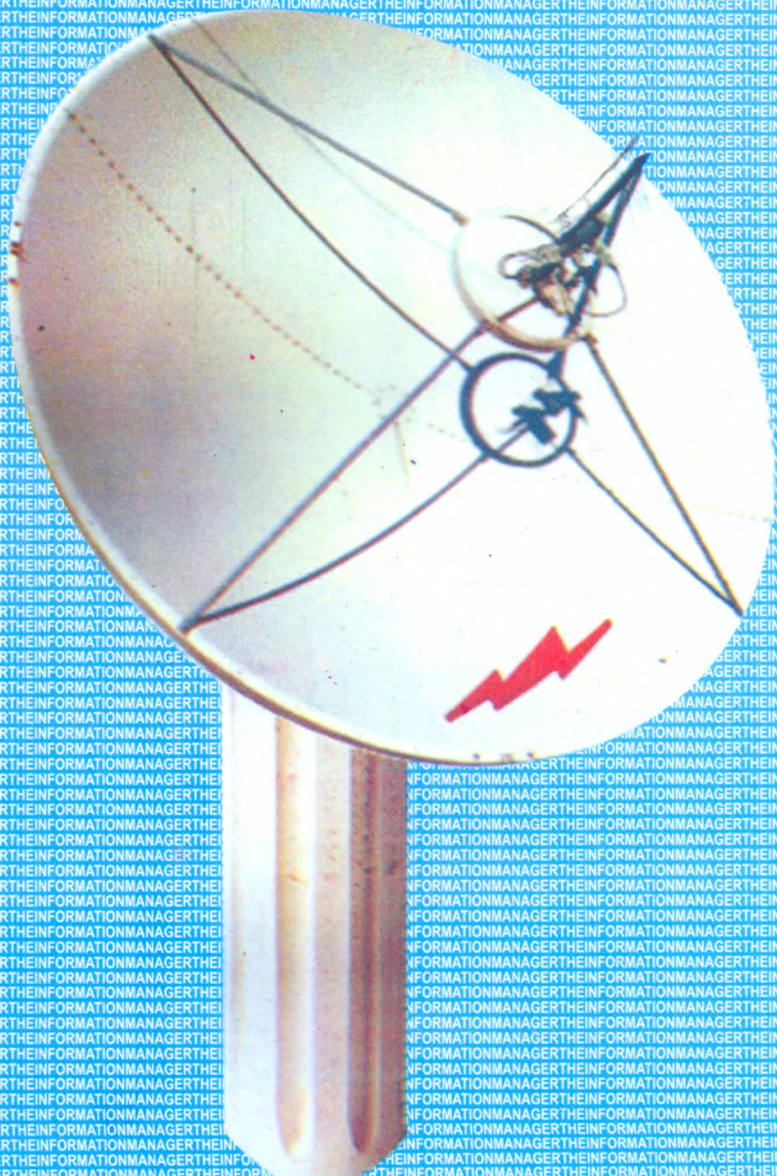
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Bibliometric Analysis of Publication Output Patterns of Faculty Members of Agriculture And Veterinary Complex of A Nigerian University

by
Kasa, M.G., Ibrahim, U. and Momoh, K.A.

Abstract

The study is set out to analyse publication research output patterns of the faculty members of Agriculture and Veterinary Complex of Ahmadu Bello University, Zaria from 2002 - 2012 using selected quantitative bibliometric indicators. Data collected emanated from 33 bounded copies of curriculum vitae and publications of professors and associated professors' approved by the university central committee responsible for the appointments and promotion of staff. The units investigated were the Institute for Agricultural Research (IAR), Division of Agricultural Colleges (DAC), National Animal Production and Research Institute (NAPRI), Faculty of Agriculture (FOA), National Agricultural Extension and Research Liaison Services (NAERLS) and The Faculty of Veterinary Medicine and Teaching Hospital (FVM&TH). To overcome anticipated variation and differences in the distribution of faculty members, a stratified random sampling was employed to proportionately draw from each stratum. Response rate achieved equals 86.84%; a total of 1134 articles were published in numerous research output formats by the faculty members, however journals (642) were the most preferred format. Year wise assessments of research output revealed that year 2006 was the most productive with score distributions of 159 and the most patronized authorship pattern was four contributors per paper (296). In conclusion, faculty members' research output trends were expressible in research output formats, year-wise distributions and prevalence authorship patterns which show commitment to research activities, dissemination and dispersion of research findings. The study recommends the maintenance of staff bound curriculum and publications because it is a veritable tool for bibliometric analysis and pointer to progress made by the faculty membership and units of the complex to agricultural development.

Introduction

Assessment of research output is a stepping stone to understanding the consequences of research, performance and commitment to research activities. Assessment, therefore facilitate evaluation that has physical attributes and rely on using a veritable statistical tool that is sufficient to record and communicate research results. According to Pendlebury (2009), quantitative analysis is perhaps the popular tool used for scientific evaluation and reporting because it supports counting, measuring, comparing quantities and analyzing measurements. It is also characterized by recording and communicating research results through publications. The use of bibliometrics analysis is only one of the quantitative indicators that are widely and increasingly used.

The aim of bibliometric analysis is to reveal the extent of research output, activities, preferences and nature (Sun, Wung and Ho, 2012). Researchers apply bibliometric methods to measure texts, patterns of publication within a given body of literature, determine author productivity, and describe author(s) collaboration, and empirically to verify bibliometric laws (Bradford's law of scatter, Lotka's law of scientific productivity, and Zipf's law of word occurrence). For instance, Bradford's law finds out core academic journals of a subject (Gu, 2004) and for exploring the scientific productivity, Lotka's law revealed frequency distribution of scientific productivity. Zipf's law established the frequency of words within a text (Wang, Pang and Huang, 2012). These laws have also been conceptualized to facilitate studies of academic disciplines and information phenomena in a multitude of ways to achieve multidimensional researches that include comparative studies of publications, analyzing the growth of the literature of a field and discovering clusters of related publications (van Raan, 2001; Weiss, 2007).In Nigeria, time and resources are devoted to institutionalizing agriculture and veterinary studies, services and training, little has been written about the Ahmadu Bello University, Zaria Agriculture and Veterinary Complex research output, the largest in the country with the mandate to three specialized agricultural institutes, two faculties (agriculture and Veterinary and Teaching Hospital) and a college of agriculture which have continued to contribute to this very important sector.

Statement of the Problem

It is noteworthy that the complex is charged to undertake agricultural research and report its activities to stakeholders comprising farmers (crops and livestock), marketers, processors, the academia, etc. It suffices therefore to assessing from the pool of

reports what were successfully reported and has not. For instance few scholars such as Ibrahim (1997/98), Akobi (2007), Lakan (2007) and Okanlawon (2010) report on the complex research output in segmentations. The work of Ibrahim (1997/98) focused on quantitative analysis of current scientific research and productivity of IAR and NAPRI, Akobi (2006) studied the importance of the essential electronic agricultural library to researchers of Faculty of Agriculture. Lakan (2007) studied the availability and utilization of electronic information databases by staff of the complex, Okanlawon (2010) looked at the citation of core agricultural journals. But what have been the contributions of faculty members in all the units of the complex is yet to be recorded, which implies there is a gap. The gap when assessed can pool and show the numerous parameters that influences research output, supply sufficient information that can remedy or overcome duplication of activities and resolves the erstwhile insensitivity to plights of stakeholders.

Objectives of the Study

The objectives of this paper is

i. To ascertain the research output formats of faculty staff from 2002 – 2012 in the agriculture and veterinary complex
ii. To determine the year-wise distribution of research output of faculty staff from 2002 – 2012
iii. To ascertain the prevalent authorship patterns from 2002 – 2012 in the published research output of faculty members of Agriculture and Veterinary Complex of Ahmadu Bello University, Zaria.

Literature Review

McBurney and Novak (2002) gave the most popular research output formats to include books, journals, conference papers, newsletters, magazines, bulletins, technical reports and monographs, and others they categorized under miscellaneous papers. Bird and Bird (1999) observed that refereed journals are the foundation of scientific communications, broadening the research base upon which a scientific discipline is built. Similarly, Xiao and Smith (2006) noted that academic journals plays significant role in academic scholarship is why Zang (2007) revealed that on the international relevance and relation research, journal has an overwhelming dominance as reference sources. The study by Javed and Shah (2008) revealed that 49.52% of citations pertained to journal articles and the rest to other resources types. This view was also shared by Gideon (2008) who reporting on Nigeria observed that scholarly publishing played a much greater role in terms of dissemination of information through scholarly journals. He pointed out that academic research is a focal point in Nigeria, compulsory for both lecturers and students, but particularly for lecturers who are affected by the concept of 'publish or perish, which has come to strap their subsistence and promotions making them to also rely on the academic environment and the volume of their research output and published works. Collaborating the above statement, Thanuskodi (2010) revealed that periodicals are the primary sources and channels of information dissemination. They are also important media for communicating the latest research findings, containing the current research development in any field of knowledge, which reflect and indicate literature growth. This is why Fagbola and Adejoro (2012) revealed that journals are more cited than other literature sources and most preferred sources of information. They attributed this to: currency of information, high rate of turnover of production, easy accessibility, frequency of production, which is faster than books and other primary sources. Attesting to the numerous sources of scientific information Wardika and Gudadhe (2013) argue that journal is one of the valuable primary sources because its literatures covers new researchable information, ideas, concept, formula and research results. It may cover the depth information on micro thoughts, comparison of subjects, depth study of subjects or new developments in subject, and so on. Specifically, McCann (2013) reported that electronic publications and formats are the most subscribed to and seen as the wave of the future when it comes to forms of scientific communication.

The influence of publications on research output is based on what is core to a subject field and medium of publication. Core publications are perceived by several authors centred on content and audience. According to van Raan and Leeuwen, (2002), core publications play important role in scholarship communication. Commenting on core Nigerian biomedical science resources, Nwagu (2007) categorically stated that these indices enable the examination of the growth of literature, which is also an indicator of the growth of science in Nigeria.Author productivity in research as noted by Creswell (1986), connotes the total research output made by an author within a given period of time. Accordingly, Millar and Senker (2000) state that a universal quantification approach to measuring research productivity was to count the number of

books, articles, technical reports, bulletins, and books reviews published, as well as presentations given and grants received. Therefore, periodic assessment becomes imperative during bibliometric analysis.

Fairweather (1999) gave elements that influence year-wise research productivity to include socio-demographic characteristics, environmental conditions, social knowledge, self-knowledge, career and social contingencies for the understanding of faculty productivity. Solu *et al.* (2012) revealed that often, departments evaluate their faculty members on their "publication count", a measure of quantity on usual yearly basis to coincide with promotion period.Edge *et al.* (2012) opined that to gain greater understanding of researcher behavior and attitudes in relation to communicating research outputs, factors driving researchers to work and to interact, motivations, institutional/organizational support are very important and have much influence over individuals' behavior on authorship productivity patterns and contributions.Sudhier (2013) reported that authorship patterns facilitate classification and description of contributor(s) in any literary endeavour. Nwagu (2007) reported that authorship is tied with reputation, career success and remuneration. This suffices to say that authorship is held accountable for the claims made in the write up. That is why the appropriation of credit and the allocation of responsibility thus go hand in hand, and this makes for a fairly straight forward social accounting.

Research Method

The study relied on bibliometric methods to undertake quantitative investigations of the research productivity and patterns of the faculty members of Agriculture and Veterinary Complex of Ahmadu Bello University, Zaria. The method facilitates the measurements of publication output, forms of publications and authorship patterns among members.Ziegler (2009) reported bibliometric methods to be very suitable for the description of research surrounding a particular field, or similarly, the quantity and focus of research output by a particular organization. As an evaluation method, it helps in the determination of the impact a technology or the effectiveness of an author or research organization. This research method is found to be very appropriate for the study because as observed by Jacobs (2001), it facilitates ascertaining the exact number of research output published through counting and over a period of time. It also helps to assess research productivity performance at individual, unit and institutional levels. The method efficiency enables producing a variety of statistics quite quickly when compared to the resource-intensive nature of others to assess the quality and innovations of intellectual thoughts.The population comprise of the six units of the Agriculture and Veterinary Complex of Ahmadu Bello University, Zaria and their respective faculty members. These units comprise of Institute for Agricultural Research (IAR), Division of Agricultural Colleges (DAC), National Animal Production and Research Institute (NAPRI), Faculty of Agriculture (FOA), National Agricultural Extension and Research Liaison Services (NAERLS) and The Faculty of Veterinary Medicine and Teaching Hospital (FVM&TH). According to ABU MIS (2013), there are a total of 545 faculty members. The sampling technique adopted was stratified random sampling. Stratified random sampling requires that population are shared into stratum that shares at least one common characteristic (Castillo, 2009). The choice of the stratified random sampling is to ensure that the populations of the six units with varying number of objects have proportional supply of sample size that provides adequate documents that can be used for generalization while guaranteeing that subjects from each stratum are inclusive. To operationalize the stratification technique, the study relied on Ibrahim (2013) procedure, which recommended sub-grouping to reduce sampling errors and facilitate random sampling of selected subjects to attain the proportional representation of the population. Therefore, 30% of professors and associate professors were purposively selected to fulfill the condition attested by Bornmann *et al.* (2008) that any proposed database must be reliable, sufficient with and formulated quality control criteria that comprise authenticity, credibility, representativeness and meaning. Inferentially, a sample size of 30% according to Afolabi (1993) is sufficient for generalization and a good representation of a target population. The instrument used for data collection were the approved bound copies of faculty members' curriculum vitae and publications by the university central committee for appointments and promotion of staff. The research instrument is adjudged to fulfill Bornmann *et al* (2008) preposition of a database that is authentic, reliable, true proof and consistent.

The standard for presentation of the bound curriculum vitae and publications for faculty members belonging to the Agriculture and Veterinary Complex is the same; it is made up of nine parts. The first part is a comprehensive curriculum vitae of the affected faculty member, the second part contains only peer-reviewed journal articles published, third

part comprise of all edited conference proceedings, fourth are unedited conference and seminar papers, fifth are for books published by faculty member, sixth are the published chapters in books, seventh is concerned with technical reports written, eight are the bulletins/magazines/newspaper, etc publications and ninth is the section designated to show innovations. For this study, the second to the eight parts will remain the focus of this research work. Data collected emerged by selecting the collocating objectives in the approved bound copies by the University's central appointments and promotion committee. Data extracted were recorded in computer files created in Excel spreadsheet (a component of Microsoft Office for mathematical operations) until all the bound copies for the different units of the complex were exhausted. Data collection lasted for two weeks considering the proximity and access to the complex faculty membership by the researchers; data were analysed descriptively.

Results and Discussion

Research Output Format

The research output here refers to the number of papers obtained following the arrangement and standard approved by the university central promotion and appointment committee that the bound copy of faculty member's curriculum vitae and publications must follow. The result is presented descriptively as Figure 1.

Fig. 1: Numerical distribution research output formats by faculty members in the Agric. and Vet. complex during 2002 - 2012

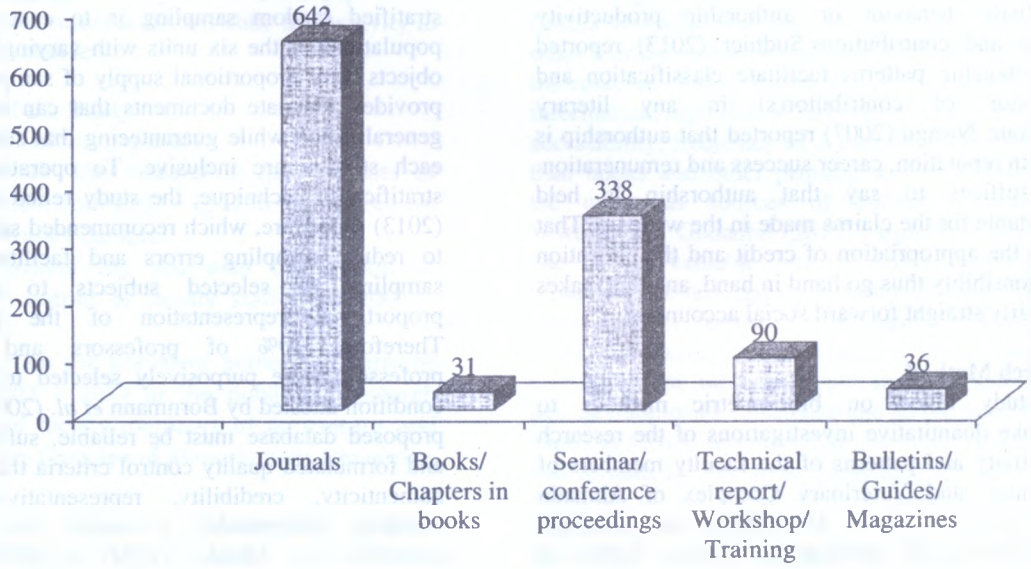


Table 1: Distribution and percentage score of the research output capacity of the units of the Agriculture and Veterinary complex of Ahmadu Bello University, Zaria during 2002 – 2012.

Year	Units of the complex						Total	% score
	DAC	FOA	IAR	NAERLS	NAPRI	VET		
2002	4	32	51	6	8	21	122	10.73
2003	2	22	32	14	6	17	93	8.18
2004	3	31	52	13	15	16	130	11.43
2005	4	38	32	18	10	17	119	10.47
2006	4	45	48	5	26	31	159	13.98
2007	11	30	31	11	17	20	122	10.73
2008	3	35	30	4	8	22	102	8.97
2009	9	17	33	2	4	38	103	9.06
2010	12	17	15	10	4	15	76	6.68
2011	10	11	19	1	4	11	56	4.93
2012	5	17	18	0	0	15	55	4.84
Total	**72**	**295**	**361**	**84**	**102**	**223**	1137	100

Key: DAC = Division of Agricultural Colleges; FOA = Faculty of Agriculture;
IAR = Institute for Agricultural Research; NAPRI = National Animal Production and Research Institute;
NAERLS = National Agricultural Extension and Research Liaison Services;
VET = The Faculty of Veterinary Medicine and Teaching Hospital

Prominent Authorship Patterns

Prominent authorship patterns were examined and results presented in Table 3.

Table 3: Authorship patterns

Unit	Number of author(s) per publication				
	1	2	3	4	5 and above
DAC	10	23	22	28	15
FOA	43	31	69	58	49
IAR	87	48	57	90	65
NAERLS	19	21	32	18	22
NAPRI	8	18	23	29	32
VET	13	17	56	73	61
Total	180	158	259	296	244

Figure 1 reveal that journals have the highest frequencies compared with the other formats. This corroborates with reports by Thanuskodi (2010), Fagbola and Adejoro (2012) and Wardika and Gudadhe (2013) who reported that journals are the most patronized by academics as a medium for sharing of research findings and as the most recognized, highly score media for the promotions, gratifications and publicity of faculty members. However, from the evidence that there is other formats attest to the recognition and acceptance of other media for the dispersion information to specific and specialized audiences. This assertion was supported by a study by McCann (2013) who argued that numerous styles and technicalities pre-empt scientific reporting to achieve comprehension and intention for which it is suitable. It is not out of place therefore to say that each research output format is specific and self-targeting.

Year Wise Distribution of Research Output

The variations during the year wise distributions of the research out are presented in Table 1. This was achieved by a direct count and recording of extracts from the bound curriculum and publications.As revealed in Table 1, the year 2006 had a total of 159 (13.98%) published research works making it the most productive year across the six units of the complex during 2002 to 2012. From the table, DAC scored the overall lowest cumulatively, however, the remaining five units show appreciable though varied research output capacities during the period under

investigation. This thrust may be attributable to the varied period for the promotion of the faculty members. The peculiarity to research output thrust were report by Solu *et al.* (2012) and Jacobs (2001) to be caused by certain factors which significantly affects faculty productivity, these factors comprise of promotion purposes, prestige and a way to show gratification.

A five scale of prominent authorship patterns was developed to describe authorship distributions in the complex. The results of the analysis revealed that multiple authorship dominated. Erlen *et al.* (1997) gave the domineering reasons of multiple authorship to the increase in multidisciplinary and for purposes of research expansion. Ahmad, Jan & Khan (2012) and Mengxiong (1993) reported that, multiple authorship support the sharing of knowledge when developed with others, whereas, Cronin (2001) was of the opinion that it could be attributable to trans-disciplinary, trans-institutional and trans-national collaborations. This implies that the prominent authorship pattern were joint with 4 authors per paper dominating which had a frequency distribution score of 296. According to Brocato (2001), this could be attributable to individual characteristics, psychological factors, environment and organizational, and group for conducting research. However, Edge *et al.* (2012) attribute researcher behaviour and attitude towards each other to be the major factor driving academics to work with others, interact, motivate and also to support each other, and making research output freely and openly available.

Conclusion and Recommendations

The research productivity of the faculty members in the Agriculture and Veterinary Complex of Ahmadu Bello University using selected bibliometric indicators revealed variable performance of publication productivity patterns throughout the study period in the complex. Therefore, it can be concluded that faculty members have shown commitment to research activities, dissemination and dispersion of research output; however forms containing productivity pattern have peak and low periods with journal publications dominating. Authorship patterns were also dominated by multiple authors per article in the units of the complex.

The following recommendations are proffered from the findings:

1. The significance of research output format should be graded equally to enable diversification and attract more patronage, and borne on the fact that other formats have a target audience and does not make them less information courier. The composition and arrangement of the research output in the complex should be maintained because it facilitate extraction and quantification of faculty members research output.
2. Periodic assessment should be tied to a reward system that acknowledges contributions made by individuals and units of the complex to boost the number of papers published, participation in research activities, document and share experiences.
3. Authorship patterns presently dominating in the complex is multiple which is characteristics of scientist in the applied sciences, It is however recommended that the patterns should be maintained and encouraged to reflect intra- and cross-discipline.

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