the publication output of the horticulture scientists to cited journals and books of the BCKV and UBKV in the period, 1991 to 2010. Here, 86 supervisors and 80 research scholars are considered as scientists during the study period. Scientists at BCKV and UBKV that contributed their research work in either journal articles or books are treated as authors.

Comparison of cited documents and contribution of horticulture scientists

From Table 2, the present study reveals that horticulture scientists have cited a total of 545 journals, 8437 journal articles and 1327 books. It also observed that they contributed to journals 49 (8.991%), journal articles 240 (2.845%) and books 84 (6.330%). Scientists contributed to Indian journals 41 (83.673%) and foreign journals 8 (16.327%); Indian journal articles 194 (80.833%) and

foreign journal articles 46 (19.167%); and Indian books 73 (86.905%) and foreign books 11 (13.095%).

Out of 545 journal citations, the horticulture scientists used Indian journals 191 (35.046%) and foreign journals 351 (64.954%) for collecting the required information. Out of 8437 journal articles citations, the citations of Indian are 3562 (42.219%) and the citations of foreign 4872 (57.781%). The book citations of Indian books are 511 (38.507%) and the citations of foreign books are 816 (61.493%).

Cited author's contribution to cited articles and books

The study has analyzed the citations by number of authors to assess the pattern of authorship in the literature of horticulture in Table 3. Out of 8437 references cited 1763 (20.695%) are single authored journals. 6691(79.305%) are multi-authored journals. Among the multi-author articles, the share of two author contributions is found to be more, that is, 3125 citations (37.039%), followed by 2119 citations (25.116%) of three author contributions and 956 citations (11.331%) of four author contributions. The study reveals that team

Table 3. Author's contribution to cited articles and books.

No. of authors	Cited articles	Journal	Cited books	
	No of articles (%)	Cum.articles (%)	No of books (%)	Cum.books (%)
1	1763 (20.896)	1763 (20.896)	679 (51.168)	679 (51.168)
2	3125 (37.039)	4888 (57.935)	446 (33.609)	1125 (84.777)
3	2119 (25.116)	7007 (83.051)	108 (8.139)	1233 (92.916)
4	956 (11.332)	7963 (94.383)	41 (3.09)	1274 (96.006)
5	273 (3.236)	8236 (97.619)	16 (1.206)	1290 (97.212)
6	201 (2.381)	8437 (100.000)	37 (2.788)	1327 (100.000)
15				
Total	8437	8437	1327	1327

Table 4. Most prolific authors.

S/N	Rank	Author's name	No. of articles	% of articles	Cum. articles	% of articles
1	1	S. N. Ghosh	23	9.584	23	9.584
2	2	M. A. Hasan	21	8.750	44	18.334
3	3	P. Dutta	18	7.500	62	25.834
4	4	P. Hazra	17	7.084	79	32.918
5	5	S. K. Mitra	14	5.834	93	38.752
6	6	H. Sen	11	4.584	104	43.336
7	7	B. C. Banik	9	3.750	113	47.086
8	7	S. K. Ghosh	9	3.750	122	50.836
9	8	A. K. Dwivedi	6	2.500	128	53.336
10	8	M. K. Sadhu	6	2.500	134	55.836

research is on the increase in the field of horticulture.

Table 3 also shows the authorship pattern of cited books. It indicates that out of 1327 citations, the maximum numbers of books are 679 written by one author (51.168%) and two authors' citations 446 (33.609%). It is followed by three authors with 108 (8.139%) citations, four authors with 41 (3.09%) citations and five authors with 16 (1.206%) citations. Only 7.084% of cited books are written by more three authors. It is also observed that there is decreasing trend towards multiple authorships.

Most prolific authors to cited articles (considering the first author only)

The distribution of the most prolific authors is presented

in Table 4. Study revealed that a total of seventy prolific authors with 240 articles appeared in the cited articles considering the first author during the study periods. Here, Table 4 presents only first 10 prolific authors. The most prolific author was S N Ghosh who topped the list with 23 papers each during the 1991-2010, followed by M A Hasan with 21 papers, P Dutta with 18 papers, P Hazra with 17 papers, S K Mitra with 14 and H Sen with 11 papers.

Co-authorship and credit study for the individual author

The co-authorship of an author is calculated by taking the number of articles published by the author as first,

Table 5. Co-authorship and credit study for the individual author.

S/N	Rank	Author's name	Total credits
1	1	S. N. Ghosh	18.166
2	2	S. K. Mitra	17.791
3	3	P. Dutta	13.250
4	4	M. A. Hasan	12.082
5	5	P. Hazra	9.000
6	6	M. G. Som	8.258
7	7	T. K. Bose	7.875
8	8	P. K. Chattopadhyay	7.250
9	9	P. K. Das	5.832
10	9	S. K. Ghosh	5.832
11	9	H. Sen	5.832
12	10	B. C. Banik	4.500
13	11	S. C. Maity	4.266
14-104	28	Other, 78 authors cover below 4.000 credit	< 4.000

Table 6. Most prolific cited authors.

S/N	Rank	Author's name	No of books	% of books	Cum. books	% of cum. books
1	1	T. K. Bose	66	78.572	66	78.572
2	2	S. K. Mitra	7	8.333	73	86.905
3	3	M. G. Som	5	5.953	78	92.858
4	4	P. Hazra	3	3.571	81	96.429
5	5	T. K. Chattopadhyay	2	2.381	83	98.810
6	6	B. C. Das	1	1.190	84	100.000
Total			84	100.000	84	100.000

second or third or four authors. The total credit given for a paper is one. For single authored article the author is given a credit point of one. For a double authored article each authors given a credit point of 0.5. For a multi-authored article the first author is given a credit point of 0.5 and 0.5 credit point is distributed equally among the other authors.

The rank list of authors according to their credit is shown in Table 5. The most credited author was S N Ghosh with 18.166 points, followed by S K Mitra with 17.791 points, P Dutta with 13.250 points, M A Hasan with 12.082 points, P Hazra with 9 points and so on.

Most prolific authors to cited books

The most prolific cited book authors of the both BCKV and UBKV is presented in Table 6. Table shows the list of prolific author's name and their contribution in the cited books. This list is preferred for considering the first authors only and arranged in decreasing order of

citations. The most prolific author is T K Bose who topped the list with 66 citations (78.572%) followed by S K Mitra with 7 citations (8.333%), M G Som with 5 citations (5.953%), P Hazra with 3 citations (3.571%), T K Chattopadhyay with 2 citations (2.381%) and B C Das with 1 citation (1.190%). The table provides a ranked list of 6 authors with 84 publications.

Co-authorship and credit study for the individual author

The rank list of authors according to their credit is shown in Table 7. The co-authorship of an author is calculated by taking the number of cited books published by the authors as first, second or third or four authors. The total credit given for a book is one.

For a single authored book the author is given a credit point of one. For a double authored book each author is given a credit point of 0.5. For a multi-authored book the first author is given a credit point of 0.5 and 0.5 credit

Table 7. Co-authorship and credit study for the individual author.

S/N	Rank	Author's name	Credit marks
1	1	T. K. Bose	20.125
2	2	M. G. Som	14.125
3	3	S. K. Mitra	12.500
4	4	B. Choudhury	9.000
5	5	P. Hazra	7.875
6	6	T. K. Chattopadhyay	5.250
7	7	T. K. Maity	3.625
8	8	B. C. Banik	2.125
9	8	B. K. Jana	2.125
10	9	B. C. Das	2.000
11-15	10-13	Other 5 authors obtained less than 2 credit	5.250
Total			84.000

Table 8. Supervisor's self citations.

Citations	Total Contributed Supervisors (CS)	Total Citations (TC)	Supervisor Self Citations (SSC)	% of SSC to TC	% of SSC to TCS	SSC:TC	SSC:TCS
Journal articles	240	8437	65	0.771	27.083	1:129.8	1:3.692
Books	75	1327	10	0.753	11.905	1:132.7	1:8.4

point is distributed dividing equally among the other authors. The most credited author was T K Bose with 20.125 points, followed by M G Som with 14.125 points, S K Mitra with 12.5 points, B Choudhury 9.0 points, P Hazra with 7.875 points and so on.

Self-citations to cited articles and books

The cited doctoral dissertations have one or more supervisors in common with the cited articles or books; they are usually described as supervisor's self-citation (SSC). Similarly, the cited dissertations have one or more research scholars in common with the cited articles or books; usually they treated as research scholar's self-citation (RSC). Therefore, SSC or RSC occurs if supervisors or research scholars refer to own paper or books, that is, if they were the author (s) or one of the co-author (s) of the cited papers or books. In this context, it is revealed that supervisors and research scholars themselves are shared as self-citation under this study during the study periods. Under this section an attempt is made to evaluate the self-citations of supervisors and research scholars.

Supervisor's self-citations to cited articles and books

Supervisors' self citation is presented in Table 8. The

present study reveals 65 number of total supervisors self citation comprising 0.771 percent of total citation and 27.083 percent of total contributed supervisors. The ratio of SSC to total citation is 1:129.8 and the ratio of SSC to contributed supervisors is 1: 3.692. Supervisor self citations to cited books is presented in Table 8. The present study reveals that out of total 75 contributed supervisors, 10 number of supervisors self citation comprising 0.753 percent of total citations and 11.905 percent of total contributed supervisors. The ratio of supervisors' self citations to total citations is 1: 132.7 and the ratio of supervisors' self citation to total contributed supervisors is 1: 8.4.

Researcher's self-citations to cited articles and books

Table 9 displays the distribution of self citing researchers. The present study identifies 6 researchers' self citations that account for 0.071 percent of the total citations and 11.321 percent of the total researchers' citations. The ratio of researchers' self citation to total citations is 1: 1406 and the ratio of researchers' self citation to contributed researchers is 1:9.

Researchers' self citation to cited books is given in Table 9. The present study identifies 2 researchers' self

Table 9. Researcher's self citations.

Citations	Total Contributed Researchers (TCR)	Total Citations (TC)	Researchers Self Citations (RSC)	% of RSC to TC	% of RSC to TCR	RSC:TC	RSC:TCR
Journal articles	53	8437	6	0.071	11.321	1:1406	1:9
Books	9	1327	2	0.151	22.230	1:663.5	1:4.5

Table 10. Choice of Indian journals for publications.

S/N	Title of the journals	No of articles	% of articles	Cum. articles	% of cum. articles
1	The Horticultural Journal	31	15.980	3	15.980
2	Indian Journal of Horticulture	27	13.918	58	29.898
3	Indian Agriculture	19	9.794	77	39.692
4	Haryana Journal of Horticultural Science	16	8.247	93	47.936
5	Orissa Journal of Horticulture	12	6.186	105	54.125
6	Progressive Horticulture	9	4.640	114	58.765
7	Indian Food Packer	7	3.608	121	62.373
8	Vegetable Science	7	3.608	128	65.981
9	Indian Journal of Genetics	6	3.093	134	69.074
10	Journal of Root Crops	6	3.093	140	72.167
11-41	Other 31 journal titles cover less than 4 articles	54	27.833	194	100.000
Total		194	100.000	194	100.000

citations that account for 0.151 percent of total citations of books and 22.23 percent of the total contributed researchers. The ratio of researchers' self citations to total citations is 1: 663.5 and the ratio of researchers' self citations to total contributed researchers is 1: 4.5.

(13.918%), 'Indian Agriculture' with 19 papers (9.794%) and 'Haryana Journal of Horticulture Science' with 16 papers (8.247%). 12 papers (6.186%) were published in the 'Orissa journal of Horticulture', 'Progressive Horticulture' with 9 papers (4.64%), and so on.

Choice of journals and books for publication by scientists

The literature of any field emerging from the research publications is the best indicator of the trends in the field. Under this section, an attempt has been made to examine the choice of Indian and foreign journals; and Indian and foreign books by the particular 266 horticulture scientists (86 supervisors and 80 research scholars) at BCKV and UBKV.

Choice of Indian journals for publications

Table 10 presents the leading Indian Journals preferred by BCKV and UBKV horticulture scientists for publication of journal articles. 'The Horticultural Journals' takes the top position in Indian Journals with 31 papers (15.98%) followed by 'Indian Journal of Horticulture' with 27 papers

Choice of foreign journals for publications

Table 11 shows the list of eight foreign cited journals preferred by horticulture scientists of both BCKV and UBKV for publications. The top slot is occupied by 'Environment and Ecology' with 22 (47.827%) papers, followed by 'Acta Horticulturae' with 13 (28.261%) papers and 'Cashew Bulletin' with 3 (6.523%) papers. Three foreign journals published 2 (4.347%) papers each and two foreign journals published a single paper also occupy the list.

Choice of Indian books for publications

Table 12 presents the leading 13 Indian books preferred by horticulture scientists for publications. 'Commercial Flower' takes the top position in Indian books with 24 citations (32.876%) followed by 'Fruits: Tropical and Sub-

Table 11. Choice of foreign journals for publications.

S/N	Title of the journal	No of papers	% of papers	Cum. papers	% of cum. papers
1	Environment and Ecology	22	47.827	22	47.827
2	Acta Horticulturae	13	28.261	35	76.088
3	Cashew Bulletin	3	6.523	38	82.611
4	Experimental Genetics	2	4.347	40	86.958
5	Horticultural Science	2	4.347	42	91.305
6	Tech Bulletin	2	4.347	44	95.652
7	Plant and Cell Physiology	1	2.174	45	97.826
8	SABRAD Journal of Breeding and Genetic	1	2.174	46	100.000
Total		46	100.000	46	100.000

Table 12. Choice of Indian books for publications.

Sl. No.	Title of the books	No of books	% of books	Cum. books	% of cum. books
1	Commercial flower	24	32.876	24	32.876
2	Fruits: Tropical and sub-tropical	18	24.658	42	57.534
3	Vegetable crops in India	12	16.438	54	73.972
4	Fruits of India: tropical and sub-tropical	10	13.698	64	87.670
5-13	9 different book titles cover only 1 citation	9	12.330	73	100.000
Total		73	100.000	73	100.000

Table 13. Choice of foreign books for publications.

S/N	Title of the books	No of books	% of books	Cum. books	% of cum. books
1	Overview of lychee production in the Asia-Pacific Region	4	36.364	4	36.364
2	Genetic improvement of vegetable crops	4	36.364	8	72.728
3	Post harvest physiology, handling and utilization of tropical and sub-tropical fruits and vegetables	2	18.181	10	90.909
4	Post harvest physiology and storage of tropical and sub-tropical fruits	1	9.091	11	100.000
Total		11	100.000	11	100.000

tropical' with 18 citations (24.658%), 'Vegetable Crops in India' with 12 citations (16.438%) and 'Fruits of India: Tropical and Sub-tropical' with 10 citations (13.698%). The top only 2 titled cited books cover 57.534 percent, top 6 titled books cover 90.410 percent and remaining 7 titled books cover 9.590 percent of total Indian cited books. Total 9 titled books cover 1 citation (1.370%) each.

Choice of foreign books for publications

Distribution of foreign cited books preferred for Publication is shown in Table 13. The table shows the list of four foreign cited books preferred by scientists of both

BCKV and UBKV for publication. Overview of Lychee Production in the Asia-Pacific Region' and 'Genetic Improvement of Vegetable Crops' occupy the first preference by the scientists with 4 citations (36.364%) each, followed by 'Postharvest physiology, Handling and Utilization of Tropical and Sub-tropical Fruits and Vegetables' with 2 citations (18.181%) as second choice and 'Postharvest Physiology and Storage of Tropical and Sub-tropical Fruits' with 1 citation (9.091%).

Conclusion

Citation analysis should be used at institutional and governmental levels for the formulation of citation-based

science policy for an all round development in science and agriculture. The findings from this study also show several important areas of reference materials as vital information sources in research for doctoral students. This will no doubt help the BCKV's and UBKV's main libraries and other departmental libraries in their use of limited budgets and funds to make far-reaching library material especially journals and books collection decisions.

8437 journal citations and 1327 book citations from 80 doctoral dissertations were analyzed. The following findings are drawn:

1. Horticulture scientists mainly use journal articles 8437 (77.796%) for collecting the required information
2. Journal articles and books both constitute 90.032% of total resources cited
3. It is stated that scientists use more foreign journals, journal articles and books for their research work than Indian one
4. Scientists prefer to publish their research works in Indian journals and also books
5. The study reveals that in journal articles team research is on the increase in the field of horticulture

Analyzing and studying dissertations assist in assessing and evaluating the quality of research scholars and output of supervisors. This study is also useful in identifying journals and books worthy of closer evaluation by librarians that are expected to be familiar with local needs as this study has generously pointed out the core journals and books in horticulture. The results of this study would be useful to the librarians and information scientists for planning, managing the library materials and services in the field of horticulture.

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