2.1. Introduction

The review of related literature is an important component of any research study and process. It helps to find out what is already known and what is still unknown. It also helps to avoid the duplication of research. Although a large number of Bibliometrics studies have been conducted in the different aspects of pure and applied sciences, only relevant ones have been chosen. The review of earlier studies pertaining to the growth rate of literature, scientific productivity of authors, collaborative trends of authors are described in brief. For this purpose, a retrospective search of literature was carried out by using Library and Information Science Abstracts (LISA). Attempts were also made to trace and collect the relevant research papers and related documents such as journal articles, conference papers and books etc.

In this chapter an attempt has been made to review the published literature under the following sub-headings.

- Studies to the Bibliometric in General
- Studies to the Literature Growth in Science and Technology
- Bibliometrics / Scientometric studies to the Agricultural Science
- Bibliometrics / Scientometric studies on National institutions
- Bibliometrics / Scientometric studies on different Subject Areas
- Bibliometrics / Scientometric studies on Continent Level

2.2. Studies to the Bibliometric in general

Rathore and Mishra (1981) have analysed the relative usefulness of periodicals in the field of biochemistry with special reference to the needs of Indian biochemists and librarians. The study is of relevance due to the increase in the amount of periodical literature and rising subscription costs. The methodology involves comparing citations in the Annual Review of Biochemistry against the abstracts appearing in the Indian Science Abstracts and covers the period 1965-78. Results show that most of the contributory work of Indian biochemists was published in foreign periodicals and that most work published in Indian periodicals was not up to the standard required by the Annual Review of Biochemistry or were not of a primary nature.

Deshmukh and Kumar (1982) have studied citation study of volumes 1-8 (1973-80) of the Indian Journal of Soil Conservation (formerly Soil Conservation Digest) has been made to find out the important Indian and foreign journals in the field of soil conservation.
Syamalakumari (1982) discussed the importance of resource sharing among social science libraries in order to cope with the ever increasing growth of literature in the field. Describes a survey conducted as part of a Master of Library and Information Science (M.L.I.Sc.) course at Kerala University. Outlines possible areas of cooperation among 5 social science libraries in Trivandrum City based on answers to a questionnaire, observation of the library collections and services, examination of the library records, and evaluation of the collection and user needs.

Nag (1984) has attempted to analysis citations, provides a quantitative picture of the utility and relationship of various types of documents in the communication of information. Examines the Indian Journal of Earth Science from 1974 to 1983 (volumes 1 to 10) in order to indicate to what extent it is representative of the different branches of earth sciences and whether there is any shortage or concentration of articles in any particular field of interest.

Suriya and Kalavathi (1987) discussed the importance of productivity measurement in academic libraries. Analyses the relation between the library productivity and the institutional productivity in the Faculty of Engineering and Technology, Annamalai University, India, by using 'document transaction' and 'research output of the institution' as indicators of productivity. Concludes that a clear relationship exists between the investment in the basic information resources and labour and the research productivity of the institution.

Sengupta (1989) contributed to a special issue on Scientometric research in India. Ranking lists of periodicals in different scientific disciplines are generally based on the total number of citations derived from a group of source periodicals with equal weightage given to all citation irrespective of chronology. As a result, in all these ranking lists, the position occupied by the post-war periodicals, may not be an accurate index of their demand or usefulness to research workers in the concerned field. A revised ranking list in the field of microbiology is recommended in preference to earlier ones. Results and findings, after application of the weightage formula, are presented and discussed.

Lakshmi and kanakachary (1994) defined the term 'humanities'. Shows the general growth of literature in the humanities and discusses the scene in India. Presents the methodology followed for data collection. Provides the scope and objectives of the study. Presents the findings of the survey according to age distribution; subject distribution; and the nature of research activities. The survey indicates an urgent need for a national documentation centre.

Mahapatra (1994) reported results of a bibliometric study of articles appearing in Indian library and information Science periodicals during the period 1975 to 1985, to determine the relative growth rate (RGR) and doubling time (Dt). The reducing trend of RGR and
increasing rate of Dt in both publications and citations indicates that the growth is neither exponential nor linear. The size of the literature was calculated by applying a logistic growth formula. Literature on different subjects follows the similar type of growth trend within equal economic, intellectual and environmental conditions and with the increase in the number of publications, the number of citations will also increase.

Kalyane, V.L and Sen, B.K. (1995) have analysed 498 research articles comprising 241 full length research papers and 257 short communications published during 1984 to 1992 in Journal of Oilseeds Research (vol. 1 - vol. 9) to find out (i) space allotment for full length research papers and short communications, (ii) authorship pattern, (iii) author productivity, (iv) prominent contributors, (v) important locations of oilseed research, (vi) pattern of tabular and graphical presentation, (vii) citation pattern, (viii) obsolescence of oilseed literature, (ix) Bradford an distribution of citations, (x) important keywords figuring in the titles and (xi) time lag between the submission and publication of an article.

Sangam (1999) has done a Scientometric in India, Part 2. Describes a study in which the bibliometric technique of citation analysis was applied to the data of 5 psychology periodicals. The distribution of citation frequencies was statistically tested and the obsolescence factors were determined. In a study of the relationship between growth and obsolescence, it was observed that the greater the growth of literature, the greater the obsolescence as well as the greater the half life.

Kaushik sanjay and Shokeenash (2004) described an investigation into the authorship pattern and citation pattern of articles that appeared in Indian Journal of Plant Physiology. The study covers issue nos. 1 to 4 of volume 7 published between January to December 2002, covering 61 articles published in these issues. Overall 1,149 citations featuring 2,770 authors were made during the year. The results reveal that periodical articles are predominant with 81 percent of the total citations. The ratio of author self citation to total citations is 1: 16.65. The ratio of self citation to total citation is 1: 31.91

Surendra Kumar and Kumar, S. (2005) analysed 743 research papers comprising 435 main articles and 308 short communications published (Total 743) in nine volumes 10 to 18, (1993 - 2001) in Journal of Oilseed Research (JOR), based on earlier study covering Vol.1-9 (1984 to 1992) comprising 241 Main Articles and 257 Short communications (Total 498 papers). The study gives status of oilseed research and importance of oilseeds in India. Also gives account of JOR, objectives and methodology of this study.

Biswas and Others (2006) attempted to analysis the journal "Bulletin of Botanical Survey of India" for the period of 1994-2003 from the Bibliometric point of view. Through the
analysis, the trends of publication in this journal like distribution of articles, authorship pattern, average citation per article, number of illustrations, subject wise distribution of articles, geographical distributions of articles etc. have been incorporated clearly. Based on results found, observations have also been included.

Mahapatra and Jena (2006) described the growth of scientific research literature on Orissa, India, published during 1985-2004, including 875 research papers from 40 different periodicals. Analyses the data by their authorship pattern, year wise growth, subject wise break up of papers. Category of journals, place of origin, length of papers, and productivity of journals. The growth of scientific research literature in Orissa was studied through a bibliometric analysis in which the objectives of the study were: to determine the trend of growth of research papers; to observe the authorship pattern; to classify the scientific literature according to subjects; to find out the periodical category; to identify the periodicals' origin such as Indian and foreign; to determine the length of papers published; and to find out the ranking of periodicals.

Surendra kumar and Sudhir kumar (2008) analyzed 1060 research papers published in journals of Oilseeds research (India) comparing 589 main Articles and 471 Short Commutations in twelve volumes number 10 to 21. (1993-2004). Analyzes authorship trends of published papers and calculation coloration coefficient. Also finds out prolific contributors, institutional and geographical distribution of the authors. The analysis reveals increasing trend of collaboration, which has reached 0.98 recent years.

Zabed Ahmed, S.M. and Anisur Rahman, MD, (2008) have attempted bibliometric analysis of nutrition literature of Bangladesh. A list of periodical articles on various aspects of nutrition research of Bangladesh published during 1972 - 2006 was compiled for analysis. A total of 636 articles by 998 authors were identified. The articles were published in 100 local and foreign journals. The five-yearly distribution of nutrition literature shows that there is a rapid growth of nutrition literature from 1987 onwards. Lotka’s law is found to be applicable to nutrition literature of Bangladesh. Bradford-Zipf’s distribution also appears to be applicable to the literature.

Sen (2010) discussed the meaning of author productivity and research productivity and shows the difference between the two. Demonstrates how simply the value of c and a pertaining to the equation of Lotka's Law can be calculated. The value of a obtained according to the method described in the paper seems to be equally good, if not better than the value obtained through Pao's method. The method is much simpler compared to Pao's method. Both the data sets taken for the study by and large follow Lotka's Law.
Guntupalli Sreenivasarao, Arvind V Hadap and Anil N Chikate (2011) have studied based on 2748 citations appeared in 202 articles in Volume No. 29 to 33 of journal of the Indian Society of Remote Sensing. Out of the total citations. Journals share comes to 57.79%. The authorship pattern of the citations shows, 30.60% of contributions are from two authors. There are ten different types of source documents citing the authors in these Volumes. Among the publishing countries of source journals, 102 journals of Indian origin stood first in the rank. Bradford’s laws of scattering was proved Half-life period of journals and books found to be 12 years and 16 years respectively. The study reveals Remote Sensing and allied field specialists frequently refer journals as a main source of information.

Elango, B. and Rajendran, P. (2012) have examined the authorship trend and collaboration pattern in Marine Sciences literature. For this purpose, the required data has been collected from the Indian Journal of Marine Sciences published from 2001 to 2010. The study reveals that the co-authored papers are dominated and the author productivity follows the Lotka’s law. Average collaboration rate (0.57) is better collaboration and mean number of authors per joint authored paper is 3.4.

Anithakumari, Thajudin and Jinusivadasan (2012) devoted to the publication of research publications of inters/multidisciplinary Journal of Plantation Crops (JPC) is an international journal of research articles of plantation crops. Analysis of 432 articles (of a ten decade 2001 to 2010) showed as average of 14.4 publications on coconut, arecanut and cocoa per year. Around 35 percent of the articles cited 6-10 references including national and international. The degree of collaborations of authors was high (0.96) indication multidisciplinary and collaborative nature. The length of papers ranged from 3-4 pages (53.2%) followed by 5-6 pages (27.5%). Over half of them (55%) presented data only as tables and graphs.

Vaishali Khaparde and Shubhangi Pawar (2013) have presented the analyses of trends in authorship pattern and author’s collaborative research in Information Technology with a sample of 17917 articles collect from LISA during 2000-2009. The average number of authors per article is 1.80. In the study the degree of collaboration (C) during the overall 10 years (2000-2009) is 0.71 but the year wise degree of collaboration is almost same in all the years of mean value 0.49. In the 10 years of period, the multi-authorship articles are higher and predominant on single authorship. The study found that the researches in Information Technology are keep toward team research or group research rather than solo research.

2.3. Studies to the literature growth in science and technology
Maheswarappa and Mathias (1987) examined the trends in authorship patterns and the research collaboration as indicated by the multi authored papers in different disciplines of applied sciences in India based on authorship data collected from the Indian Science Abstracts (1965-1983). 2-authored papers were the maximum in applied sciences in general and agricultural and chemical technology in particular. Single-authored papers were maximum in engineering.

Sengupta and Kumari (1991) have analysed AIDS literature published during 1976-86 to identify its international channel of communication, medium of communication, contributing countries, and authorship trends. This study is based on data printed in a source document entitled Collected Papers on AIDS Research 1976-86 published by BIOSIS.

Qurashi (1991) analysed the research paper in a special memorial issue to Michael Moravcsik. Analyses the outputs of 2 prolific research groups: one from University, Bangladesh, and one from Karachi University, Pakistan, each over 2 decades. The data, obtained from published bibliographies, are sub-divided into small successive ranges of lab. Group size, 1-2, 3-4, 5-6, and analysed by calculating the relevant publication-rate per person for each range. Plots of the data from each group show evidence of an initial linear rise followed by a maximum at group-size of 6-8 persons. This group size would correspond to the optimum efficiency, as a balance between the benefits of increasing interaction.

Maheswarappa and Ningoji (1992) have studied the relative growth rates and doubling time of literature in the field of science and technology in India and fits the data with modified exponential, logistic and linear curves. Concludes that the data does not fit with the modified exponential, logistic and linear pattern.

Hall (1992) dealt with the application of signal processing methods to research and industry indicators, with emphasis on time and frequency domain correlations and lags, and on growth modelling of the indicators using the special and general logistic models. The findings show that: there was a strong interchange across the science-industry interface; quantitative methods can establish the degree of correlation and the time periods in which these correlations mainly reside; the timing of decisions to initiate exploration and research can be specified in this case.

Sen and Shailendra (1992) described a new method of evaluating scientific output by laboratories engaged in diverse fields of research. This method helps to evaluate those outputs which are quite recent and not amenable to citation analysis. For the purpose of analysis, impact factor of journals is described which tends to show better results than simple
impact factor. By comparing the performances over several years the trend of research activity of each laboratory can be also be obtained.

Maheswarappa and Ningoji (1993) have studied the growth of literature in the field of applied sciences in India based on 'Indian Science Abstracts' (1965-89). The relative growth rate has declined and figures indicate that it is heading towards saturation. The doubling time of literature has consistently increased. The growth of literature in the field of applied sciences in India does not fit with the modified exponential, logistic and linear curves. Concludes that the data has to be tested to fit with other growth models.

Vaishnav and Deo (1993) described a bibliometric study in which the LISA database was analyzed to discover the growth of literature on computerized library and information services, subject wise growth, authorship trend, authors' publishing outlets, journal literature, its distribution and application of Bradford's Law. Most literature is to be found in the areas of computerized information storage and retrieval, cataloguing and information services.

Ramakrishna and Pangannaya (1999) have examined the Derwent Biotechnology Abstracts and the serial publication Animal Cell Biotechnology for references to the relative growth rate (RGR) and doubling time (Dt) of animal cell culture technology literature between 1983 and 1993. Finds a reducing trend of RGR and increasing rate of Dt, indicating that the growth is neither exponential nor lineal. The size of the literature was calculated by applying the logistic growth formula.

Gupta, Sharma and kumar (1999) have contributed to an issue devoted to Scientometric Research in India Part 2. Deals with the nature of growth models currently used in the literature for modeling the growth of publications. Suggests that the growth of Indian physics literature follows a logistic model, while the growth of world physics literature is explained by combination of logistic and power models.

Seetharam and Rao (1999) have Contributed to trace and compare the trends in growth of food science and technology literature (periodical articles, patents, standards, theses and dissertations) produced by CFTRI (Central Food Technological Research Institute) scientists, by food scientists in India and by food scientists of the world, covering a period between 1950 and 1990; to identify the best fitting growth models for actual and cumulative growth of data through regression analysis; and to compute and compare the growth rates of food science and technology documents.

Ramakrishna and Pangannaya (1999) made a study on science and business databases with most entries containing the term 'biotechnology' in their title from the DIALOG databases were analyzed to see how the number of references with this term in the title has changed.
over a period of time within the group of a particular type of publications. The relative growth rate (RGR) and doubling time (DT) for the publications from 1985 to 1997 were determined. The size of the literature was calculated by applying a logistic growth formula.

Gupta and Karisiddappa (2000) have introduced different approaches for studying the growth of scientific knowledge, as reflected through publications and authors. Applies selected growth models to the cumulative growth of publications and authors in theoretical population genetics from 1907 to 1980. Notes the criteria by which the growth models were selected. Concludes that among the models studied, the power model is the one which best explains the cumulative growth of publication and author counts in the theoretical population genetics.

Mahapatra and das (2000) attempts to establish the nature of the growth of literature on geology between 1987 and 1996. Examines the type of collaboration among authors and the trend of growth, the degree of collaboration among various categories of authors, correlation of the growth of various categories of authors, and the impact of collaboration on the growth of literature. From a study of 5 well-established journals concludes that geology is a fully developed field of study where the numbers of collaborative publications have increased, and the growth rate of publications is low.

Dhiman and Sinha (2001) have attempted to illustrate the nature of the growth of literature in the developing branch of ethno botany in the decade 1989-1999. Emphasises collaborative research work among various categories of authors, noting the correlation between the growth of such authorship and the impact of collaboration on the growth of regularly published literature.

Sharma, Gupta and Kumar (2002) Discusses the application of 3 well known growth models, the exponential, logistic and power models, to the growth of world literature in physics, chemistry, and electrical and electronic engineering research, as reflected in international databases from 1907 to 1994. Emphasizes the need for more rigorous research on the time series data on publications growth of various fields to test the utility of these particular growth rate functions.

Gupta and Others (2002) Presented a study on selected growth models to the growth of publications in six sub disciplines of the social sciences (anthropology, economics, history, political science, psychology and sociology) in the world; and to verify the criteria for selecting the most appropriate growth model suggested by Egghe and Rao (1992).

Keshava and Sangam (2003) examined the growth of world social science literature in the 6 disciplines of anthropology, economics, history, psychology, political science and

Tsay and Ku (2005) explained the growth of literature in photocatalysis literature based on the theoretical perspectives of the bibliometric, such as literature growth, document type and language, author affiliation productivity and journal productivity. The distribution of journal articles and core journals were examined by Bradford's law, Bradford-Zipf's law and the impact factor of ISI's Journal Citation Reports (JCR). A total of 7141 bibliographic records, from 1970 to 2003, were retrieved from Science Citation Index Expanded (SCIE) database. The results of this study reveal that 1. The literature growth rate is in a steadily up-growing trend recently. Moreover, the overall growth is similar to exponential model; 2. Research article is the major type of publication. Research and review papers account for 92.5% of total literature.

Anwar (2006) has carried out a bibliometric analysis of the literature on Phoenix Dactylifera L (date palm). The purpose was to study the periodic growth of literature, author patterns, topical focus, language dispersal, and geographic origin of literature on dates. The volume of literature on date palm started increasing from less than one publication per year before 1970 to 80+ papers annually during the 1990s. Most of this literature comes from Agriculture, Biological Sciences, and Chemistry. A small core of authors contributed about one-third of the citations. Four-fifths of the citations are the result of collaborative work. About two-fifths of the papers are published by only 36 journals. Iraq and Egypt are the leading contributors to this literature. English is the most predominant language. The findings of this study will be of benefit to scholars in several disciplines.

Biradar (2006) have submitted the reported the results of a study of the references appended to the articles published in Indian Journal of Environmental Protection volumes 14, 19 and 24 published in the years 1994, 1999 and 2004 respectively. The objectives of the study were to determine: the average number of references per article; the forms of materials used by the scientists; the nature of the authorship pattern and the degree of collaboration; and the organization-wise contribution of articles. The study highlights the authorship trend and collaborative research in environmental science during 1994, 1999 and 2004. The study found that team research is preferred in the field of environmental science rather than solo research. The degree of collaboration varies from year to year and is found to be 0.78 to 0.95. The overall degree of collaboration is calculated and found to be 0.85. The study also found that on an average 11.595 references are referred to by each article.
Kurnar Patra and Chand (2007) presented the analysis of article on growth over time of Indian AIDS research output based on bibliographic data from PubMed and Web of Science. Authorship distribution was examined using Lotka's law. Bradford's law of scattering was used to identify core journals. The study identifies active institutions and state wide distributions of Indian AIDS research output.

Keshava Hittalamani and Gowda (2008) have determined the growth of literature in the field of sociology and the related authorship pattern; value of group co-efficient for collaborative research and geographical distribution of papers during 1999-2003. The study shows that the highest numbers of papers (86) were published in 2001 and 2003. The number of single author papers is higher at 84% out of a total of 475.

Gupta and Jain (2009) examined 125 articles on marketing of library and information services during the period 1980-2008 mainly covering literature published in India, literature published by Indian authors in foreign publications, and literature published by foreign authors on India. Growth of literature year-wise has been shown; prominent authors, productive journals have been identified.

Urbizagastegui (2009) proposed the growth of literature produced on Lotka's law from 1922 to 2003, as well as the growth of authors producing that literature, is analyzed. The growth of literature follows an exponential model with an annual average of 7.5% growth and doubling its size every 9.6 years. The number of authors producing this literature grows at a rate of 7.3% per year and duplicating its volume every 10 years. The statistics indicate a good adjustment to the exponential model, with R2 of 0.985 for literature and 0.992 for authors, both at a level of 0.01.

Sangam , Keshava and Agadi (2010) carried out a study of the growth pattern of world marine engineering literature derived from the Engineering Information CDROM COMPENDEX published by Elsevier for the period 1969-2005. Determines the rate of growth of marine engineering literature by calculating relation growth rates and doubling time for publications. The criteria on which growth models are to be selected for application to marine engineering literature are briefly discussed.

2.4. Bibliometrics / Scientometric Studies to the Agricultural Science

Raina Roshan (1984) described the history of phytopathology and its studies in India. Presents a ranked list of the 49 most cited journals, taking the Annual Review of Phytopathology as a source journal. Based on this analysis, concludes that the core journals cited covered more than 70% of the world literature output in this subject.
Begum and Sami (1988) attempted bibliographic items from Indian Science Abstracts (INSDOC) were scanned to identify the authorship pattern and the collaborative research trend in the field of agriculture science and to make an assessment of research collaboration by comparison with the extrapolated data of a similar investigation made in the fields of biochemistry and chemical engineering, phytomorphology and computer-based information retrieval and storage in Geo-Science. The overall analysis of authorship pattern indicates that the single author papers account for a meager 16.44% and more than 83.56% of the papers have 2 or more authors.

Karki (1990) investigated the trends in environmental science research in India with regard to its various branches, channels of communication, authorship of papers, institution-wise output, rank of journals, extent of collaboration and scholarship of papers based on entries noticed in Paryavaran Abstracts. Major areas of interest of Indian environmentalists are given and prolific investigators have been listed. Journals used by Indian workers for publication of their work are studied. Subject areas with number of papers, number of authors, and average authorship are tabulated.

Gupta, Sharma and Mehrotra (1990) have analysed 2,339 research papers appearing in 330 journals covered in Medicinal and Aromatic Plants Abstracts, India (1983) on the basis of their country of origin; plant genera and their species; and by type of investigation. Under each of the broad subject fields and major genera, an attempt has been made to identify the nature and focus of research in different countries through minimal level content analysis. Focuses particularly on Indian publication output.

Lal and Ray (1991) reported a bibliometric study of 511 articles, published in 4 leading horticultural periodicals during 1987 and 1988, in 3 major fields (fruits, vegetables and flowers) for the contributions of Indian and foreign scientists. Analysis reveals that the contribution of Indian scientists largely appears in the domestic periodicals rather than in the foreign periodicals.

Kalyane and Rao (1992) have investigated collaboration trends in research and researchers in the sugarcane industry, a case study undertaken with the help of publications from the Sugarcane Breeding Institute, India, from 1948 to 1987. Two variables: Collaboration Coefficient (CC); and Average Authorship per Paper (AAP); were calculated. Both CC and AAP were found to increase steadily over a period of time. The relationship between these 2 factors indicates positive direction but with varied magnitudes among the disciples.

Gupta and Others (1996) have taken up the study of publications as a measure of scientific productivity, analyses author productivity patterns for Indian potato research for the period
Applies Lotka's Law in its original form as inverse square law and in its modified and generalized form to the author productivity data. Examines the applicability of the binomial distribution model to the author productivity data. Applies the K-S test and t-test at 0.01 level of significance to measure the conformity to Lotka's Law and the negative binomial model, and analyses the application of Price Square Root Law and the 80/20 Rule to the data.

Meera (1998) has described some of the characteristics of ecological literature published during the period 1994-1995 with a view to establishing the place and date and language of publication, precise subject areas, etc. Describes the methodology used in collecting the data, numbering 4,840 items, from source documents, and presents an analysis covering the ranking of 222 periodicals, with author ranking, distribution by country, language and subject dispersion, and word ranking.

Gupta (1998) has studied the relationship between growth rates and obsolescence rates and half life of theoretical population genetics literature. Explores the application of lognormal distribution in age distribution of citations over a period of time.

Surendra Kumar and S. Kumar, (2004) conducted study in citation and bolometric analysis for knowing the extent of utility of journals, conferences proceedings and either literature. In this study, productrometric analysis of contribution of National Research Centre for Soybean, Indoor, has been carried out for the period 1987-2001 in terms of number of research articles produced by its scientists. The study is based in a chronological documentation list prepared for the purpose along with author and subject indexes. Authorship pattern is also studied in this paper. It also gives method calculating score of individual authors, gives method of calculating score of individual authors, and calculates their scores and rank orders. Concludes with strengths and weaknesses of soybean research in India.

Senthilkumaran and Amudhavalli (2005) have made an attempt a Scientometric analysis of Major Spices Research literature published in Asian countries between 1968-2002 was undertaken using HORT-CD database. Asian countries are the major producers, marketers, and consumers of spices in the world. Hence, the R & D activity is assumed to be very on this subject. The major spices are chilli, Pepper, Garlic, Ginger, Turmeric, and Cardamom. This paper investigates the most prolific authors and their affiliations and key journals in major spices in the Asian region.

Vijay (2005) identified the collaborative research and authorship trends in the area of food science and technology in India by examining and analyzing the authorship patterns in food science and technology periodicals, studying the proportion of single authored articles
compared with multi authored ones, determining the degree of collaboration in food science and technology, and studying the publication pattern of authors from different organizations. The results indicated that collaborative research was preferred to solo research in the area of food science in India and the degree of collaboration was found to be 0.91. The average number of authors/paper also showed an upward trend from 4.89 in 1994 to 8.2 in 2003.

Gaffney (2008) has attempted citation analysis and literature mapping this study mapped the literature of food science and explored the relationships found within it. Using articles published in the Journal of Food Science from 2003 through 2005, a stratified random sample of citations was studied to yield a ranked list of the thirteen most frequently cited journals, which formed a core set for further analysis. The study is an extension of previously published research covering the years 2000-2002 and attempts to analyze and compare the results across time frames.

Nabi Hasan and Mukhtiar Singh (2008) analysed and quantifies the contributions on Himachal Pradesh agriculture and allied field, based on publications, indexed in AGRICOLA, AGRIS, CAB abstracts and FST CD – ROM databases. This macroscopic study was undertaken with the following objectives: to identify and categorize the literature; source-type, subject/field, authorship-pattern and language; to make comparative study among different categories of publications; to find out the quantitative growth of literature, contributed by the concerned scientists and agencies; and to identify the highly productive author, journals, institutions and so on.

Sharma (2009) undertook the study of a total of 2603 research articles published by the scientists of Central Potato Research Institute (CPRI) during 1991 to 2007 were collected by scanning of annual reports of CPRI and Journal of the Indian Potato Association. Analysis show that majority of the scientists preferred to publish research papers in joint authorship (82.67%) having 0.82 degree of collaboration. Study further shows no uniform pattern of literature growth but factors like fund availability, scientists' recruitment and their availability, and years that had special occasions like conferences, seminars etc. Have impact over scientific productivity of the scientists during the period under review.

Bala adarsh and Gupta (2009) had attempted to analyse the research profile of biochemistry, genetics and molecular biology research in India during 1998-2007, country's performance based on its research output, its publication share and rank in global context, and annual publication growth rate. It also analyses the share of international collaborative papers in India's research output, the characteristics of research output of major Indian institutions,
authors, and highly-cited papers. The patterns of research communication by Indian scientists in most productive journals in this discipline have also been evaluated.

Kaur Har and Gupta (2009) have examined India's performance based on its publication output in immunology and microbiology during 1999-2008, based on several parameters, including the country's annual average growth rate, global publications share and rank, institutional profile of select top 15 institutions, international collaboration profile and major collaborative partners, patterns of communication in national and international journals, and characteristics of its top 15 most productive authors. The study uses 10 years publications data in immunology and microbiology drawn from Scopus International multidisciplinary bibliographical database.

Charlene, L. Qallaf, A.L, (2009) have identified and analyzed the intellectual structure of the Punica granatum L (pomegranate) literature and to determine trends and patterns. Specific areas addressed were growth of the literature, publication type, author productivity and patterns, subject focus, language dispersion, and characteristics of the journal literature. All publications were reviewed through 2006. Data were sorted and manipulated using the software package ProCite. For analysis of the data, bibliometric techniques were applied. The results show that the literature has grown consistently from 1970 onwards exploding to significant proportions beginning in 2000. Most of the publications are the result of author collaboration (71.82%) and written in the English language (69.57%). India and the United States are the leading contributors to the literature and educational institutions make-up more than fifty percent of the authors' affiliation. The literature is multi- and inter-disciplinary in nature. According to Bradford's Law a core of 38 journal titles form the nucleus of this literature.

Yunjing and others (2010) have analysed Co-author citation analysis has been widely used in the knowledge domain visualization. As a study case the field of hybrid rice research in China was visualized via co-author citation analysis. Path Finder Network is used in the process of visualization. The effect of knowledge domain visualization in revealing the development history of one research field is validated.

Hadimani manjunath and Rajgoli (2010) have Analysed 10553 citations appended to 538 papers published during 2004-2008 in the journal Applied Engineering in Agriculture. On average, there were approximately 20 citations per paper. Out of 10553 citations appended, 2263 (21.44%) citations appeared in the year 2006 closely followed by 2231(21.14%) citations in the year 2005. Out of 1775 authors who contributed a total of 538 papers, 1376
(77.52%) were affiliated to institutions located in USA. Also examines year-wise distribution of papers, authorship pattern, length of papers, degree of collaboration among authors, year-wise appearance of citations, form-wise distribution of resources used by the authors and ranked list of authors by geographical location.

Balu, M, Supreeti Das and Sabitri Majhi ,(2011) 68 described results of research productivity study of agricultural scientists at Central Rice Research Institute (CRRI), Cuttack. The purpose of the study is to evaluate the research performance of CRRI Scientists. The study includes citations of 586 Papers collected from the Annual Reports of CRRI, Cuttack for a period authorship pattern, collaboration, etc. Findings of the study indicate that journal article (72.69%) is the predominant type of publication. The authorship collaboration at CRRI was identified to be very low i.e.0.15. The individual productivity reveals that 96.68% of the authors have published only ten or less number of articles during the period. Dr. T. K. Adhya was the highest productive author with 55 articles. Oryza has the highest frequency of publication of CRRI articles.

Banker and Lily varghese (2011) 69 completed a productrometric analysis of contributions of National Research Centre for Citrus; Nagpur was carried out for the period of 1988 to 2008 in terms of number of research papers published by the scientists of Centre. The study concentrated on chronological documentation of list prepared for the purpose along with authorship pattern and subject indexes in addition to analysis an aver age number of papers published per year, type of documents publishing the papers along with the names of the journal, subject, language distribution and authorship pattern.

Rathinasabapathy (2012) 70 has analysed the research activities on goat, based on the total publications output. The data is retrieved from CAB Direct Online Database for 52 years (1960-2012). Types of documents, languages rank list of journals most productive of authors, ranking on countries based on their publications output are presented.

Thanuskodi, S. (2012) 71 has described the bibliometric analysis of the journal titled "Indian Journal of Agricultural Research" for the period from 2001 to 2010. The data were downloaded from the journal's website. This study aims at analyzing the research output performance of agricultural scientists on agricultural science subjects. The analysis cover mainly the number of articles, authorship pattern, subject wise distribution of articles, average number of references per articles, forms of documents cited, year wise distribution of cited journals etc.

Deepakmeenakumar and Anilkumarjain (2014) 72 revealed importance of pulses in Indian dietary system & its production and demand in India. The paper analyses data for the year
2000-2008 collected from Crop CD. Reviews literature available on similar studies. Applies Growth rate, Doubling time, Degree of Collaborations. Collaboration index, dominance factor. Lotka law and Bradford law. Out of 3610 contributions India has contributed 2676 (73%) research paper in the study. Also reveals that 92% papers are collaborative, 94% offered in 227 journals, 99% published in English etc Concludes with need for feathering the research on pulses to meet countries demand.

Rathinasabapathy and Kopperundevi (2014) conducted a scientometric study undertaken to analysis the publications output on Dairy science and technology research using CAB Direct online database revealed that a total of 2,08,488 publications (3.87%) followed by Germany with 5,763 publications (2.76%). India is the third largest producer with 5,035 publications which is 2.42% to global publication output. Journal of Dairy Science is the preferred journal for publications by the scientists as it has published 13,103 papers which is 6.29% of total publications followed by Milchwissenschaft with 2,640 papers. Among the top 10 most productive authors, S.Singh of India held 10th position with 196 papers.

Deepakmeenakumar and Anilkumarrain (2014) provided importance of pulses in Indian dietary system & its production and demand in India. The paper analysis data for the year 2000-2008 collected from Crop CD. Reviews literature available on similar studies. Applies Growth rate, doubling time, Degree of collaborations, collaboration index, Dominance factor, Lotka law and Bradford law. Out of 3610 contributions India has contributed 2627 (73%) research paper in the study. Also reveals that 92% papers are collaborative, 94% offered in 227 journals, 99% published in English etc., Concludes with need for feathering the research on pluses to meet countries demand.

2.5. Bibliometrics / Scientometric studies to the national institutions

Raghavan and Shalini (1977) presented the result of Rationalisation of periodical holdings based on a cost effectiveness study is an important process. B.C. Brookes has developed a mathematical model based on Bradford's distribution phenomenon for cost effectiveness studies (70/841). Reports 1 such study of the periodical holdings of the CFTRI (Central Food Technological Research Institute) library. The scatter of periodical literature in this area obeys the Bradford's distribution; a flexible decision making model regarding the coverage of periodical literature can be developed.

Pulla Reddy and Sharma (1988) describes a study in which data from a survey of EGT (Environmental Genetic Toxicology) research in India, conducted by the Environmental Mutagen Society and covering a period of 40 years, are analysed in order to assess: the growth of EGT literature in India; authorship patterns; the distribution of publications in
different forms of literature and in different periodicals; the environmental agents investigated in India; the biological test systems employed in India; and the distribution of publications according to institution.

Kademani, B.S. Ganesh Surwase; Anil Sagar and Vijai Kumar,(2006) 77 have described the bibliometric analysis in the growth and development of research work in this field on Bose-Einstein Condensation (BEC) in terms of publication output as per Science Citation Index (1982-2005). The most preferred journals by the scientists were: Physical Review- A with 1504 papers, Physical Review Letters with 824 papers, Journal of Physics-B with 205 papers, Physical Review- B with 178 papers, Physics Letters-A with 157 papers, Physical Review –E with 122 papers and Journal of Low Temperature Physics with 102 papers. The high frequency keywords were: Bose-Einstein Condensation (2012), Gases (1928), Atoms (860), and Dynamics (493).

Jena (2006) 78 in his analysis of the periodical "Indian Journal of Fiber and Textile Research" for the period 1996-2004 was carried out to study the trend of publications such as the year wise distribution of articles, bibliographical distribution of citations, authorship pattern, citation pattern, average length of articles, number of tables and figures used, time lag, geographical distribution of authors and subject analysis. Concludes that the increasing trend in the number of contributions in the periodical from year to year shows that the periodical is a respected primary publication by researchers in the area.

Sevukan and Sharma (2008) 79 have investigated the study of research performance of biotechnology faculties in central universities of India from 1997-2006. The data used for the study were retrieved from two database sources, namely, Pub Med, NCBI (National Centre for Biotechnology Information); and ISI Web of Science database – Science Citation Index Expanded (SCIE). Bibliometric techniques have been employed to analyze the data. The results indicate that the growth of literature in biotechnology has steadily increased from 15 articles in 1997 to 43 articles in 2006; two-authored publications predominate amongst the pattern of authorship; applicability of Lotka's law is validated from the values n=2.12, C=0.669, and D=0.027 obtained using least square method. However, the application of Bradford's law does not fit to the literature analysed.

Varghese and Others (2009) 80 evaluated the research publications of 632 of RGCB scientists during 1995-2006 show that the publications of RGCB scientists include journal articles, conference papers, patents, book chapters and PhD guided. The year 2005-2006 with 112 articles (25.87%) published is the most productive year in the case of journal articles. The
productivity of the scientists of RGCB shows substantial growth both quantitatively and qualitatively with the development of the institution. Baskaran (2013) has analyzed the author productivity, discipline-wise and institution-wise collaboration and ranking of authors in research contribution of Alagappa University during 1999-2011. Relative growth rate (RGR) was found to be fluctuating trend during the study period. The doubling time (DT) was found to be increased and decreased trend in this study. Degree of collaboration and its’ mean value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University, and Anna University.

Gopikuttan and Aswathy (2014) evaluated the research productivity of University of Kerala based on the data collected from Web of Science over a period of thirteen years from 2000 to 2012. This study attempts to analyse the overall performance of the faculty members of Science Departments of University of Kerala in research productivity. The parameters such as form-wise, year-wise, subject-wise classification of published papers, most productive authors and the most preferred journals, etc. are considered for the study. The impact factor and the citation received were also analyzed.

Ashwathy, S. and Gopikunttan, A. (2015) found that the DC among the teachers in physics faculties of Kerala Universities. Lotka’s Law seems to be satisfactory in UOC only. It can be concluded that universities can attain visibility, prestige, and credibility in the border academic community by producing high quality research and this in turn enhance the reputation of the universities and provide a greater opportunity for attracting better students and faculty.

2.6. Bibliometrics / Scientometric studies to the different subjects areas

Maheswarappa, Nagappa and Mathias (1984) have investigated collaborative research in science and technology in India based on the authorship data collected from the Indian Science Abstracts covering the calendar years 1965, 1970, 1975, 1980 and 1983. Slightly less than of scientific papers were multi authored with an average number of 2.13 authors per paper. Single-authored papers constitute slightly more than of papers. The proportion of 3 and 4 authored papers has doubled as a function of time and correspondingly the single-authored papers halved. The average number of authors per paper has increased from 1.84 in 1965 to 2.33 in 1983. The relative figures for the degree of collaboration have been from 0.61 to 0.80, indicating a high degree of collaboration.

Parmar (1984) has evaluated the growth of chemical literature in Indian periodicals published in India and written by Indian authors which appeared from 1972-76. Suggests that
most of the articles abstracted in Indian Science Abstracts are considered which includes most of the literature published in India. Examines growth of periodical literature quantitatively revealing the scope of India's contribution to international chemical literature.

Garg and Rao (1988) have analysed the output of the publication data of an Indian laboratory in the field of physics in Science Citation Index (SCI) and non SCI covered Indian and foreign journals, processes developed and Indian patents filed during the period 1965-82 to find out the pattern of productivity. Looks at the journals wherein the laboratory scientists publish. Also points out the sub-areas of physics in which the laboratory scientists have published maximum papers and the pattern of scientific co-authorship in the research work. Correlation coefficients between input variable (manpower and budget) with output variables (number of papers published, processes developed and Indian patents accepted) have been calculated.

Shukla Milind (1989) reported the results of a bibliometric analysis of the published output, on research on renewable energy, from India during 1980-88.

Ashok and garg (1992) carried out an analysis of 785 papers, books and reports, in the field of laser research published in India, 1967-84, indicates that output comprises of 1% of the international output. The total output came from 77 academic and research institutions, out of which 10 contributed almost 23%. The laser research performed in India appears to be a part of mainstream science as indicated by the pattern of publications and citations.

Garg, Praveen and Sharma (1993) have investigated the stage of evolution at which the scattering of articles over journals obeys Bradford's law in the field of solar power. Traces the related changes that take place in the size and element of the core during the evolution and growth of literature. The study reveals that a curve similar to Bradford's curve is obtained when the field matures. The finding has been supported with the help of a simple mathematical model.

Parvathamma, Gunjal and Nijagunappa (1993) described a study in which the rate of growth of Indian earth science literature was determined by calculating relative growth rates and doubling time for the period 1978-88. Results show that the mean relative growth rate has declined whilst mean doubling time has increased. Concludes that Indian earth science literature follows a logistic pattern of growth. The scientific productivity of authors is found to conform to Lotka's law and distribution of the scientific productivity follows negative binomial distribution.

Karki and Garg (1997) have reported results of a bibliometric study of published materials devoted to alkaloid chemistry research work undertaken in India. Indian output was
compared with world output by: measuring Indian authors' publications for 1971-1989; identifying centres of excellence in India based on publications and citations; identifying research groups around whom the research activity is concentrated; identifying channels used for communication; and measuring cited of Indian work in the international literature. Chemical Abstracts was used as the tool for the study. Alkaloid chemistry research performed in India was found to be fairly collaborative and part of mainstream science.

Gupta, Sharma and Kumar (1998) have contributed to an issue devoted to applications of logic to information retrieval. Studies the growth of Indian and World physics literature from 1900-50. Explores the applicability of selected technology diffusion models to the growth of literature in Indian and World physics. Focuses on the applicability and validity of 2 forms of Lotka's Law and negative binomial distribution model to the cumulative author productivity of data on Indian physics. Explores the relevance and applicability of 2 well known generalizations, Price Square Root law and 80/20 rule to the cumulative author productivity data on Indian physics. Studies the increase in the number of practitioners, at different productivity levels, and the emergence of core authors in Indian physics.

Yinan, G.U and Zainab, A.N (2001) have investigated made in the CD-ROM databases, COMPENDEX (1987-1999), IEL (IEE/IEEE Electronic Library) (1988-1999) and INSPEC (1990-1998) revealed a total of 389 publications contributed by Malaysian researchers in the field of computer science and information technology. The trend in output indicates rapid growth that is expected to continue in future. A total of 458 unique Malaysian authors contributed to the 389 publications. Collaboration between two authors was the dominant authorship pattern. Single-authored or more than 3-authored works were rare. The active authors were affiliated to a few institutions, with the University Technology Malaysia, University Sains Malaysia and University Malaya accounting for the highest number of publications, either in the form of journal articles or papers in conference proceedings.

John (2002) examined the models of the scholarly communication circuit of scientists developed in communication science, and models of information flow developed in the fields of library and information science, bottlenecks in the flow of information between scholars can be identified and possible solutions to underlying problems can be considered. Significant potential bottlenecks to the flow of information become especially evident upon close examination of certain key roles of the scientific literature in the scholarly work of scientists. Examination of such issues as the role of scientific documents in social processes, of scientific scholarship, the problems associated with how meaning is represented by documents, the problems associated with the fragmentation of scientific literature as a result
of the growth of literature, and the difficulties associated with the use of information retrieval systems, highlight the serious limitations of the scholarly communication circuit, irrespective of the use of advanced information technology. Implications of these issues for the librarian and the scientific scholar are discussed.

Kannappanavar, Kumar and Swamy (2004) described the results of a bibliometric study to determine the productivity pattern of authors in the field of chemistry in India and to determine: the nature of the authorship patterns in chemistry; the proportion of single versus multi-authored papers in chemistry; and the degree of collaboration in the field. Reports the data for the trend in the period 1996-2000, which found that team research is preferred rather than solo research. The degree of collaboration was calculated to be 0.76, with the absolute value varying from year to year in the range 0.72-0.83. The average number of authors per paper increased over time from 7.52 to 8.39.

Dhawan and Gupta (2005) conducted a study on computer science research in India in terms of publication output, its areas of strength and weakness, and the leading institutions and individual scholars involved in computer science research in the country.

Swapan kumar and Bhattacharya (2005) did bibliometric analysis of oncology research in India. The study analyses literature growth trends. Bradford law of scattering was employed to identify the core journal, which published Indian cancer research literature. Lotka's law was employed to study the authors' productivity pattern. The study also identifies the active institutions in India, which published the cancer literature the most.

Kaliyaperumal and Natarajan (2009) this study aims to focus on growth pattern as well as overall trend in literature output on retina during 2002-2007. Secondary data collection from a set of retrieved bibliographic records from the literature output in the field of retina from the CD-ROM sources of MEDLINE was studied. The results indicate variability in the authorship pattern, and English language as the major medium in literature output for retina. The contribution of the USA is higher in this subject also in comparison of other countries of the world.

Mishra Paras and Others (2010) provide an insight into the citation analysis of research publications of the National Metallurgical Laboratory (NML) during the period 1972-2007. Analysed 2830 most valuable citations spread over 561 publications made by the NML scientists and researchers indexed in Science Citation Index retrieved through the Web of Science. Determines research and citation impact using the parameters such as extent of citation received in terms of number of citation per paper, year wise break up of citation, domain wise citation, self citations and citation by others, diachronous self citation rate,
citing authors, citing institutions, highly cited papers and categories of citing documents, citing journals and impact factor. A Bradford plot constructed to determine the core-citing journals shows that the curve is a typical S shape which indicates subject maturity.

Kaur Har and Gupta (2010) examined India's performance based on its publication output in dental sciences during 1999-2008, based on several parameters, including the country annual average growth rate, global publication share & rank among 25 most productive countries of the world, national publication output and impact in terms of average citations per paper, international collaboration output and share and contribution of major collaborative partners, contribution and impact of select top 25 Indian institutions and select top 25 most productive authors, patterns of communication in national and international journals and characteristics of its 45 high cited papers.

Kumar Narendra (2010) examined the applicability of Lotka's Law as a general inverse power (alpha/=2) and as an inverse square power relationship (alpha=2) to the distribution of the research productivity in Council of Scientific and Industrial Research (CSIR), India. Two data-sets of the research papers (6076 and 17681) contributed by CSIR's scientists during the period of 1988-1992 and 2004-2008 were collected from SCI-CD-ROM and Web of Science respectively. AK-S Test was applied to measure the degree of agreement between the distribution of the observed set of data against the inverse general power relationship and the theoretical value of alpha=2. It was found that the inverse square law of Lotka did not conform as such.

Gupta, Harkaur and Adarshbala (2011) This study analyses the India research output in diabetes during 1999-2008 on several parameters including its growth, rank and global publications share, citation impact, overall share of international collaborative papers, and share of major collaborative partners. The publications output, impact and collaborative publication share of India is also compared with China, South Korea and Brazil.

Har Kaur and Preeti Mahajan (2012) have compared the quality of research output of the two high profile health care institutions of North India—All India Institute of Medical Science, New Delhi and Post Graduate Institute of Medical Education and Research, Chandigarh. The study has been conducted using Scopus citation database. In this paper, research output of these institutions during 1999-2008 has been compared in the form of growth of publication, rank of various subjects, further citations of these publications has been observed to check the quality of the research using three year window in addition to the h-index as well as the International collaboration of publications (ICP).

2.7. Bibliometrics / Scientometric studies to the continent level
Adenaikebabs (1982) conducted a study of 2 bibliographies on cowpeas, one covering the period 1888-1949 and the other 1950-1973, were analysed to study various characteristics of the literature. Results showed that growth of the literature have been exponential, doubling every 20 years, with the English language accounting for over 87% of the literature. Though the periodical was the most popular publishing medium, format changes were evident and Bradford distributions of the 2 groups resulted in a third Bradford distribution when merged. Ikhizama (1982) has analysed a bibliography of maize research in Nigeria to determine the amount of literature and the various aspects of maize that have been investigated; the way and the language in which it is published were also analysed. The analysis revealed that Nigerian maize literature has increased since 1950, although not drastically. The peak for maize literature was in 1976 when agricultural establishments changed their multipurpose approach to research and concentrated on specific crops.

Gupta (1987) undertook a bibliography of entomological research in Nigeria, 1900-1973 totaling 1720 publications was analysed to study the author productivity patterns and to test the applicability of Lotka's law for the obtained distributions. 4 different files were generated: publications of all the authors; publications by First authors; single authors; and co-authors. Lotka's law in its original form as inverse square law does not apply to any of the 4 data sets. However, it does apply in its generalized form with the calculated values of characteristic exponent. The values were found to be 1.9, 1.8, 2.2 and 2.4 for the 4 different data sets.

Villagrarubia (1992) contributed to a thematic issue on scientometric research in Spain. Reviews the scientific production of Spanish universities in the areas of social sciences and language sciences from 1986-88 The results obtained underline the increasing rate of production achieved in the 3 year period, a certain stagnation in the number of authors and in team research activities, a restricted diffusion in periodical publications and a somewhat unbalanced thematic diversification as compared to the geographical and cultural variety of Spain.

Maclean and Janagap (1993) analysed the literature output over 1 year, 1990, of 22 international agricultural research centres was examined to determine the publication productivity of scientists in these institutions. There was no correlation between scientific productivity and numbers of scientists in a centre but there was a significant positive correlation between scientific productivity and budget, indicating higher efficiency in the larger centres.

OLSEN (1994) reported on a 5 year project to identify the most vital or core literature of the agricultural sciences, covering results for the advanced countries as well as the
developing countries. Citation analysis and other bibliometric techniques were used to identify the most valuable literature for university level instruction and research. Describes of analysis, evaluation techniques, and end products. 4 out of 7 books describing the literature of agriculture have been published and a final product will be the transfer of the full text of the monographs and the periodicals for a 5 year period onto CD-ROM for use in developing countries.

Jarneving (2005) explained in his quantitative survey of the literature pertaining to the study of public libraries, covering the period of 1986-2005, was pursued applying bibliometric methods. The survey aimed at the arrival of descriptive data that would inform about the features and development of the field's base literature. The exploration of a presumed shared intellectual focus on the earlier literature showed that approximately half of all papers were isolated in terms of not sharing references with any other paper, though a weak tendency of increased consensus was noted.

Ocholladennis and Bosireonyancha (2006) have taken up the study recognizes agriculture as the mainstay activity of most economies in Africa and analyses research nature and trends in the discipline by using descriptive informatics and focusing on seven indicators, by using AGRICOLA and ISI-E databases from 1991 to 2005. They observed that research output in the discipline is much higher in South Africa and Kenya, and research collaboration is greater than non-collaborative research output and collaboration is less among African countries. The most popular research domains were found to exist in environmental science, soil science, plant/crop production and [agricultural] economics. Helpful conclusions and recommendations for an agricultural policy, capacity and research orientation have been made.

Ramaiah (2006) aimed to study the electronic publishing (e-publishing) trends in India, to compare the results with another study conducted in Singapore, and to identify the challenges, opportunities and problem areas faced by the publishing industry in Asia. Findings of the survey show that about one-third (35%) of the Indian and about three-quarters (74%) of the Singaporean publishers are engaged in e-publishing, with a further 20% of Indian publishers likely to start e-publishing in the next three years.

Allen (2007) has made an analysis of agricultural research output on energy crops and bioenergy for the period 2000-2005. Seven hundred eighty-three (783) articles gathered from CAB Abstracts from this period were analyzed to determine which disciplines have been publishing the most on this subject. The findings show that engineering-related research is most prevalent but that twelve distinct agricultural disciplines produced research on the
subject during the study period, with varying degrees of productivity for each discipline. The resources were divided into woody crops, non-woody crops, and animal-based resources, and the number of articles for each was tabulated. The core journal literature dealing with energy crops and bio energy was determined by doing searches in both CAB Abstracts and Web of Science and tabulating the number of articles appearing in each journal.

Tijssen Robert (2008) \textsuperscript{114} attempted Comparative quantitative indicators describe and analyze broad patterns and macro-level trends within intra-EU scientific cooperation, at various high aggregate "macro" levels, drawing on bibliometric analysis of jointly authored research articles published in the years 2001-2005.

Naresh Kumar and Nadia Asheulova, (2011) \textsuperscript{115} have attempted was made to analyze the growth of publication share in BRIC countries (Brazil, Russia, India and China) vis-à-vis the United States in terms if world publication output the emerging areas and disciplines during 1980-2009 based on data for the period 1980-2009 downloaded from the Scopus database. Result indicate that China be an emerging leader in scientific publication followed by India among the BRIC countries.

2.8. Analysis of literature reviewed

The above reviewed documents in the form of articles / abstracts as presented on different facets of bibliometrics / Scientometric scanned from journals and downloaded data from the available readymade databases example Library and Information Science Abstracts (LISA). Further tabulated and analyzed the above reviewed articles as follows.

Table: 2.1. Analysis of Literature Reviewed

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<tr>
<th>S.No</th>
<th>Subjects</th>
<th>Articles</th>
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<td>No’s</td>
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<tr>
<td>1</td>
<td>Studies to the bibliometric in general</td>
<td>21</td>
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<tr>
<td>2</td>
<td>Studies to the literature growth in Science and Technology</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>Bibliometric studies in agricultural science</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>Bibliometric Scientometric studies on National institutions</td>
<td>09</td>
</tr>
<tr>
<td>5</td>
<td>Bibliometric and Scientometric studies on different subject area</td>
<td>20</td>
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<tr>
<td>6</td>
<td>Bibliometric/ Scientometric studies on continent level</td>
<td>12</td>
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<td></td>
<td>TOTAL</td>
<td>115</td>
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2.9. Conclusion
To conclude, it can be stated that, with the help of bibliometric / Scientometric measures the number of the studies have been done. The present study is to find out productivity of scientific contributions in two Rice Research Institutes i.e., National Rice Research Institute, Cuttack and Indian Institute of Rice Research, Hyderabad under the auspices of Indian Council of Agriculture Research (ICAR).

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