ORIGINAL ARTICLE

Scientometrics Analysis of Biodiversity Conservation in Ethiopia from Scopus

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Abstract

The present paper is an attempt to assess the research output of biodiversity conservation in Ethiopia using the Scopus database for the period 1995-2016. The database contained 35417 publications on Biodiversity conservation. When it is specified for Ethiopia, the output becomes only 141. The study analyzed the broad features of contributions on biodiversity conservation in Ethiopia focusing on year-wise distribution of publications, relative growth rate, international collaboration of contributors, highly productive institutions, contributions from the specific subjects and to the journals, wherein they contributed are analyzed.

Keywords: *Biodiversity, Conservation, Scientometrics, Scopus, Relative Growth Rate.*

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INTRODUCTION

Information is the result or product of processing data. It leads to unearthing knowledge or intelligence. This knowledge in turn leads to innovation or development. Such innovation or development brings in further information which adds to the earlier knowledge, which helps further development. This is the technological development life cycle which plays a vital role in the growth and sustenance of any R&D environment (Knowledge flow project, 2003). Science and technology play a significant role in the overall development of a country. An important and tangible component of studies in information studies is citation analysis, bibliometrics, scientometrics, webometrics and almetrics. The term 'Scientometrics' was originated from a Russian word (naukometriya) and coined by Vassily V. Nalimov and Z. M. Mulchenko in the year 1969. This term is mainly used for the study of all aspects of the literature of science and technology. The term had gained wide recognition in the year 1978 by the foundation of the journal 'Scientometrics' by Tiber Braun in Hungary. According to its subtitle, Scientometrics includes all quantitative aspects of the science of science, communication in science and science policy. Scientometricians explain about input and outputs resource in terms of organizational structure. They develop benchmarks to evaluate the quality of information resources and packages of information for decision making in science. It provides a key opportunity to the researcher to publish their articles with new strategies, innovations, new methods and new ideas (Nattar, 2009).

Biodiversity education begins with learning about all living species on Earth and their relationships to each other. This includes the differences in genes, species and ecosystems. It also refers to the comprehensive umbrella term for the degree of natures variety or variation within the natural system; both in number and frequency. In general, it refers to the variety of all forms of life on earth like the different plants, animals, micro-organisms, the genes they contain and the ecosystem. The manifestation of biodiversity is the biological resources (genes, species, organisms, ecosystems) and ecological processes of which they are part. Having many different living things allows nature to recover from change. If too much biodiversity is lost, there is a problem because we depend on it to survive. Ecosystems, for instance, are extremely important because they carry out processes such as producing oxygen and cleaning soil and water (Mutia, 2009).

Humans use at least 40,000 species of plants and animals every day and rely on biodiversity for many things, including food, medicine and clothing. Biodiversity conservation incorporates the preservation, maintenance, sustainable use (conservation), recovery and enhancement of the components of biological diversity. Conservation is the sustainable use of resources and encompasses protection as well as exploitation and Preservation is an aspect of conservation meaning to keep something without altering or changing it. The intent of biodiversity conservation as strategy in different countries encompass to protect and improve ecological integrity and long-term viability of the landscapes; to reinstate ecosystems that have been differentially lost in locations where this will meaningfully contribute to stemming species declines and reinstating critical ecological processes (such as pollination); and to ensure the long-term persistence of species and ecosystems at immediate risk of extinction in the wild. The actions

required to implement this work are specific to individual species and ecosystems, but typically focus on increasing distribution and the more pervasive threats to the climate change and new invasive species also. The publications by different researchers empirically describe the constantly changing relationships between science, technology and the market. They forecast productivity of scientists, so that dynamics of scientific research and technological development can be understood. This consequently sheds more light on our knowledge of the structure of subject of literature and better organization of information resources which can ultimately be effectively used. Today's threats to species and ecosystems are the greatest recorded in recent history and virtually all of them are caused by human mismanagement of biological resources often stimulated by misguided economic policies and faulty institutions (Xu, G etal, 2017). Hence many research articles are published on biodiversity conservation as it is the most important aspect for the livelihood of the human being. In this research an attempt has been made by the researcher to reveal the trends towards the biodiversity conservation in Ethiopia by using the Scopus database from 1995 to 2016, which covers quality of research articles in Science discipline.

Scopus Database - Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. Delivering a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, and arts and humanities, Scopus features smart tools to track, analyze and visualize research across all research fields—science, mathematics, engineering, technology, health and medicine, social sciences and arts and humanities. It delivers a broad overview of global, interdisciplinary scientific information that researchers, teachers and students need to stay informed. It covers over 18,000 titles, which include mostly peer-reviewed journals, books series, and conference proceedings that feature scientific, medical, technical and social science topics from more than 5,000 international publishers. This database also contains over 23 million patent records and Scrius a scientific web page search. Scopus provides users the option to access article reference citations and to perform cited reference searching. Scopus also provides an article's bibliography and links to articles that have cited the original article. As research becomes increasingly global, interdisciplinary and collaborative, you can make sure that critical research from around the world is not missed when you choose Scopus. (www.scopus.com)

Scientometrics is the science about science, and as an academic field, it has established lines of inquiry, methodologies and a distinct identity. It is a discipline which analyses scientific publications to explore the Structure and growth of science. According to A. F. J. Van Raan (1997) Scientometrics applies the bibliometric techniques to science and examines the development of the sciences. Main areas of Scientometrics are individual scientific documents, authors, scientific institutions, academic journals and regional aspects of science. It developed out of work by prominent researchers including Robert King Merton, Derek J. de Solla Price and Eugene Garfield (Price, 1963; Garfield, 1972; Merton, 1973, 1976; Garfield, 1979). There are two general scientometric approaches viz i) Normative and ii) Descriptive (Neufeld et al., 2007).

The purpose of the normative perspective is to establish norms, rules and heuristics to

ensure a desirable discipline progress. In contrast, the objective of the descriptive approach is to observe and report on the actual activities of the field's scholars. In this project, the descriptive method is followed since it fits better with a quantitative analysis of scientific publications. It is noted, however, that the line between the normative and descriptive paradigms is blurred. There are a number of reasons why researchers may want to conduct a descriptive scientometric study of a particular academic area (Straub, 2006). Among them, the most critical issue is an attempt to understand the identity of a scientific discipline. In fact, despite a continuous growth of the body of knowledge, it is useful to pause from time to time and engage in a retrospective analysis of the discipline itself to answer important questions (Holsapple, 2008). We may want to know, for example, what topics we study, what methods we use, who lead our research, how we collaborate, in what outlets we publish, how we perceive the quality of our journals, etc. In other words, descriptive scientometric projects explore the entire intellectual core of a scientific domain instead of concentrating on its individual works (Sidorova et al., 2008).

Country, institutional and individual-level research productivity has been a traditional focus of scientometric projects (Manning and Barrette, 2005). As the competition for funding, faculty and students becomes increasingly more globalized, a scientometric analysis of national productivity becomes critically important. The volume and impact of academic publications are believed to reflect the nation's scientific wealth and lead to economic development (King, 2004). Understanding which countries develop or exploit competencies within the biodiversity conservation allows researchers, academics and prospective students to develop their careers strategically. It may also affect the decisions of international granting agencies or private sector companies looking for countries with knowledge-intensive economies. Gunasekaran & Balasubramani (2012) studied and analysed the artificial intelligence research output, carried out during the year 1973-2011 with different parameters including authorship pattern, growth, rank with global publication, institutions contribution, most productivity journals were analysed. Scoups citation database has been used to retrieve the data for 39 years (1973-2011) by using the keywords (Artificial, Intelligence, Neural networks). The profile of India research output was compared with other countries by the help of scientometrics technique. During the study period a total of 228 papers were published by authors. Analysis report shows that India ranks at 1st position among the top 17 countries with 219 (96.05%) papers. The Indian research output delivered very slightly decreases in the year 1973 and gradually increased every year. The journal of Expert Systems with Applications was the first among 147 journals published in the articles. The Indian authors Kulkarni BD, Patnaik PR have been published 7,6 respectively with 1st & 2nd rank among the authors contribution.

Pouris (2011) provided an analysis of scientometric research in South Africa and discussed the sources of growth in the country's research literature in general. South Africa is identified to have limited expertise in the field revealed mainly during the last decade. However, the country is ranked 21st in the world among the countries publishing in the journal Scientometrics and it is the only African country with such a standing in the field. Identification of the forces affecting

positively the growth in the number of research publications in the country indicates that the primary incentive fuelling the recent growth is the new funding formula in the country which subsidizes the universities by more than R100 000 for each publication that their staff produces. The increase in the number of journals indexed in the ISI Thomson Reuters database and the incorporation of social sciences at the NRF have also affected the growth of research publications, but to a lesser extent. Karpagam, R and others (2011) have studied and analysed the growth pattern of Nanoscience and Nanotechnology literature in India during 1990-2009 (20 Years). The Scopus Database has been used to identify the Indian contributions on the field of Nanoscience and Nanotechnology. The study measures the performance based on several parameters, Country annual growth rate, Authorship pattern, Collaborative index, Collaborative coefficient, Modified collaborative coefficient, Subject profile, etc. Further, the study examined National publication output and impact in terms of average citations per paper, International collaboration output and share, contribution and impact of Indian institutions and impact of Indian journals. Surwase and others (2014) studied on research trends on food preservation using scientometric analysis. The present study has aimed at analysing the global publication trends on food preservation using Scopus database for the period 1998-2012. The database contained 17511 publications on food preservation. The study analysed the broad features of literature on food preservation focusing on year-wise distribution of publications, highly productive countries, international collaboration, activity index, highly productive institutes, methods of food preservation, preservation by food types, and channels of communication.

Objectives of this study

The main objective of the study is to update the information available on biodiversity conservation in Ethiopia and present the growth of literature and make the quantitative assessment of it by way of analysing the following aspects of research output:

- To examine the total number of articles published on Biodiversity conservation and in particular in Ethiopia from 1995 to 2016.
- To examine the different types of documents wherein they are published.
- To find out the different types of sources in which they are published.
- To find out the authors and their contributions.
- To sketch the subject area distribution of contribution.
- To find out the source titles published articles on biodiversity conservation in Ethiopia from maximum to minimum.
- To find out the contributions made by different types of organizations.

Scope of this study

The study has been made to analyse the contributions for biodiversity conservation in Ethiopia for the period 1995 to 2016 from Scopus database.

METHODOLOGY

The data pertaining to biodiversity conservation in Ethiopia for the period 1995 to 2016 from Scopus database is collected by using searching mechanism using the keywords as “Biodiversity conservation” in “Ethiopia”. The total number of contributions is 141 in the Scopus database, a proprietary product of

Elsevier is used for the study. Publications classified as articles, conference paper, editorial material, letter and note etc. were also considered for the study. After searching, all the records were imported toMS Excel file, analyzed and tabulated for making observations. All the data were subsequently examined, observed, analysed and tabulated for making observations.

RESULTS

This study analyzed about the biodiversity conservation in Ethiopia output as a measure to observe the growth rate. Further, it is a resolute to observe the performance of various discipline of scientific research. Bibliographic data is drawn from the contributions on biodiversity in Ethiopia listed in Scopus covering the period 1995–2016, and numbering 141 were analyzed to study the pattern of productivity.

Year wise Analysis

The data has been collected from 1995 to 2016 for 22 years from Scopus database.

Table 1 shows the distribution of contributions year-wise. It portrays 141 contributions, of 13.47%, the maximum has been contributed in 2016, 12.05% were contributed in 2013, 11.34% in 2014, 10.63% in 2012, 8.51% in 2011, etc. and the least as 0.7% in each of years 1995, 1997, 1998, 2000 and 2004 and there is no publication in 1996 and 1999. It is inferred from the table of distribution of contributions from 1995 - 2016 that the level of the percentage of distribution is not constant. A notable attribute of the study is that the year 2016 shows the maximum number of contributions.

Table 1. Distribution of contributions year-wise

Year	No. of contributions	Percentage (%)	Cumulative contributions	Cumulative Percentage (%)
1995	1	0.7	1	0.7
1996	0	0	1	0.7
1997	1	0.7	2	1.41
1998	1	0.7	3	2.12
1999	0	0	3	2.12
2000	1	0.7	4	2.83
2001	**4**	2.83	8	***5.67***
2002	3	2.12	11	7.8
2003	2	1.41	13	9.21
2004	1	0.7	14	9.92
2005	7	4.96	21	14.89
2006	6	4.25	27	19.14
2007	3	2.12	30	21.27
2008	**9**	6.38	39	***27.65***
2009	2	1.41	41	29.07
2010	10	7.09	51	36.17
2011	12	8.51	63	44.68
2012	15	10.63	78	55.31
2013	**17**	12.05	95	67.37
2014	16	11.34	111	78.72
2015	11	7.8	122	***86.52***
2016	19	13.47	141	100
Total	**141**	**100**		

For the analysis (1995-2016) of 22 years, first seven years (1995 to 2001), the cumulative percentage value is just 5.67; the year 2001 has highest publications among the first seven years; in the second seven years (2002 to 2008), the cumulative percentage is 27.65; the year 2008 is having the highest distribution of publication; and in the third seven years (2009 to 2015) having 86.52 percents of publications and its actual percents level is 51.87 percents, the year of 2013 having highest contribution of publications. The publication growth rate has 0.07 at the year of 1995 and it has risen at the year of 2015 is 7.8; it indicates the growth rate is increased manifolds. In the year 2012 (18th year) only reached the half of the publications output in taken sample data, it means the last decade having the revolution of publication for their research output on Biodiversity conservation in Ethiopia.

Table 2 shows the distribution of contributions in different types of document types like articles (115), reviews (8), books (6), book chapters (5), conference papers (4), articles in press (2) and Note (1). It is below with the number of contributions in each:

Table 2. Document Types

Document Type	Total Nos.
Articles	115
Reviews	8
Books	6
Book Chapters	5
Conference Papers	4
Article in Press	2
Note	1
Total	**141**

The data has also been collected from the Scopus database regarding the sources, where the contributions were made. The following pie chart (Fig.1) shows the distribution of the sources:

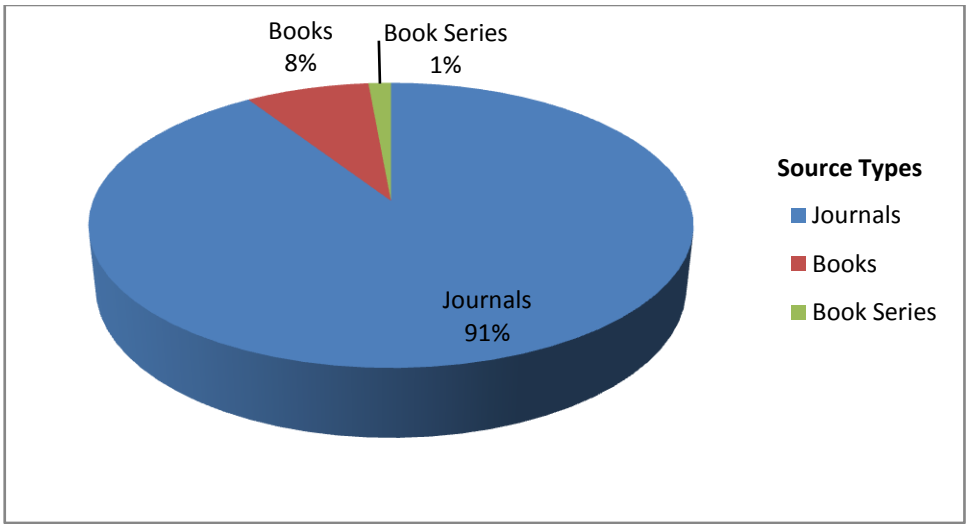

Fig. 1: *Source Types*

Relative Growth Rate and Doubling Time study

The analysis of growth rate for biodiversity conservation in Ethiopia's research output is one of the important aspects of discussion. This analysis aims to identify the trends and growth of prospects in the present research. However, proliferation of literature has made it extremely difficult for researchers / scientists to keep in touch with the recent advances in their fields. Hence the provision of information to

information seekers is the prime duty of library professionals, who have to meet the information needs of researchers / authors in various disciplines. In this connection, the published literature is taken as a target to measure the knowledge in a discipline, and the growth rate study of publications would provide some useful results. The rate of growth of literature on biodiversity conservation in Ethiopia is determined by calculating relative growth rates (RGR) and doubling time (Dt) of the publications.

RGR is a measure to study the increase in number of articles of time (Mahapatra, 1985) and the Dt is directly related to RGR. It is the time required for articles to become double of the existing amount. The following Table 3 represents the chronological distribution, RGR, Dt, and mean of RGR and Dt of biodiversity conservation in Ethiopia's research during the periods of 1995- 2016. It is observed that the mean RGR for the first seven years is 0.19 and the Dt is 0.08 years, for the second seven years it is 0.79 and 1.81 years, for the third seven years it is 0.35 RGR and 7.06 years respectively. Dt is the period of time required for a quantity to double in size or value. Hence it can be seen that the Dt is increased (22 times) during the 2002-2008 and become four times during 2009-2015. When the RGR is constant, the quantity undergoes exponential growth and has a constant Dt or period which can be calculated directly from the growth rate.

Table 3. Relative growth rate and doubling time for the research output of biodiversity conservation in Ethiopia

Year	No. of contributions	Exponential Growth rate	*loge1p*	*loge2p*	RGR	Mean	Dt	Mean
1995	1	-	-	0	-	0.19	-	0.08
1996	0	0	0	0	0		0	
1997	1	0	0	0	0		0	
1998	1	1	0	0	0		0	
1999	0	0	0	0	0		0	
2000	1	0	0	0	0		0	
2001	4	4	0	1.39	1.39		0.5	
2002	3	0.75	1.39	-0.28	1.11	0.79	0.62	1.81
2003	2	0.67	-0.28	-0.40	0.12		5.75	
2004	1	0.5	-0.40	-0.69	0.29		2.39	
2005	7	7	-0.69	1.95	1.26		0.55	
2006	6	0.86	1.95	-0.15	1.8		0.39	
2007	3	0.5	-0.15	-0.69	0.54		1.28	
2008	9	3	-0.69	1.1	0.41		1.69	
2009	2	0.22	1.1	-1.51	0.41	0.35	1.69	7.06
2010	10	5	-1.51	1.61	0.1		6.93	
2011	12	1.2	1.61	0.18	1.43		0.48	
2012	15	1.25	0.18	0.22	0.04		17.35	
2013	17	1.13	0.22	0.12	0.1		6.93	
2014	16	0.94	0.12	-0.07	0.05		13.86	
2015	11	0.68	-0.07	-0.39	0.32		2.17	
2016	19	1.72	-0.39	0.54	0.15		4.62	
	141							

The exponential growth rate (Fig. 2) is shown below as line diagram for clarity:

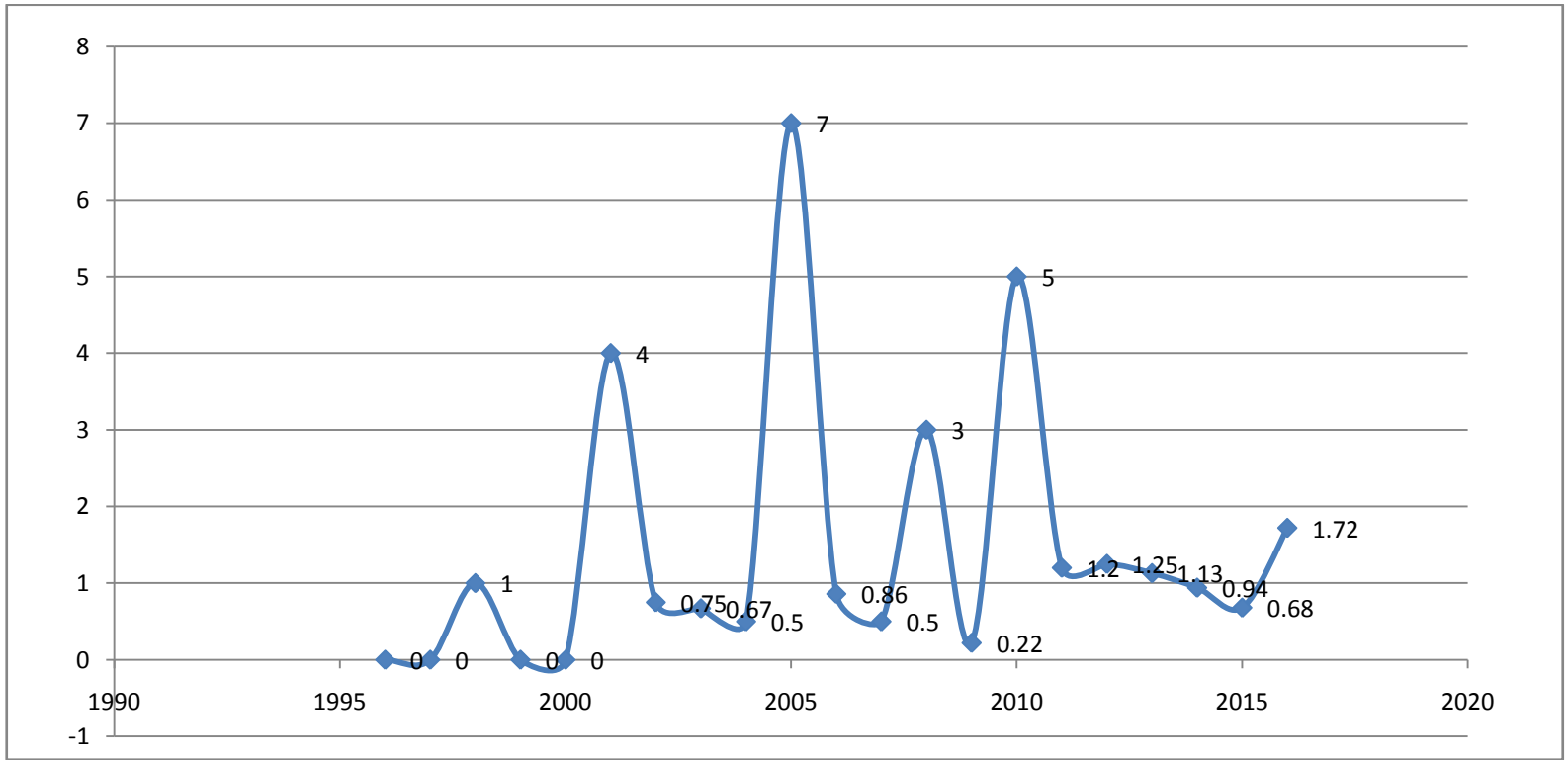

Fig. 2. *Exponential growth trend of Biodiversity conservation in Ethiopia*

The above histogram explores between the year group of 1995 to 2016 has increased and it has to reduce its growth level. Again it shows little increase between the year groups of 2000 to 2015, with small ups and downs.

In this analytical study period of 1995 to 2016, 292 researchers/scientists have produced 141 articles contributions scattered over 101 journals.

In accordance to this the researcher has ranked according to their highest publications arranged from 1st rank to 8th rank for all the published authors. Table 4 reveals the first 100 (1.10 %) prolific authors belong to their highest productivity. In the present study, the authors are ranked on the basis of their maximum number of papers published.

Table 4. Most Predominant authors

Author	Frequency	Rank	Author	Frequency	Rank
Demissew, S.	10	1	De Beenhouwer, M.	2	7
Aerts, R.	7	2	De Graaf, M.	2	7
Denich, M.	7	2	Deckers, J.	2	7
Muys, B.	7	2	Dejen, E.	2	7
Honnay, O.	6	3	Gebrehiwot, K.	2	7
Hylander, K.	6	3	Giday, K.	2	7
Nemomissa, S.	6	3	Gijbels, P.	2	7
Teketay, D.	6	3	Gole, T.W.	2	7
Friis, I.	5	4	Haile, M.	2	7
Shennan, C.	5	4	Hailu, B.T.	2	7
Asfaw, Z.	4	5	Hammer, K.	2	7
Bekele, A.	4	5	Healey, J.R.	2	7
Boehmer, H.J.	4	5	Labouisse, J.P.	2	7
Hundera, K.	4	5	Machiels, M.A.M.	2	7
Sibbing, F.A.	4	5	Maeda, E.E.	2	7
Tadesse, G.	4	5	Mekuria, W.	2	7
Zavaleta, E.	4	5	Mohammed, A.J.	2	7
Aerts, R.	3	6	Nagelkerke, L.A.J.	2	7
Aynekulu, E.	3	6	November, E.	2	7
Bezabih, M.	3	6	Oba, G.	2	7
Bongers, F.	3	6	Pretzsch, J.	2	7
Hermy, M.	3	6	Richerzhagen, C.	2	7
Negussie, A.	3	6	Stenseth, N.C.	2	7
Senbeta, F.	3	6	Taddese, G.	2	7
Wudneh, T.	3	6	Teshome, A.	2	7
Angassa, A.	2	7	Van Mechelen, M.	2	7
Argaw, M.	2	7	Van Overtveld, K.	2	7
Atickem, A.	2	7	Vlek, P.L.G.	2	7
Balemie, K.	2	7	Wale, E.	2	7
Beierkuhnlein, C.	2	7	Wassie, A.	2	7
Bekele, E.	2	7	Worku, A.	2	7
Bekele, T.	2	7	Abdi, A.	1	8
Beyene, F.	2	7	Others 94	1	8
Daye, D.D.	**2**	**7**	**Total authors**	**292**	**141**

Among the 292 authors, "Demissew, S" has published 10 (14.1%) of articles and it is the highest publications. The authors "Aerts, R; Denich, M; and Muys, B" have published the second highest number of articles have been 7 (4.96%) of research output and they stood in the second place of publication output. The authors "Honay, O; Hylander,K; Nemomissa; and Teketay D" have published 6 articles (4.25%) and they stood at third place. The authors "Friss, I; and Shennan, C" have published 5 (3.54%) and the author stood in fourth position to the productivity. Abdi A. and other 94 authors have contributed single publication only. From the above analysis the researcher has concluded the authors of " Demissew, S", "Aerts, R; Denich, M; and Muys, B"; "Honay,O; Hylander,K; Nemomissa; and Teketay D"; and "Friss, I; and Shennan, C" were produced more articles on biodiversity conservation in Ethiopia.

Research output under various subjects

The publications on Biodiversity conservation in Ethiopia has further grouped based on subject wise. They are identified and the same is shown in below as pie chart. The highest number of publications were in the field of Agriculture and Biological Sciences comprising 90 (36.3%) articles, the second being in Environmental Sciences 70 (28.2%), Social sciences 21 (8.47%), Biochemistry, Genetics and Molecular Biology 19 (7.66%), Medicine 13 (5.24%), Earth and Planetary sciences 12(4.84%), Economics, Econometrics and Finance 6(2.41%), Business, Management and Accounting 4(1.61%), Chemical Engineering, Engineering, Health Professions and Immunology & Microbiology each 2 (0.8%) and each 1 (0.4%) for the five subjects like Arts & Humanities, Energy, etc. The same is shown below as pie chart in Fig 3:

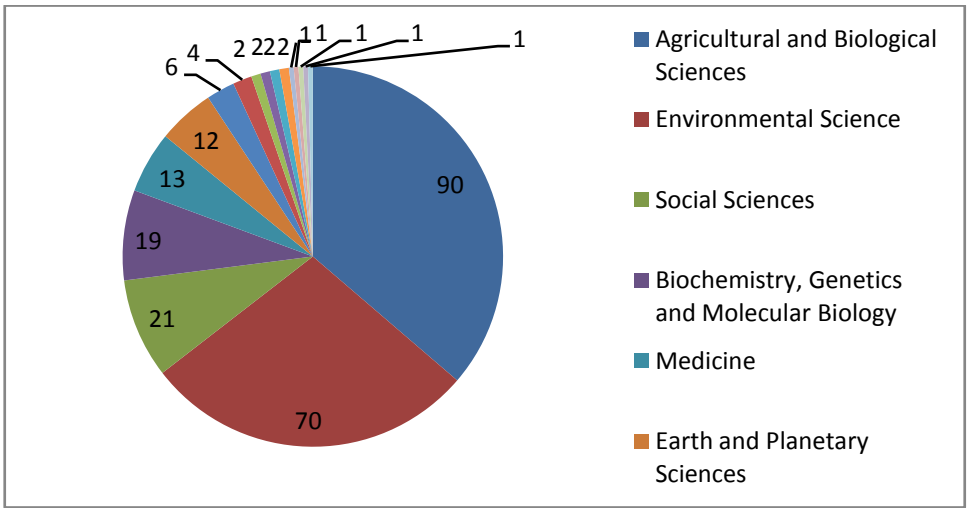

Fig. 3. *No. of contributions as per subject areas*

From the above it is clear that Agriculture and Biological Sciences deal more with biodiversity conservation and least being in Arts & Humanities and Energy.

C**hannels of** C**ommunication**

The journal articles (90.78%) were the most preferred channels for scholarly communication, followed by books (11%) and book series (1.41%). The publications on biodiversity conservation in Ethiopia were spread over 101 journals. The leading journals preferred by the scientists are: *Biological Conservation* with *7* publications followed by *Environmental Management and Forest Ecology and Management* each with 5 publications, *Forest Trees and Livelihoods* with 4 publications, 3 Publications in each of Agriculture Ecosystems & Environment, Environmental Monitoring & Assessment Genetic Resources & Crop Evolution and Journal of Ethnobiology & Ethnomedicine. Others can be seen below in Table 5 which gives the list of journals:

Table 5. Journals with Number of Publications

Journals	Publications	Journals	Publications
Biological Conservation	7	Annals of The New York Academy of Sciences	1
Environmental Management	5	Applied Geography	1
Forest Ecology and Management	5	Applied Geomatics	1
Forests Trees and Livelihoods	4	Applied Vegetation Science	1
Agriculture Ecosystems & Env	3	Aquatic Ecosystem Health and Mgt	1
Environmental Monitoring and Assessment	3	BMC Research Notes	1
Genetic Resources & Crop Evolution	3	Basic and Applied Ecology	1
Jl of Ethnobio and Ethnomedicine	3	Biodiversity	1
African Journal of Ecology	2	Biotechnology and Conservation of Species from Arid Regions	1
Agroforestry Systems	2	Biotropica	1
Biodiversity and Conservation	2	Botanical Journal of Linnean Society	1
Conservation Biology	2	Cahiers Agricultures	1
Diversity And Distributions	2	Canadian Journal of Botany	1
Ecological Economics	2	Catena	1
Economic Botany	2	Community Biodiversity Mgt Promoting Resilience & the Conservation of Plant Genetic Resources	1
Environment Development and Sustainability	2	Community Seed Banks Origins Evolution and Prospects	1
Folia Geobotanica	2	Comptes Rendus Biologies	1
Global Ecology and Conservation	2	Conservation Genetics	1
Hereditas	2	Decentralization Forest & Poverty Framework and Case Studies Ethiopia	1

International Journal of Biotechnology	2	Degraded Forests in Eastern Africa Management and Restoration	1
Journal of Arid Environments	2	Ecology	1
Land Degradation & Development	2	Ecology And Society	1
Plos One	2	Ecosystems	1
Acta Horticulture	1	Environmental & Resource Economics	1
African Entomology	1	Environmental Conservation	1
African Journal of Biotechnology	1	Environmental Science and Policy	1
Agricultural Economics	1	Feddes Repertorium	1
Agricultural Systems	1	Field Crops Research	1
Agronomy For Sustainable Dev	1	Fisheries Research	1
Altex	1	Forest People Interfaces Understanding Community Forestry and Biocultural Diversity	1
Animal Biodiversity &Conservation	1	Forest Policy and Economics	1
Animal Biology	1	Forestry Studies in China	1
		Other 37 Journals 1 each	37
		Total Journals 101	**141**

Highly Productive Institutions

Table 6 shows (up to 2 articles contributions) the institutions that have contributed for biodiversity conservation in Ethiopia during the period 1995 to 2016. Addis Ababa University topped the list with 36 publications followed by KU Leuven with 13 publications. Jimma University has published 7 papers; 9 organisations have contributed each 3 papers; 21 organisations have contributed each 2 papers and 97 organisations have contributed each one paper only.

Table 6. Highly productive institutions on biodiversity conservation in Ethiopia

Name of the Institutions	*No. of Publications*	*Name of the Institutions*	*No. of Publications*
Addis Ababa University	36	Haramaya University	3
KU Leuven	13	Mada walabu University	2
Wageningen University and Research Centre	12	Ethiopian Environment & Forest Research Inst	2
Mekelle University	10	Hawassa University	2
Universitat Bonn	9	University of York	2
Jimma University	7	Goteborgs University	2
Stockholms universitet	6	University of Sussex	2
World Agroforestry Centre	6	Universitat Kassel	2
Bahir Dar University	6	Technische Universitat Dresden	2
Universitetet for miljo- og biovitenskap	5	Universitat Hohenheim	2
Universitetet i Oslo	5	Technische Universitat Munchen	2
University of California, Santa Cruz	5	University of Botswana	2
Kobenhavns Universitet	5	Universitat Bayreuth	2
International Livestock Research Institute Addis Ababa	4	Universitat zu Koln	2
Ministry of Agriculture Ethiopia	4	University of Utah	2
Institute of Biodiversity Conservation	3	Universitat Freiburg im Breisgau	2
Amhara Regional Agricultural Research Institute	3	Bangor University	2
Helsingin Yliopisto	3	Forest Stewardship Council Ghana	2
Universitat fur Bodenkultur Wien	3	University of the South Pacific	2
Sveriges lantbruksuniversitet	3	Leibniz Inst of Plant	2

		Genetics & Crop Plant Res	
Universiteit Gent	3	Bioversity International	2
		Graduate School of Agricultural and Life Sciences The University	
Wondo Genet College of Forestry	3	of Tokyo	2
Ethiopian Institute of Agricultural Research	3	97 institutions each	1
Total number of Institutions contributed		**160**	

Collaborators for Publications

The Scopus DB has given the output as 141 contributions for Biodiversity conservation from Ethiopia. The contributions are not necessarily only from Ethiopia. The authors may be within Ethiopia collaborating with other countries (authors) or contributors from other countries are collaborating with Ethiopia for these 141 contributions. Accordingly the following bar chart (Fig. 4) shows the contributions from different countries:

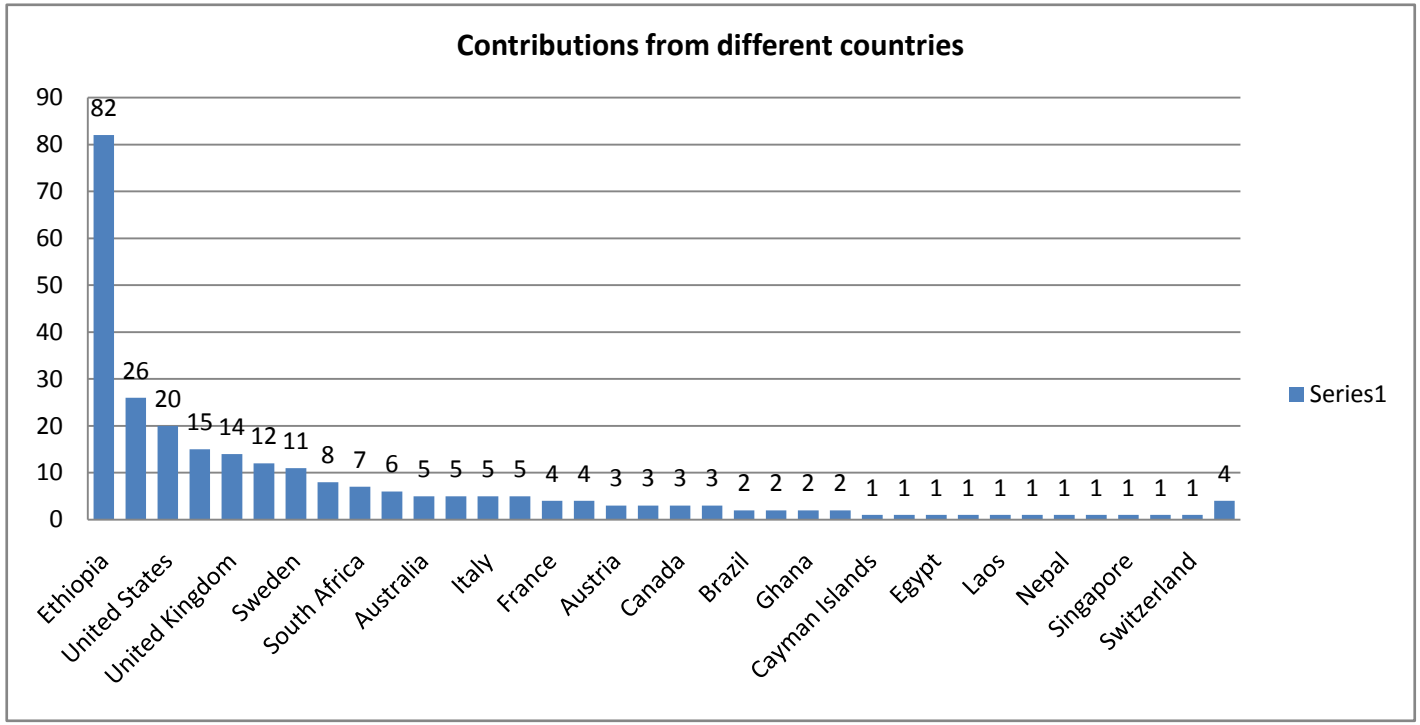

Fig. 4. *Contributions from other countries (collaborators)*

As the search was done for the contributions from Ethiopia, naturally the maximum number of contributions were 82 (58.15%) from Ethiopia, next 26 (18.43%) from Germany, US 20 (14.18%), etc.

CONCLUSIONS

The present study attempted to highlight the growth and development of research publication on biodiversity conservation from Ethiopia. A total of 141 publications were published during 1995-2016. The average number of publications per year was 6.4. There was a steady growth of publications during 2010-2013, and decreased in 2014 and 2015. However in 2016 it has been increased more. Out of the total publications, Agriculture and biological Sciences contributed for the highest percentage (36%) of Publications, Followed by Environmental Sciences with 28% of publication.

Arts and Humanities, Energy and few other subjects contributed only (0.4%) as the least. The most preferred journals for publications were Biological Conservation with 7 publications followed by Environmental Management and Forest Ecology & Management each with 5 publications. Maximum number of publications are contributed during this period is from Addis Ababa university (36), second from KU Leuven (13), Jimma university (7) and others. Collaborated for contributions are more from Germany (26), second from US (20) and the major language of publications is in English (138) and others are German and French. Further studies can be made for more number of years or for specific countries in Africa or for any country in the world.

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