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Scientometric Mapping of Green Revolution: The Global Perspective

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Abstract

An analysis of 1165 publications published by scientists on Green Revolutions during 2005-2014 and indexed by Web of Science online Database indicates that the publication output in the Global Research Publication. The highest numbers of papers were published during the year 2014 with 175 records and the following year 2012 with 168 records there were contributions. The least number of papers was recorded during 2005 with 61 records. Overall, 3760 authors contributed 559 publications in the journal and cited reference with 46219 records of the articles.

Keywords: Green revolution, Global research

1. INTRODUCTION

The Green Revolution refers to a series of research, and development, and technology transfer initiatives, occurring between the 1940s and the late 1960s that increased agricultural production worldwide, particularly in the developing world beginning most markedly in the late 1960s. The initiatives, led by Norman Borlaug, the “Father of the Green Revolution” credited with saving over a billion people from starvation, involved the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers. The term “Green Revolution” was first used in 1968 by former United States Agency for International Development (USAID) director William Gaud, who noted the spread of the new technologies: “These and other developments in the field of agriculture contain the makings of a new revolution. It is not a violent Red Revolution like that of the Soviets, nor is it a White Revolution like that of the Shah of Iran. I call it the Green Revolution.”

This study reveals the nature of research publications in the field of Green Revolutions. Scientometric output reach activities in country wise through the study are estimated. Now days, research depicts much interest in publishing the articles in the field of Science. Green Revolution is a multidisciplinary subject that employs and develops theories and methods for the investigation of Science systems. This analysis helps to identify the key issues affecting the research field. Scientometric

techniques are employed to analyze the publications Green Revolution to identify the nature and the significance of publications.

2. OBJECTIVES

The main objective of this study was to use Scientometric Mapping of Green Revolution with special reference to research activities at global level:

- i To identify and analyze the rate of growth of research productivity;
- ii To examine the Year wise distribution of publications;
- iii To note the Document wise distribution of publications;
- iv To analyze the authorship pattern and examine the extent of research collaboration
- v To identify journal wise distribution of publications;
- vi To assess the Institution wise research concentration;
- vii To identify Country – wise Collaborative Distribution of Publications;
- viii To identify the word wise distribution of publications.
- ix To test the law of metrics.

3. METHODOLOGY

Scientometric and Bibliometrics study is the examination of the frequency, patterns, chart, and graphs of citations in articles and books. This study is aimed to discuss the mapping of the Green Revolution with special reference to research activities at global level. The relevant sources and data are collected from Web of Science. Based on the available sources the following discussions were made.

4. PRINCIPAL BENEFICIARIES OF THE GREEN REVOLUTION

I. WHEAT

- i Mexico
- ii Egypt
- iii Turkey

II RICE

- i Thailand
- ii Vietnam
- iii Korea
- iv Indonesia

III BOTH

- i India
- ii China and Pakistan

5. BIO REVOLUTION COMPARED WITH GREEN REVOLUTION

TABLE 8.1 Biorevolution Compared with Green Revolution		
Characteristics	Green Revolution	Biorevolution
Crops affected	Wheat, rice, maize	Potentially all crops, including vegetables, fruits, agro-export crops, and specialty crops
Other sectors affected	None	Pesticides, animal products, pharmaceuticals, processed food products energy, mining, warfare
Territories affected	Some developing countries	All areas, all nations, all locations, including marginal lands
Development of technology and dissemination	Largely public or quasi-public sector, international agricultural research centers (IARCs), R&D millions of dollars	Largely private sector, especially corporations, R&D billions of dollars
Proprietary considerations	Plant breeders' rights and patents generally not relevant	Genes, cells, plants, and animals patentable as well as techniques used to produce them
Capital costs of research	Relatively low	Relatively high for some techniques, relatively low for others
Access to information	Restricted due to privatization and proprietary considerations	Relatively easy, due to public policy of IARCs
Research skills required	Conventional plant breeding and parallel agricultural sciences	Molecular and cell biology expertise as well as conventional plant-breeding skills
Crop vulnerability	High-yielding varieties relatively uniform; high vulnerability	Tissue culture crop propagation produces exact genetic copies; even more vulnerability
Side effects	Increased monoculture and use of farm chemicals, marginalization of small farmer, ecological degradation. Increased foreign debt due to decrease in biomass fuels and the increasing reliance on costly, usually imported petroleum	Crop substitution replacing Third World exports; herbicide tolerance; increasing use of chemicals; engineered organisms might affect environment; further marginalization of small farmer

6. ANALYSIS AND INTERPRETATIONS

6.1 Author-wise Distributions

Table 1 Shows that the Top 15 author wise distributions of publications during the study period 2005-2014 in the field of Green Revolution at Global level. The Total number of author publication in these records with 3760. The highest Productivity of publications goes to Matsuoka M with 21 (1.8%) records and followed by the Kitano H with 18 (1.5%) records. The least productivity of publications goes to Hedden P and Boulton MI with 6 (0.5%) records.

6.2 Journal-wise Distributions

Table 2 shows that the Top 15 Journal wise Distributions of publications in this highest journal of PLOS ONE with 25 records and the followed by Agricultural Economics, Proceedings of the National Academy of Sciences of the United States of America and Theoretical and Applied Genetics with 21 records of each and rest as the journal was least records.

Table 1 Top 15 Author-wise Distributions

Sl.No.	Author	Records	TLCS	TGCS	(%)
1	Matsuoka M	21	193	1215	1.8
2	Kitano H	18	181	1045	1.5
3	Otsuka K	16	38	124	1.4
4	Ashikari M	15	167	978	1.3
5	Yano M	9	28	238	0.8
6	Matsumoto T	8	20	92	0.7
7	Rahman S	8	6	31	0.7
8	[Anonymous]	8	0	0	0.7
9	Asano K	7	60	193	0.6
10	Erenstein O	7	3	37	0.6
11	Jia JZ	7	19	30	0.6
12	Qian Q	7	89	748	0.6
13	Wakatsuki T	7	2	8	0.6
14	Boulton MI	6	37	77	0.5
15	Hedden P	6	36	120	0.5

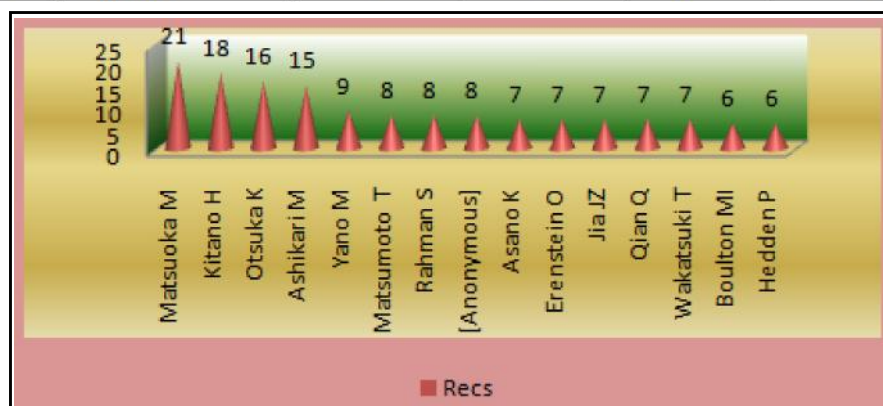


Fig.1 Top 15 Author-wise Distributions

Table 2: Top 15 Ranking of Journals According to Bradford's Distribution

Sl. No.	Journal	Records	R	%	TLCS	TGCS	TGCS
1	Plosone	25	1	4.47	0	134	71
2	Agricultural Economics	21	2	3.76	28	186	22
3	Proceedings of the National Academy of Sciences of the United States of America	21	2	3.76	75	1532	19
4	Theoretical And Applied Genetics	21	2	3.76	35	389	53
5	Plant Physiology	19	3	3.40	64	289	34
6	Molecular Breeding	18	4	3.22	15	84	33
7	Euphytica	17	5	3.04	20	267	14
8	Journal of Experimental Botany	16	6	2.86	40	276	27
9	Field Crops Research	13	7	2.33	7	121	15
10	Crop Science	12	8	2.15	11	89	12
11	Food Policy	12	8	2.15	8	131	15
12	Agricultural Systems	11	9	1.97	8	145	11
13	Journal Of Development Studies	11	9	1.97	12	60	10
14	Plant Science	11	9	1.97	4	145	8
15	Food Security	9	10	1.61	14	87	10

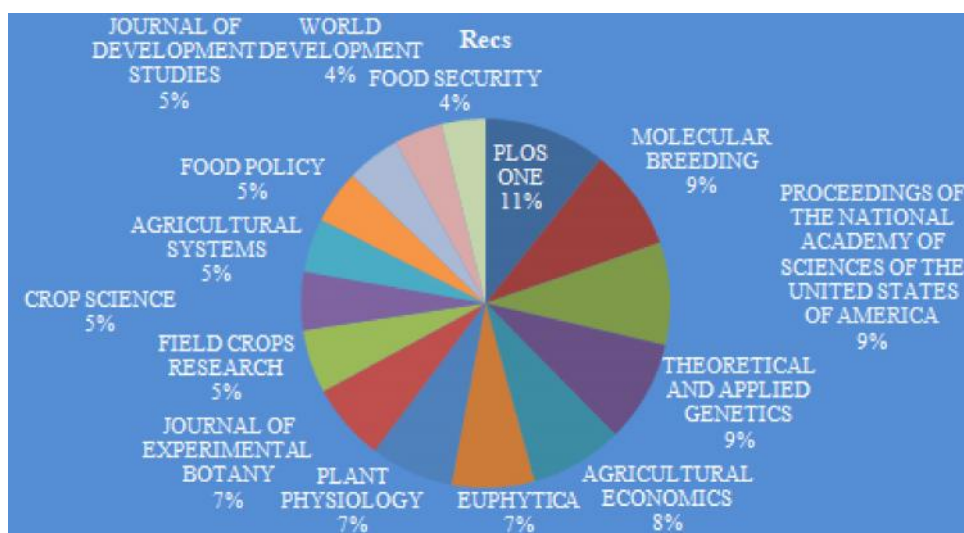


Fig.2 Top 15 Journal-wise Distributions

6.3 Words-wise Distributions

Table 3 shows those Top 15 Words wise Distributions in the highest publication of words Green and Revolution

Table 3 Top 15 Words-wise Distributions

Sl.No.	Word	Records	TLCS	TGCS
1	Green	244	281	1803
2	Revolution	239	301	1979
3	Rice	184	280	1841
4	Wheat	95	151	1278
5	Plant	78	87	655
6	Agricultural	73	31	313
7	Gene	64	132	522
8	Food	62	53	1010
9	Africa	55	70	384
10	Development	55	37	500
11	India	53	25	220
12	Agriculture	50	29	793
13	Analysis	49	50	370
14	Genetic	49	49	535
15	Crop	44	35	883

6.4 Yearly-wise Distributions

Table 4 Shows that Yearly wise distributions during the year 2006-2014. The highest publication of records with 175 in the year 2014 and least records of publication with 61 in the year 2005. The calculation with the variance and Standard Variations in 134463.9 and 366.69.

with 244 and 239 records. The Least publications of words Crop with 44 records.

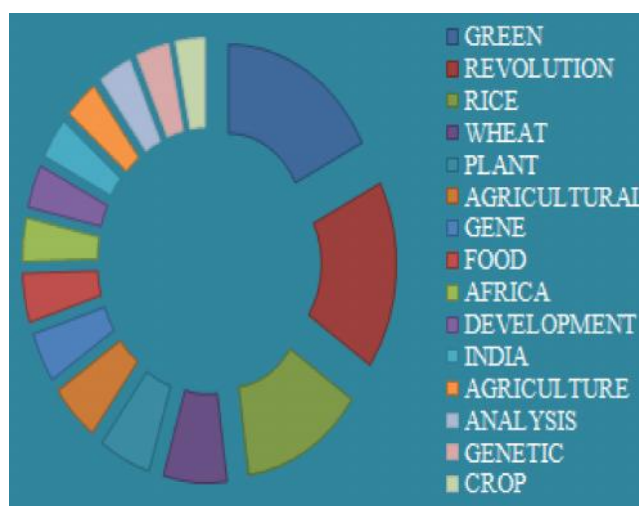


Fig.3 Top 15 Words-wise Distributions

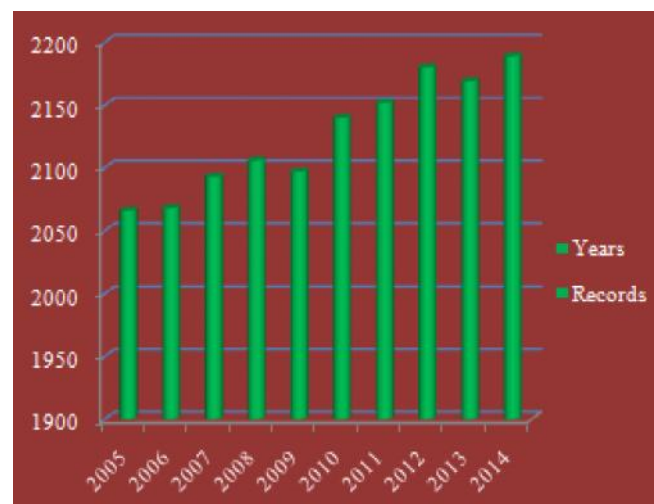
The Table 5 reveals the Exponential Growth rate of over all publications on Green Revolution during ten years. An exponential growth rate in number of publication was observed during 2005 to 2014. The highest growth rate (1.48 %) was found during 2009 with 88 publications followed by (1.39 %) with 62 publications during 2006 and least growth rate (0%) was found during 2014 with 175 publications followed by (0.9%) was found during 2008 with 98 publications.

Table 4 Yearly-wise Distributions

Sl.No.	Publication Year	Records	TLCS	TGCS	D	D ² /n	Variance	S.D (σ)
1	2005	61	153	1665	-244	59536	134463.9	366.69
2	2006	62	175	1562	-186	34596		
3	2007	86	163	1689	-172	29584		
4	2008	98	94	1749	-98	9604		
5	2009	88	107	1598	0	0		
6	2010	130	95	1685	130	16900		
7	2011	141	137	1547	282	79524		
8	2012	168	85	1064	504	254016		
9	2013	156	47	531	624	389376		
10	2014	175	8	121	875	765625		
	Total	1165			1715	1638761		

Table 5 Exponential Growth Rate in Number of Publication Was Observed During 2005 to 2014

Sl.No.	Publication Year	Records	Growth Rate
1	2005	61	1.02
2	2006	62	1.39
3	2007	86	1.14
4	2008	98	0.9
5	2009	88	1.48
6	2010	130	1.09
7	2011	141	1.19
8	2012	168	0.93
9	2013	156	1.12
10	2014	175	0
	Total	1165	10.24

**Fig.4 Yearly-wise Distributions of Publications**

6.5 Document-wise Distribution of Publications

Table 6 shows that the major portions of publications covered by Web of Science databases on Green Revolutions results in Article with 835 (74.16%) and

followed by the Review 128 (11.37%). The minor portions of publications covered by web of science on green revolutions results in Biographical-Item and Reprint with 2 (0.18%).

Table 6 Document-wise Distributions

Sl.No.	Document Type	Records	TLCS	TGCS	Perc(%)	Cum.Perc(%)
1	Article	835	818	9547	73.5	73.5
2	Review	132	139	3435	11.3	84.8
3	Editorial Material	58	32	351	5.0	89.8
4	Book Review	44	0	1	3.8	93.6
5	Article; Proceedings Paper	39	28	604	3.3	96.9
6	Review; Book Chapter	8	6	171	0.7	97.6
7	Article; Book Chapter	6	3	104	0.5	98.1
8	Letter	6	2	13	0.5	98.6
9	Meeting Abstract	6	0	0	0.5	99.1
10	News Item	6	0	0	0.5	99.6
11	Biographical-Item	2	1	1	0.2	99.8
12	Reprint	2	0	0	0.2	100
	Total	1165			100	

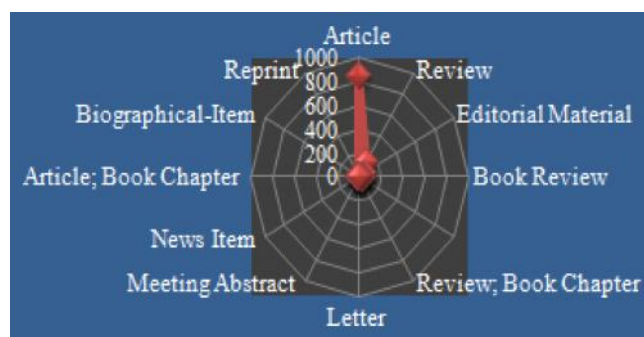


Fig.5 Document-wise Distributions

*TLCS-Total Local Citation Scores

**TGCS – Total Global Citation Scores

6.6 Language-wise Distributions

Table 7 Shows that language wise distribution, among the languages English language ranks first with 1101 records and followed by the French and Spanish language with 9 records each.

Table 7 Language-wise Distributions

Sl.No.	Language	Records	TLCS	TGCS
1	English	1139	1029	14207
2	French	9	0	3
3	Spanish	9	0	4
4	German	3	0	4
5	Portuguese	3	0	5
6	Chinese	1	0	4
7	Czech	1	0	0

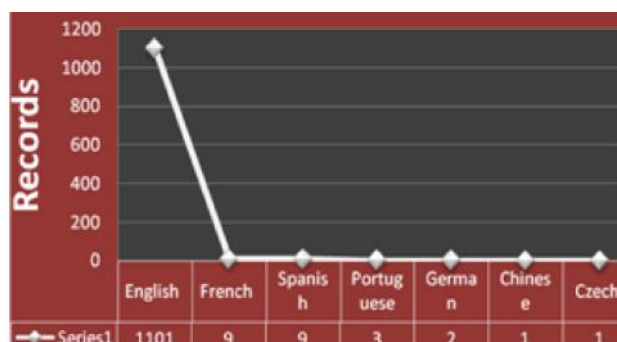


Fig.6 Language-wise Distributions

6.7 Country-wise Distributions

Table 8 shows that the country wise distributions among the USA with 317 records and the followed by the People R China 155 with records as well as follows.

Table 8 Country-wise Distributions

Sl.No.	Country	Records	TLCS	TGCS
1	USA	320	247	4964
2	Peoples R China	155	173	2061
3	UK	136	138	2010
4	Unknown	120	111	1076
5	Japan	102	261	1992
6	India	97	38	757
7	Australia	59	83	855
8	Germany	46	24	734
9	France	42	21	859
10	Canada	39	12	563
11	Netherlands	31	20	591
12	Italy	30	14	346
13	Philippines	30	17	305
14	Mexico	21	30	432
15	Spain	20	3	136

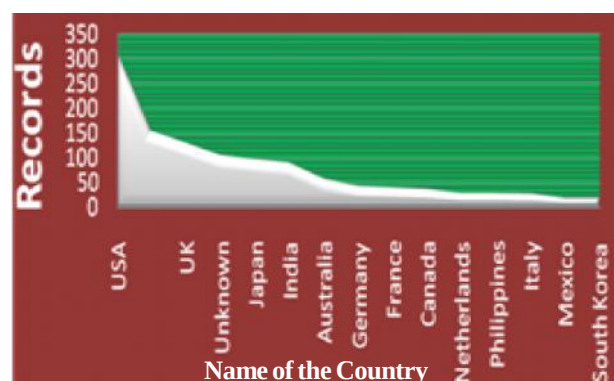


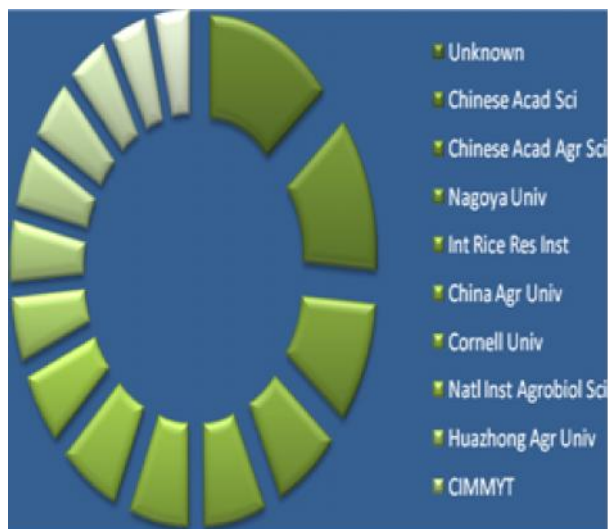
Fig.7 Country-wise Distributions

6.8 Institution-wise Distributions

Table 9 shows that institution wise distribution among the Chinese Academic Science with 41 records and the followed by Chinese Academic Agricultural Science with 32 records as well as follows.

Table 9 Top 15 Institution-wise Distributions

SL.No.	Institution	Recs	TLCS	TGCS
1	Unknown	50	9	75
2	Chinese Acad Sci	44	80	743
3	Chinese Acad Agr Sci	32	53	658
4	Nagoya Univ	26	196	1248
5	Int Rice Res Inst	24	19	434
6	Cornell Univ	22	11	431
7	China Agr Univ	21	19	297
8	Natl Inst Agrobiol Sci	19	72	496
9	Huazhong Agr Univ	17	15	219
10	Wageningen Univ	16	14	420
11	CIMMYT	15	35	345
12	USDA ARS	15	10	283
13	Michigan State Univ	14	18	316
14	Int Food Policy Res Inst	13	22	112
15	Rothamsted Res	13	41	275

**Fig.8 Institution-wise Distributions**

7. FINDING AND CONCLUSION

During the period (2005-2014) 1126 articles were published which are indexed in Web of Science. Overall, 3760 authors contributed 559 publications in the journal. The authorship pattern of Scientometric Mapping of Green Revolution: The Global Perspective identified that majority of papers authored. This study has highlighted quantitatively the contributions made by the Scientometric Mapping of Green Revolution: The Global Perspective researchers during 2005-2014 as reflected in Web of

Science database. During 10 years period (2005-2014) contributions in terms of number of publications is significant. WOS is useful for researchers, administrators, policy makers, editors, librarians and analysts for their respective nature of work.

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