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Mapping of Research Output in Food Economics:A Scientometric Ananlysis

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Abstract

A tiny attempt is taken to investigate the research performances in the area of Food Economics based on the Scientifics measure as called Scientometrics. As per web of science data collection, a total of 3213 data has been gathered through key word searching from 1975 to 2020 (August). A remarkable finding was retrieved under the analysis of Publication Impact and Citation Impact from the following categories such as Year wise, Country wise and Institutional wise. In the year 2019, the highest research contribution of 286 was recorded, but it was purely opposite in the citation impact by 2329 as in decreasingly. In the view of the country level impact, the three more countries such as USA (42.9%), UK (11.8%) and Australia (6.3%) have been reflected as the top by receiving global citations of 43221, 13314 and 6143 from their output of 378,378 and 202 respectively.The meaningful contributions have been recorded from Indian publications with 3.2% in total publications which was reflected as 1819 in total global citations. Cornell University was the highest publication witnessed by 62 followed by INRA (48), University of Minnesota (47). This publication seems that the growth rate is fluctuating vice versa instead of neither constant nor gradually increasing between periods of research in the research forum.

Keywords: Publication Impact, Citation Impact, Research Collaboration, Scientometrics, Food Economics.

Introduction

The availability of food, storage and safety are major issues in the 21st century, especially in maintaining the food for the next generation is an acute problem. (Mitsuda, 1999).According to Modified Atmosphere Packaging (MAP), the storage of real time tested food without affections of synthetic chemical preservations is increasing the demand for the present life for all living things (Grunert, 2005, Okpala et.al., 2016 and Pillay et.al,.2018).Each country has a own system in firming and preparing agricultural food according to their culture with the help of latest technology. Due to insufficiency of food availability or awful food availability, the diseases would be rose against natural life system. Different category of causes such as chronic disease, resource depletion, environmental circumstances, infection, disease and poverty have threatened continuously global public health (Dominique,et.al.,2019).

Therefore the present study is going to observe the best solutions and innovative idea of the scholarly communication in the scientific literature of Food Economics through the different format such as article, proceedings, letter, book and etc.Most of the research contributions

depend from the journal, which is considered as the main source for evaluating to find quantity as well quality in the research publications as per availability of data from Web of Science, Scopus, PubMed, and Google Scholar. Those databases are to be evaluated by applying the scientific method is called Bibliometric or Scientometric to identify the quality of research output from country's total production (Cristian, et.al., 2014) in the proper manner. In the current scenario, Scientometrics plays an essential role in evaluating the bibliographic database and help to make decision policy (Mingers & Leydesdorff,2015 and John Kearney, 2010). Hence, the special attention of world scholar and experts likely will further increase in the field of Food Economics.

Purpose

The cardinal purpose of this study is to evaluate in the following pointed out to understand the research growth status as reorganization of weakness and strengths in quality output.

1. To find out the year-wise research output & Citation Impact
2. To extract average citation per year & per article
3. To measure the county's research contribution & Citation
4. To ascertain the research collaboration network among country
5. To find the average per article in the country level publication
6. To identify the institutional wise production& citation impact

Data Collection & Analysis Design

A total of 3213 data of Food Economics was gathered from 1989 to 2020 (August) as per database of Web of science by keyword searching about Food Economics in the following categories of the Journal, Author, Institution, Country and Chronicle, which are ordered based on the publication output and these citations and it was examined and highlighted graphically with the support of MS excel, Hitscite, Biblioshiny and VosViewer. The summary of the data collection report has been tabulated elaborates below as follows.

Table 1.Summary of Data Collection

Category	Output
Total Records	3213
Total Authors	9274
Total Journals	1292
Total Cited Reference	138008
Average years from publication	8.7
Average citations per documents	24.3
Average citations per year per doc	2.622
Keywords Plus (ID)	7507
Author's Keywords (DE)	8399
Authors of single-authored documents	651

Authors of multi-authored documents	8623
Documents per Author	0.346
Authors per Document	2.89
Co-Authors per Documents	3.45
Collaboration Index	3.45

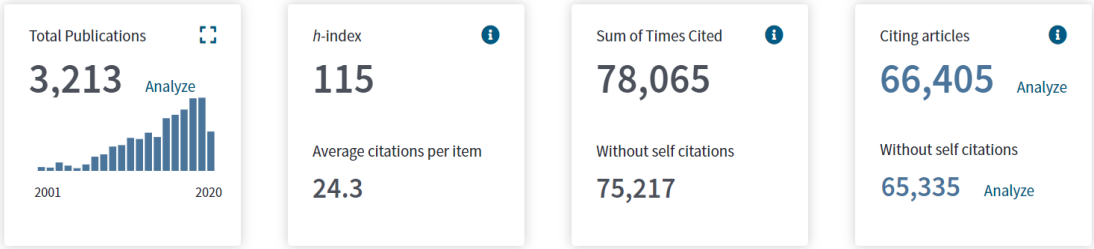

Figure 1.Citation Impact on Total Publications

Statement of Problem

This study came to observe from the present situation that all irrespective hungry peoples around the world especially in India (Banik,2016) are being affected in their health by heavy prices on materials and malnutrition (Derek and Harold,2019)different categories of disease due to insufficient of quality food (Sultan,2014). Most of the experts, physicians and very most senior citizens have suggested and recommend that consuming of food should be a natural originality cent percentage according to availability of agricultural materials.

This study is going to reflect the level of awareness of the expert's mentality through their publication of research contribution on Food Economics in the different manner. A growth of the country is purely belonged to innovative thinking in research and development activities. The application of scientific Scientometrics tools in the field of Food Economics is to measure the quality of the total research contribution in the global level.

Review of Literature

This study referred many senior research publications according to current situational topic. Out of them a few literature has been selected based on the Scientometrics evaluation, which was arranged chronically order as follows.

The research output of Indian authors has been revealed with global citations from 1975 to 2014 in the field of Food Technology as per statement of Vinitha, et.al.,2016. In the year of 2010-2014, the research outcomes have been placed as higher than other years. In the view of Institutional performances was that the Central Food Technology and Research Institute were received TLCS 5278 and 28104 of TGCS against their total publication of 2118 followed by the National Diary Research Institute (742), Indian Institute of Technology (612) as the most

dominated in research publication in that field. At the reviewing author productivity, the Singh was the top most position of research contribution of 205, TLCS (646) and TGCS (3748).

According to Jesus & co (2016) the co-word analysis was evaluated among research contribution of the food science through keywords with the help of the thematic cluster based on the Scientometrics tools which revealed that the structure of the corresponding map in antioxidants as greatest growth during the period of 2003 -2014.

An another excellent finding of Mixing.et.al., 2020 was that the most his findings assisted to evaluate the country and institutional wise research output. A total of 14692 research output from web of science in the field of Global Health during the 1996-2019 was examined based on the systematic of Scientometrics analysis and the following finding revealed that the USA, England, Canada, Australia and China have the most dominated in country level publication output and the top Institutional also have been recognized such as Global Health Diplomacy, Medical Education, Global Health Education and Antimicrobial Resistance.

In the analysis of research mapping between impact of research, production and impact of citations, the most suitable and relevant paper from Surulinathi, et.al.,2020 have been chosen. As per web of science data collection, a total 3678 research experiences have been evaluated from 1984 to 2020 (March) in the field of Hantavirus. The USA was top position in country level research, production as well as global citations than other countries at the same time the Sweden was in the largest number of research articles and received citations just 142 papers and one research paper of genetic Identification of a hantavirus Associated with an Outbreak of Acute Respiratory Illness by Nichol, et.al has been reflected as the most cited with 855 citations.

At the evaluating of research performance from Laksham & co, 2020, the research performed on Coronavirus was scaled in the different segment such as year, country, author, and institution between 1975 to 2020. The highest number of citations was received in year 2015 rather than the rest of this analytical period. India has a rapport collaborated with 38 foreign countries for involving research activities. The publications of research paper from the following institutions such as CSIR, DBT, UGC, USDS, DST and ICMA were the dominated performances in publications as a remarkable finding.

Data Analysis and Interpretations

The chapter on data interpretation with analysis is going to break-up the clarification through the different systematic approach such as tabular representation, graphical expression and identification of illustration towards thoroughly understanding the impact of research collaboration in the discipline of Food Economics.

I. Year wise Publication & Citation Impact

Table 2 examines the research contribution of technical papers in the field of Food Economics, totally 32 years of research publication articles has been reflected as in the form of publication impact, citation impact, per article impact, per year impact based on the number of citations since 1989 to 2020.In the publication impact as well as citation impact, the data on research publication have been ordered according to low level to high based on the chronicle. In the view of publication impact, the remarkable publications were recorded from 289,276 and 250 in the year 2018, 2019 and 2017 respectively as the dominated as other years.

The reasonable research output also has been reflected as 232,220,170,155,155,152,148,127 and 122 for the years are 2016, 2015,2013,2014,2020,2011,2012,2010, and 2009 respectively. The very lowest publications of research activities in the area of Food Economics were 9 and 4 in the 1980 and 1990.This publication seems that the growth rate is fluctuating vice versa instead of neither constant nor gradually increasing between years, which are shown clearly in figure 2.

Table 2.Year wise Publication & Citation Impact

Year	Records	TGCS	Mean TC Per Article	Mean TC Per Year	Citable Years
1989	4	1	0.25	0.01	31
1990	9	281	31.22	1.04	30
1991	32	907	28.34	0.98	29
1992	22	567	25.77	0.92	28
1993	38	1279	33.66	1.25	27
1994	33	1317	39.91	1.53	26
1995	35	1431	40.89	1.64	25
1996	34	1202	35.35	1.47	24
1997	45	1566	34.8	1.51	23
1998	34	1053	30.97	1.41	22
1999	47	1860	39.57	1.88	21
2000	38	994	26.16	1.31	20
2001	51	2501	49.04	2.58	19
2002	49	2574	52.53	2.92	18
2003	67	2839	42.37	2.49	17
2004	56	2688	48	3	16
2005	47	3420	72.77	4.85	15
2006	60	2255	37.58	2.68	14
2007	87	4454	51.2	3.94	13
2008	95	4040	42.53	3.54	12

2009	122	3944	32.33	2.94	11
2010	127	5276	41.54	4.15	10
2011	152	5588	36.76	4.08	9
2012	148	3536	23.89	2.99	8
2013	170	5858	34.46	4.92	7
2014	155	3047	19.66	3.28	6
2015	220	3823	17.38	3.48	5
2016	232	3839	16.55	4.14	4
2017	250	2741	10.96	3.65	3
2018	289	2329	8.06	4.03	2
2019	276	745	2.7	2.7	1
2020	155	102	0.66	0	0

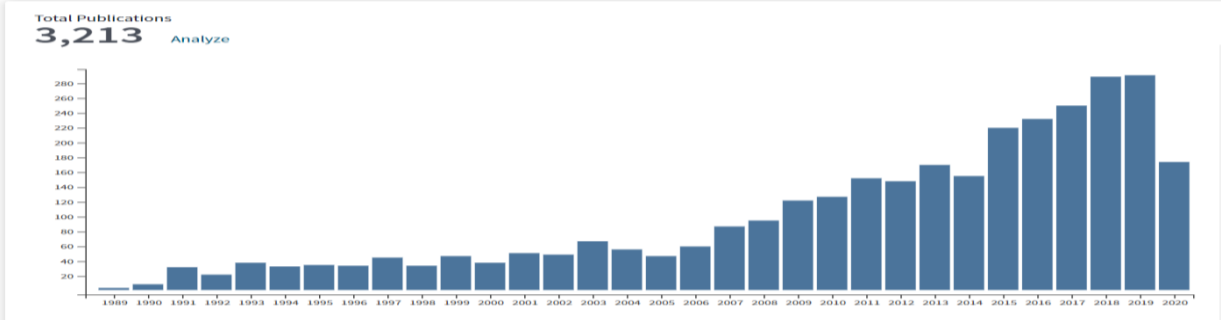

Figure 2.Year wise Publication Impact

On the other hand, of citation impact, the significant analysis has been recorded as a reflection of citation up to August 2020 at the global level in the year of 2013,2011 and 2010 by 5858,5588 and 5276 respectively. Comparative analysis between publication impact and citation impact is also observed that the highest research publication was in 2018 with 289 publications, but it was an opposite in the citation impact of 2329 as decreasingly than others.

Whereas, in the year 2013, as was the most remarkably recorded by 5858 of global citations from the publication of papers just 170 when compared to rest of the years. More than 4000 citations were recorded from year 2007 and 2008 for 87 and 95 papers. In the year of 1989, where the publication's impact (4) as well as citation impact (1) was on the bottom level of research contribution.

II. Analysis of Average Citation per Year & per Article

An average calculation of total citation per year as well as per article from the total years of publications has been evaluated as shown in table 2. The highest value of total citation per article was that 72.77 in 2005 followed by 52.53 in 2002 and 51.2 in 2007 and at the same time lowest value also was recorded in 0.25 and 0.66 in 1989 and 2020 respectively. The figure 1 represents

the quality of total publications of 3213 has been illustrated with those impacted by 78065 times in total of 66405 research articles. In addition to that the analysis also reflected through an average citation per item as 24.3 and the H-Index is 115 of the total publications from the Food Economics.

III. Geographical wise Publication Impact and Citation Impact

The strength and weakness of each and every country in their research performing has been evaluated under the two categories of publication impact and citation impact in the table No.3.The country wise research contributions have been recorded according to the highest to lowest. As expected in a result, analysis that, the three more countries such as USA (42.9%), UK (11.8%) and Australia (6.3%) have been reflected as the top by receiving global citations of 43221, 13314 and 6143 from 378,378 202 respectively. The more than 100 papers have been published from Germany (6%), France (5%), Netherlands (4.3%), Italy (4.1%), China (3.5%) and India (3.2%). In the 118 total countries, 25 countries have contributed as only 1 with 0% in the analysis report.

Table 3.Geographical wise Publication Impact & Citation Impact

S.No.	Publication Impact			Citation Impact		
	Country	Records	%	Country	Records	TGCS
1	USA	1378	42.9	USA	1378	43221
2	UK	378	11.8	UK	378	12314
3	Australia	202	6.3	Australia	202	6143
4	Canada	195	6.1	France	159	5221
5	Germany	193	6.0	Canada	195	4982
6	France	159	5.0	Germany	193	4824
7	Netherlands	138	4.3	Netherlands	138	3533
8	Italy	131	4.1	Italy	131	2914
9	Peoples R China	114	3.5	Peoples R China	114	2731
10	India	102	3.2	Sweden	62	2597
11	Spain	90	2.8	Spain	90	2171
12	Belgium	62	1.9	Switzerland	58	2129

13	Sweden	62	1.9	Belgium	62	2120
14	Switzerland	58	1.8	India	102	1819
15	Denmark	57	1.8	Denmark	57	1734
16	Brazil	51	1.6	Norway	44	1562
17	South Africa	46	1.4	South Africa	46	1390
18	New Zealand	44	1.4	Austria	28	1336
19	Norway	44	1.4	Brazil	51	1244
20	Japan	40	1.2	New Zealand	44	1173
21	Finland	33	1.0	Ireland	24	1159
22	South Korea	31	1.0	Malaysia	23	1127

In terms of citation impact measurement, analysis, the total global citation has been recorded based on the research output from each country in order to find the quality level publication of research and development activities in the field of Food Economics. The USA, UK and Australia were huge dominated as recognizing their quality of research contributions rather than other countries in the universe and it has been highlighted separately, as shown in figure 4, 5 and 6. In the view of Indian publications, the meaningful contributions have been recorded with 3.2% in total publications which was reflected as 1819 in total global citations.

The five more countries are Algeria, Bosnia Herceg, Morocco, Seychelles and Tunisia have a zero level citation has been reflected, even though, a little contribution in those countries. On the other hand, though a single contribution from the following countries, the motivations of research have been reflected enthusiastically by 218 of total global citations from Namibia followed by 238 and 203 from Jordan and Uruguay. This is found that no doubts in producing the quality of research from those countries are the best an example against all developed as well as developing countries in the world.

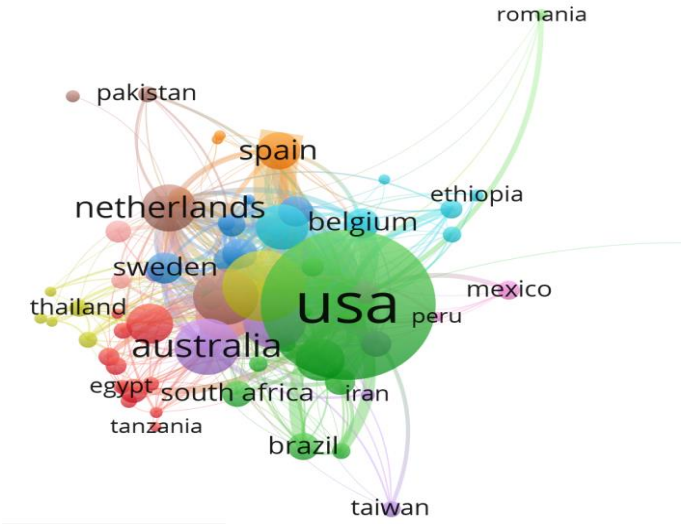

Figure 3.Country wise Citation

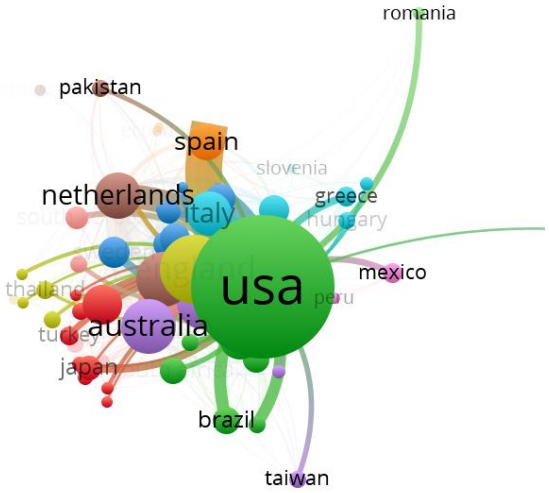

Figure 4.Citation Impact of USA

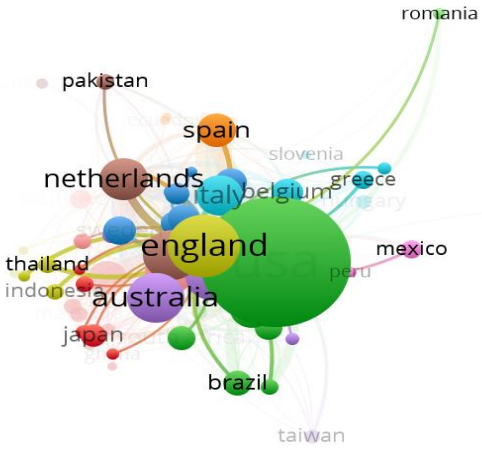

Figure 5.Citation Impact of UK

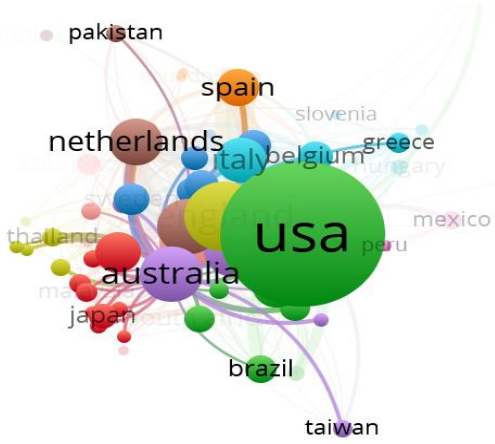

Figure 6.Citation Impact of Australia

Table 4.Country wise Collaborations Network on Publication

S.No.	From	To	Frequency
1	USA	CANADA	55
2	UNITED KINGDOM	USA	53
3	USA	CHINA	39
4	GERMANY	USA	32
5	AUSTRALIA	USA	31
6	NETHERLANDS	UNITED KINGDOM	31
7	NETHERLANDS	USA	25

8	USA	ITALY	24
9	GERMANY	UNITED KINGDOM	23
10	UNITED KINGDOM	ITALY	23
11	USA	FRANCE	23
12	UNITED KINGDOM	FRANCE	22
13	USA	SWITZERLAND	22
14	AUSTRALIA	UNITED KINGDOM	21
15	GERMANY	FRANCE	21
16	INDIA	USA	18
17	AUSTRALIA	CHINA	16
18	UNITED KINGDOM	CANADA	16
19	NETHERLANDS	BELGIUM	15
20	NETHERLANDS	GERMANY	15
21	UNITED KINGDOM	BELGIUM	15
22	NETHERLANDS	FRANCE	14
23	UNITED KINGDOM	CHINA	14
24	USA	SPAIN	14
25	AUSTRALIA	CANADA	13
26	NETHERLANDS	ITALY	13
27	GERMANY	CANADA	12
28	NETHERLANDS	SWITZERLAND	12
29	NORWAY	DENMARK	12
30	UNITED KINGDOM	SPAIN	12
31	UNITED KINGDOM	SWEDEN	12
32	USA	KENYA	12
33	USA	NEW ZEALAND	12
34	GERMANY	ITALY	11
35	ITALY	FRANCE	11
36	KOREA	USA	11
37	NETHERLANDS	SPAIN	11
38	UNITED KINGDOM	DENMARK	11
39	UNITED KINGDOM	IRELAND	11
40	GERMANY	BELGIUM	10
41	ITALY	BELGIUM	10
42	ITALY	SPAIN	10
43	UNITED KINGDOM	SWITZERLAND	10
44	USA	NORWAY	10
45	AUSTRALIA	NETHERLANDS	9
46	CANADA	FRANCE	9
47	ITALY	SWITZERLAND	9
48	NETHERLANDS	CANADA	9

49	NETHERLANDS	DENMARK	9
50	NETHERLANDS	NORWAY	9

IV. Research Collaborations between Countries

The table 4 highlights the performance of research collaboration between different countries have been listed based on their output of articles. Top of the listed countries in terms of research collaboration that USA with Canada (55) and UK to USA (53) were on the top, followed by USA-China (39), Australia – USA (31) and Netherland – UK (31) has shared their collaborations. This analysis found that the USA, UK and Netherlands have had well collaboration with many foreign countries by reflecting their contributions in cumulative total publication of 211,199,163 respectively. In this climate, India is 16th placed among top 50 countries by their collaborating networks with USA as 18 articles.

Figure 7.Country wise Collaboration Map

V. Country wise Citation per Articles

The country wise citation per articles has been evaluated in table 5. The top 50 countries have been ordered according to received citations on per their article. The analysis states that only Malaysia is in the top position by 68.71 per article citation from total citation of 962 followed by Pakistan, 41.43 from 290, Portugal 39.8 from 398 and Australia 39.63 from 753 total citations. At the considering of total received citations, USA (38679) and UK (8398) was the predominated rather than the rest of the country. The 3 more countries have been recognized in sharing equals total citations as well as citation per article from Kuwait 34 in 34, Zimbabwe 18 off 18 and Qatar 9 off 9. Qatar is the last position of publication impact and citation impact from this tabular representation.

Table 5.Country wise Average Citation per Articles

S.No.	Country	Total Citations	Average Article Citations
1	MALAYSIA	962	68.71
2	PAKISTAN	290	41.43
3	PORTUGAL	398	39.8
4	AUSTRIA	753	39.63
5	CAMEROON	37	37
6	DENMARK	1229	36.15
7	SYRIA	69	34.5
8	SRI LANKA	137	34.25
9	KUWAIT	34	34
10	NORWAY	755	31.46
11	UNITED KINGDOM	8398	30.99
12	USA	38679	30.24
13	KENYA	326	29.64
14	SINGAPORE	321	29.18
15	CHILE	271	24.64
16	GREECE	434	24.11
17	SPAIN	1379	23.78
18	NEW ZEALAND	665	22.93
19	NETHERLANDS	1668	22.54
20	HUNGARY	290	22.31
21	SWITZERLAND	689	22.23
22	SOUTH AFRICA	732	21.53
23	BELGIUM	723	21.26
24	ICELAND	42	21

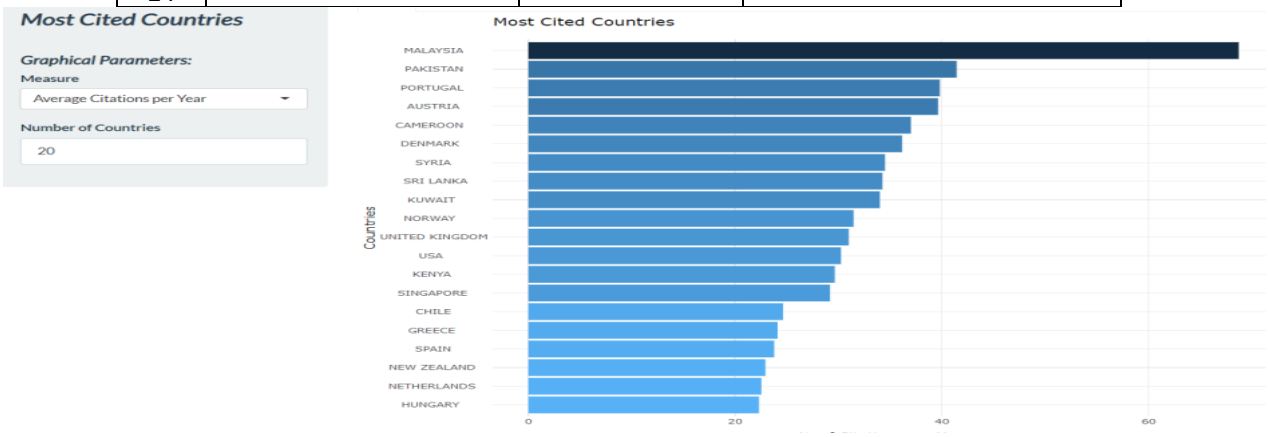

Figure 8. Most Cited Articles

VI. Institution wise Publications

In the table 6, research output of Food Economics has been measured based on the research institutions in the World. As consequently, a top 100 institutions have been listed based on their research publications out of 3113 institutions. Cornell University, USA has been as the highest publication witnessed by 62 followed by INRA, UK (48), University of Minnesota,USA (47).Two institutions, namely that Michigan State University,USA and Wageningen University,UK have shared equally position with 35.8 by more than 30 publications, 18 institutions have contributed more than 20 publications, 23 institutions have contributed more than 15 publications and more than 10 publications shared by 45 institutions.

Table 6.Institutional wise Publications

S.No.	Institution	Records	TLCS	TGCS
1	Cornell University	62	132	1582
2	INRA	48	45	1232
3	Univ Minnesota	47	45	1328
4	Michigan State University	45	29	3180
5	Wageningen University	45	23	987
6	University Florida	39	37	1117
7	University Washington	37	100	2509
8	University Connecticut	36	197	2744
9	University Illinois	36	34	709
10	University Calif Davis	35	25	1368
11	Univ Calif Berkeley	34	51	1893
12	Univ Oxford	33	14	959
13	Purdue Univ	31	28	635
14	Harvard Univ	29	54	1517
15	Int Food Policy Res Inst	29	26	1401
16	Johns Hopkins Univ	29	178	1053
17	Univ Bonn	29	27	1197
18	Columbia Univ	25	21	962

VII. Institutional wise Citation on Publications

Table 7 illustrates that finding the impact of institutional performances on their total output of receiving the globally total citations have been examined and listed at top 60 institutions have been placed. Three more universities were recognized in the producing the quality of research

output, namely Michigan University with global citation of 3180 from 45 records, University Connecticut with global citation of 2744 from 36 records and University Washington, USA with global citation of 2509 from 37 records. More than 1000 total global citations have been registered from 16 Institutions that Univ Calif Berkeley, Cornell Univ, Texas A&M Univ, Harvard Univ, Int Food Policy Res Inst, Univ Calif Davis, Univ Minnesota, INRA, Univ Bonn, UCL, SUNY Buffalo, Univ Florida, Conservatoire Natl Arts & Metiers, Johns Hopkins Univ, Univ Cambridge and Univ London Imperial Coll Sci Technol & Med.

At the examining the local citations, University Connecticut,USA with 197 was the highest contributions followed by University of Washington, USA with 100.As far as concerned Michigan University was really great in maintaining network collaboration with foreign countries than local contribution. The two countries of DuPont Cent Res & Dev Dept, and DuPont & Biosci have shared their global citations equally as 650, even though their contributions is that single and local citation is as zero.

Table 7.Institutional wise Citations on Publications

S.No.	Institution	Records	TLCS	TGCS
1	Michigan State Univ	45	29	3180
2	Univ Connecticut	36	197	2744
3	Univ Washington	37	100	2509
4	Univ Calif Berkeley	34	51	1893
5	Cornell Univ	62	132	1582
6	Texas A&M Univ	18	19	1529
7	Harvard Univ	29	54	1517
8	Int Food Policy Res Inst	29	26	1401
9	Univ Calif Davis	35	25	1368
10	Univ Minnesota	47	45	1328
11	INRA	48	45	1232
12	Univ Bonn	29	27	1197
13	UCL	16	20	1136
14	SUNY Buffalo	23	126	1124
15	Univ Florida	39	37	1117
16	Conservatoire Natl Arts & Metiers	3	50	1106
17	Johns Hopkins Univ	29	178	1053
18	Univ Cambridge	21	12	1032
19	Univ London Imperial Coll Sci Technol & Med	13	5	1030
20	Wageningen Univ	45	23	987

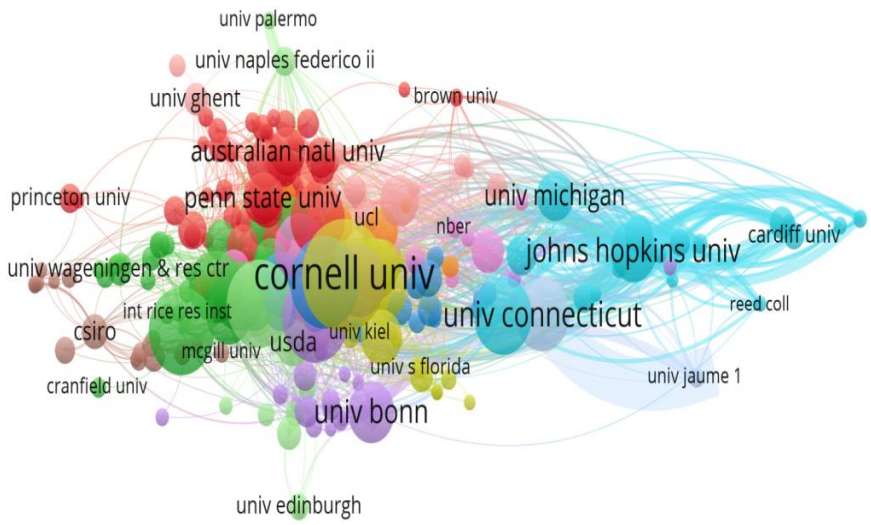

Figure 9.Institutional wise Citation Impact

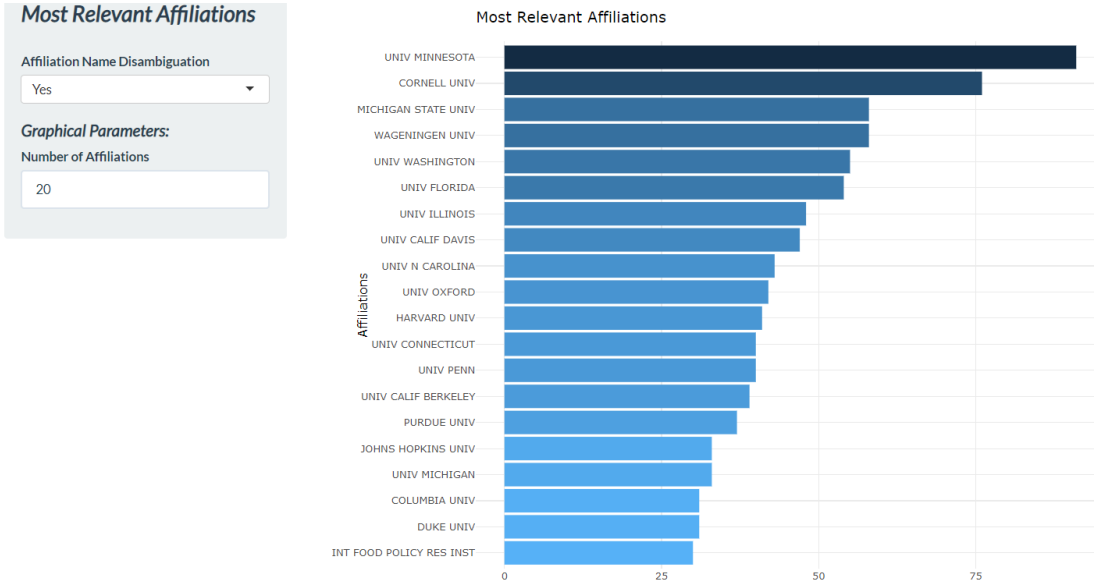

Figure 10.Most Relevant Affiliation

Finding and Conclusion

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It was very interesting to visualize the research status through the impact of quantity and quality while application of Scientometrics tools in the scientific literature of Food Economics. Based on the Web of Science data collection, a total of 3213 research productions was received from 3113 Institutions in 118 countries have been identified at the research forum. As a consequence, the following findings are stimulating for the further research.

i. This publication seems that the growth rate is fluctuating vice versa instead of neither constant nor gradually increasing between years.

ii. The strength and weakness of each and every country in their research performing has been found under the two categories of publication impact and citation impact.

iii. It is found that no doubts in producing the quality of research through global citations from the single publication by Namibia, is the best an example against all developed as well as developing countries in the world.

iv. This analysis found that the USA, UK and Netherlands have had well collaboration with many foreign countries by reflecting their contributions in cumulative total publications. In this climate, India is 16th placed among top 50 countries by their collaborating networks especially along with the USA.

v. The most of the research performance is shared by developed countries, particularly in the USA is very predominated rather than developing countries as well as developed countries.

When observing the above key findings, the following technical advice has to adopted in the strengthening the scientific research collaboration in the field of Food Economics between developed and developing countries. The mechanism of prevention system and controlling different infectious virus, and the framing the professional cultivation methodology need to long-term special attention and discussion.

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