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SCIENTIFIC JOURNAL SELECTION BASED ON THE STUDY OF A LOCAL JOURNAL

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Abstract—A new dimension in solutions for journal selection problems could be found in selection of titles from journals published locally. Core journals in microbiology have been selected from the references made at the end of articles published. The ages of the materials as well as the forms of the literature confirm the fact that retrospective and up-to-date information is necessary for research in this field.

1. INTRODUCTION

Librarians continually evaluate their collections in line with the demand of users. As a result, new materials are usually added to the collections as older ones are withdrawn. This places greater responsibility on the person who selects the materials as both acquirer and as weeder (Miller & Rockwood, 1979). New materials need to be acquired to keep up the stock, and since space does not increase at the same rate at which the stock increases, there is usually a need for more space for the materials, hence one is forced to weed.

For effective selection and weeding, a clear understanding of the subject is essential. Librarians are faced with requests for favourite titles from users. It is difficult and often impossible to strike a balance on the title that will have broad coverage of all areas of interest. Since we selected microbiology as our research subject, we conducted a bibliometric study of the journal published by the Nigerian Society of Microbiology.

References made at the end of the articles published in the *Nigerian Journal of Microbiology* were studied with the aim of identifying the book collections used by microbiologists in Nigeria. It was hoped that this would lead to identification of relevant collections on the subject. This survey covers both journals that are available and unavailable, since concentration on only available materials would make it impossible to know which journals are rarely used and should be replaced with more useful journals (Danikowicz & Szaraski, 1981).

1.1 *Microbiology as a subject*

Webster's Dictionary (1966) defined microbiology as the branch of biology dealing especially with microscopic forms of life (such as bacteria protozoa, viruses, and fungi) and went further to define biology as the branch of knowledge that deals with living organisms and vital processes, but is commonly restricted to consideration of principles of wide application to the origin, development, structure, function, and distribution of living matter as represented by plants and animals and to the generally recurrent phenomena of life, growth, and reproduction. The *McGraw-Hill Encyclopedia of Science and Technology* (1977) went further to classify the subject into:

Medical and Sanitory Microbiology
Food Microbiology
Soil Microbiology
Industrial Microbiology
Microbial Biochemistry
Bacterial Taxonomy

The above groupings show that within the subject alone there are different subjects areas that will draw one's attention. Garfield (1979) rightly pointed out that bibliometric studies can help every researcher to identify journals when the interaction between specialities or disciplines pushes one beyond the borders of familiar territory. This study will throw more light onto microbiology as a subject and help to identify relevant books and journals.

The study of micro-organisms is universally based, and the aim of establishing this journal (*Nigerian Journal of Microbiology*, 1982) was to provide an effective means for Nigerian scientists to contribute to international and technological knowledge in the area of microbiology, as well as to promote research cooperation among microbiologists in institutions in Nigeria and other countries.

A study of the available volumes of this journal spotlights the areas where interest has been concentrated in the subject field and the contribution the Nigerian microbiologists have made towards the study of microbiology. Knowledge gained from this investigation will be useful when assembling a list of indispensible titles in microbiology.

2. METHODOLOGY

A study of volumes two to six of the *Nigerian Journal of Microbiology* was undertaken in this study. The journal is published twice annually. The first issue is published in June, while the second issue comes out in December of the same year. Smooth progress in publishing the issues was marred by problems that left the journal with only six volumes since its establishment in 1981. Volume one was not available for this study.

To find the distribution of source articles, the number of articles published in each issue were calculated. In the same way, the total number of articles that were referred to at the end of each article was also studied. We also calculated the number of authors who wrote each article, so as to establish the level of joint authorship and discover whether microbiologists prefer to write articles with other authors or not. The incidences of self-citation and double citation were surveyed by checking whether authors had referred to their earlier published works in their current articles. To determine the forms of literature used by microbiologists, the following information was extracted—number of times a particular form of literature was cited, and the cumulative numbers of citations of these forms of literature, as well as their cumulative percentage. The ages of the literature cited were also noted and plotted out. A list of all journals referred to was compiled according to the number of times each journal appeared in the references. Also, their cumulative citations and cumulative percentage of appearance were calculated. The journals were ranked and the ranking was plotted out. The universal nature of the title list so generated was confirmed by cross checking the titles in the 26th edition of *Ulrich's International Periodical Directory* (1987).

From the addresses of the source authors, their geographical locations were compiled. Cumulative numbers and percentages of source authors from each institution were calculated and plotted out. The departments where source authors were based was studied to expose the interdisciplinary nature of the subject. A graph of this was also produced.

3. RESULTS AND FINDINGS

Results of the study of the volumes of the *Nigerian Journal of Microbiology* show that about 118 articles have been published. This number generated 1688 references (see Table 1). Volume two had the highest number of articles (28). From the table, it will be seen that the ratio of source articles to reference articles is 1:15. Each article published usually has a number of references which serve as pointers to related literature in the field. From the above statistic, it is clear that each article generated about 15 other articles which are equally related to the main article.

The number of contributors to both source and cited articles is shown in Table 2. In the column for source articles, is the number of articles written by either one or two authors—142. The number of articles written by three to four authors was 58, and just five

Table 1. Distribution of source/cited articles

Volume	Year	No. of source articles	No. of articles cited
2	1982	28	375
3	1983	26	358
4	1984	20	339
5	1985	22	266
6	1986	22	350
Total		118	1688

Ratio of No. of source articles to No. of articles cited = 1:15.

articles were written by five authors. There was a total of 205 authors who wrote the 118 articles published. For the articles cited in the references (see Table 2), 976 articles were written by one or two authors, 426 articles were written by three to four authors, and 69 articles were written by five to seven authors. The ratio of number of authors of source articles to the number of authors of cited articles is 1:8. While the maximum number of co-authors to one article in the source articles was five, cited articles had a maximum of 11 authors to one article. Finally, on this issue of co-authorship, it will be observed from the above findings that microbiologists, as shown in both source and cited articles, generally prefer writing articles alone or with just one other author.

Considering the incidence of self-citation (where one author cites his or her own work) and multiple citation (where another's work has been cited in the same paper more than once), the number of self-citations was 112, while multiple citations numbered 284. Microbiologists cite other people's work more often than they cite their own, hence the incidence of self-citation was less common.

3.1 *Forms of literature*

The forms of literature used by microbiologists as discovered in the study are displayed in Table 3. These were derived from the references made at the end of each article. Of the 1688 publications cited, 1197 references were made from periodicals, 288 from books, and 10 from standards, whereas personal communications, articles in press, and unpublished sources had three references each.

The cumulative percentages also show that periodicals were cited more than any other form of literature. This means that periodicals constitute above 75% of the literature referred to by microbiologists. This indicates that microbiologists prefer the use of periodicals to other sources of information. This may be because the information in periodicals is generally more current than that in other sources. Personal communications are rarely used by microbiologists.

Table 2. Joint authorship

Authors of source articles		Authors of cited articles	
Number of authors	Number of articles	Number of authors	Number of articles
One to two	142	One to two	976
Three to four	58	Three to four	426
Five	5	Five to seven	69
		Eight to 11	4
Total	205		1475

Ratio of authors of source articles to cited articles = 1:8.

Table 3. Forms of literature

	No. of times cited	Cumulative citation	Cumulative percentage
Periodicals	1197	1688	100.00
Books	288	491	29.087
Technical report	93	203	12.026
Conference/Workshop	53	110	6.516
Manuals	21	57	3.376
Thesis	17	36	2.132
Standards	10	19	1.125
Personal communication	3	9	0.533
In press	3	6	0.355
Unpublished	3	3	0.177

3.2 *Ages of literature*

Variation in the ages of literature used is shown in Fig. 1. The highest number of citations was made from articles published between 1971 to 1975. That is from 6 to 10 years before the first issue of the *Nigerian Journal of Microbiology* was published. The appearance of articles that were published before 1940 is a good warning to the information provider when considering weeding of stock. Keeping books that are up to 45 years old is often difficult. They usually need to be handled with care, as they are fragile and can easily crumble (this is due to deterioration of the quality of the materials).

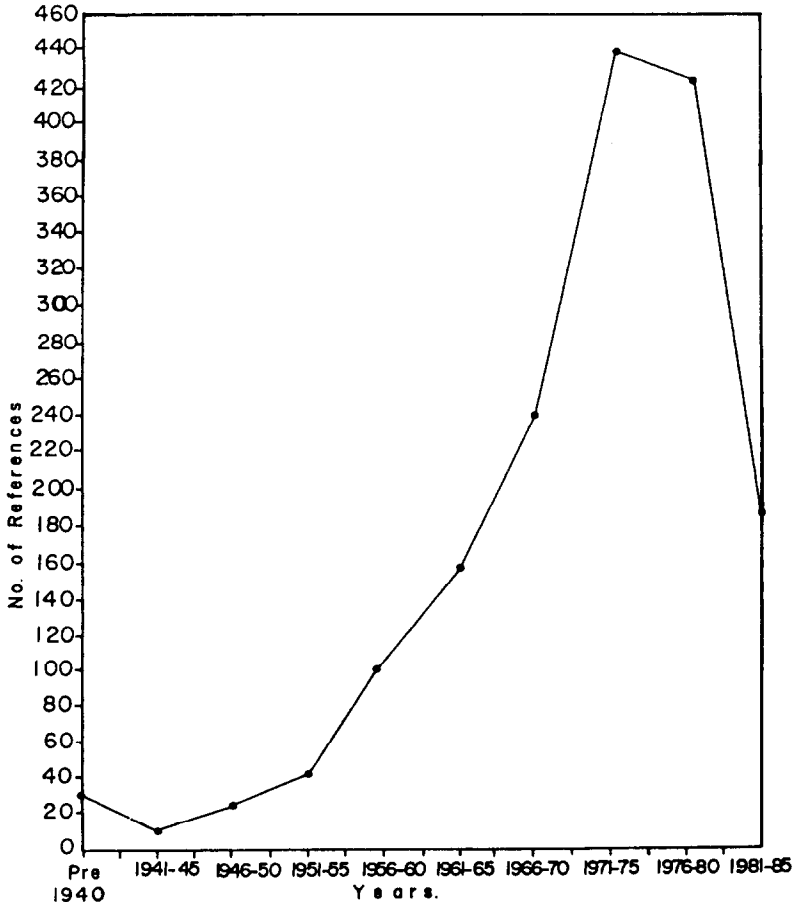

Fig. 1. Ages of literature cited.

The journals least referred to were those published between 1941 and 1945. The decline in references to articles published from 1981 to 1985 occurred because source authors have not come across most of the recent publications from that period. Also, some of the publications may still have been in press at that time, and therefore, not have been available to authors.

3.3 *Ranking of journal list*

The total number of times particular titles of publications were mentioned in the citations was calculated and ranked. This is a measure of their level of importance. Table 4 shows a list of all the journals that were referred to more than five times. A total of 308 publications were mentioned, and those cited less than five times were not considered for this research. Only 56 (18.18%) were mentioned more than five times while the rest, 252 (81.82%), were mentioned less than five times.

In the list, the *Bulletin of the World Health Organisation* was ranked first. The publication is known worldwide, but unfortunately only libraries that are depositories for United Nations publications receive the items published. They were referred to 38 times. The *Journal of Bacteriology*, which was referred to 37 times, was ranked second. The *Nigerian Journal of Microbiology* was ranked 31st and was referred to only eight times.

In Fig. 2, only journals cited more than 24 times appeared in the upper quartile. The median gives only journals cited up to 17 times. In Table 4, only 16 titles fall within the range. In most cases financial resources available only allow each department of an insti-

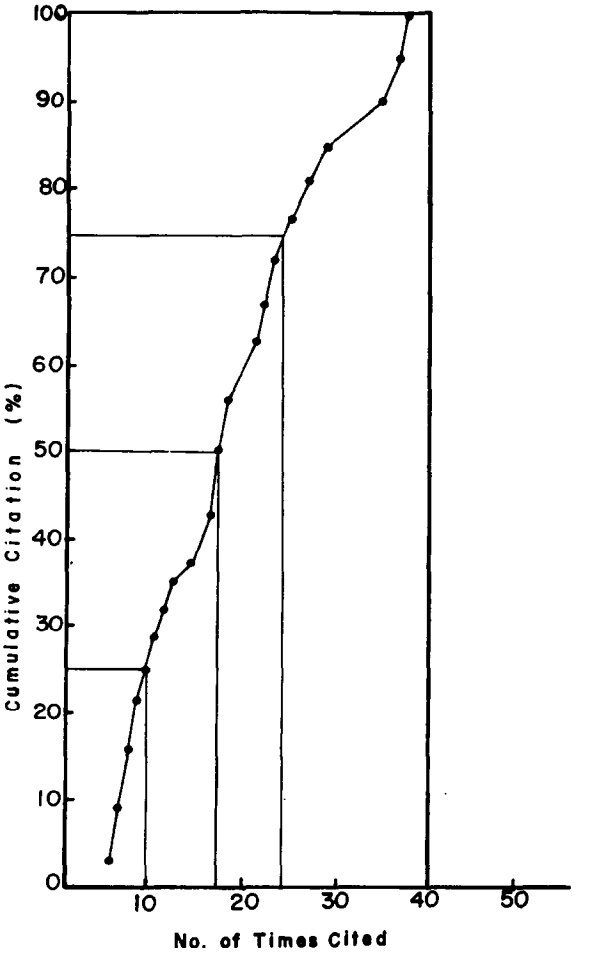

Fig. 2. Cumulative ranking of journals cited more than five times.

Table 4. Ranking of journal list

Title of journals	No. of times cited	Rank	Cumulative citation	Cumulative percentage
Bull. Wld. Hth. Org.	38	1	722	100
Journal of Bacteriology	37	2	684	94.736
J. Gen. Microbiology	35	3	647	89.612
Lancet	29	4	612	84.764
Appl. Microbiology	27	5	583	80.747
Bri. Med. Journal	25	6	556	77.068
Can. J. Microbiology	23	7	531	73.545
J. Appl. Microbiology	23	7	508	70.360
W. Afri. Med. Journal	22	9	485	67.174
J. Hygiene Cambridge	21	10	463	64.127
Phytopathology	21	10	442	61.218
J. of Infectious Diseases	18	12	421	58.310
Nigerian Medical Journal	18	13	403	55.817
Trans. Roy. Soc. Trop. Med. and Hygiene	18	13	385	53.324
Br. Jn. of Veneral Disease	17	15	367	50.831
J. of Trop. Med. & Hygiene	17	15	350	49.476
Ann. Trop. Med. & Parasitology	16	17	333	46.121
J. Biol. Chemistry	16	17	317	43.905
Journal of Clinical Pathology	16	17	301	41.689
J. of Food Science & Technology	16	17	285	39.473
New England J. of Medicine	14	21	269	37.257
Annual Review of Resp. Diseases	12	22	255	35.318
Biochemical Journal	11	23	243	33.656
Journal of American Medical Assn. (J.A.M.A.)	11	23	232	32.132
Nature	11	23	221	30.609
Appl. Env. Microbiology	10	26	210	29.085
J. Antimicrobiol Chemother	10	26	200	27.700
Annual Review of Microbiology	9	28	190	26.315
Trans. Br. Mycol. Soc.	9	28	181	25.069
W. Afri. In. Biol. Appl. Chem.	9	28	172	23.822
Infection and Immunol.	8	31	163	22.576
Journal of Med. Microbiology	8	31	155	21.468
Nig. Journal of Microbiology	8	31	147	20.360
Biochem. Biophys. Acta.	7	34	139	19.252
East Afri. Medical Journal	7	34	132	18.282
Immunology	7	34	125	17.313
J. Agric. Food Chem.	7	34	118	16.343
J. Comp. Pathol & Terap	7	34	111	15.373
Journal of Immunology	7	34	104	14.404
Rep. Nig. Stored Prod. Res. Inst.	7	34	97	13.434
Science	7	34	90	12.465
Bacterial Review	6	42	83	11.495
Bull. Epizool. Dis. Afri.	6	42	77	10.664
Indian J. Med. Res.	6	42	71	9.833
Journal of Biochemistry	6	42	65	9.002
Journal of General Virology	6	42	59	8.171
Paediatrics	6	42	53	7.340
Trop. An. Geogr. Med.	6	42	47	6.509
Vet. Rec.	6	42	41	5.678
Am. J. Clin. Path.	5	50	35	4.847
Am. J. Pub. Health	5	50	30	4.155
Antonie Van Leeuwenhook	5	50	25	3.462
Int. J. System. Bact.	5	50	20	2.770
J. Milk Food Technology	5	50	15	2.077
Mushr. Sci.	5	50	10	1.385
Res. Vet. Sci.	5	50	5	0.692

tution to subscribe to a few journals. The lean resources of libraries can allow subscriptions to only the journals that fall above the upper quartile on the graph.

Steps taken to arrive at this conclusion are essential for anyone faced with problem of journal selection. There are many journals in which relevant articles in microbiology have been published, but only few of them are popular among researchers. These will satisfy the interest of many information seekers.

3.4 *Cross checking of titles*

To find out how these titles were grouped based on the subjects, the 56 titles selected were checked in *Ulrich's Directory* [7]. The list of these titles is displayed in Table 5. Sixteen of the titles were found under medical sciences. Fifteen were listed under biology. This clearly supports the contention made that microbiology belongs to a number of subject groups. Other related subjects like public health and safety had three subject groups, while the rest, like agriculture and physical fitness and hygiene, had only one subject group title each.

3.5 *Geographical location of the source authors*

As stated earlier, by instituting this journal, the Nigerian Society of Microbiologists intended to achieve international and technological coverage. To find out the extent to which this has been accomplished, a study of the location of the authors of the articles pub-

Table 5. Subject groups of the titles in *Ulrich's Directory* (26th ed.)

Subject group	Journal titles	No. of titles
Medical sciences	*British Med. Journal* *East African Med. Journal* *Indian J. Med. Res.* *J. of Amer. Med. Assn.* *J. Med Microbol.* *Lancet* *New England J. Med.* *Nig. Med. Journal* *Tropical Med. J.*	16
—Allergology and immunology	*Immunology* *J. of Immunology*	
—Anaesthesiology		
—Communicable diseases	*J. of Infectious Diseases*	
—Dermatology and venereology	*J. of Trop. Med. & Hygiene*	
—Paediatrics	*Paediatrics*	
—Pharmacy	*J. Antimicro. Biol. Chemother.*	
—Respiratory diseases	*Ann. Rev. of Resp. Diseases*	
Biology	*Am. J. Clin. Path.*	15
—Botany	*Phylopathology*	
—Biophysics	*West African Biol. Appl. Chem.*	
—Biological chemistry	*J. of Biochemistry* *J. of Bio. Chem.* *J. of Clin. Path.*	
—Microbiology	*Antonio Van Laewenhook Med.* *Jydschir Hyg.* *Appl. Microbiol.* *Can. J. of Microbiology* *Inter. Jou. Syst. Bact.* *J. of Appl. Microbiology* *J. of Bacteriology* *J. Gen Microbiology* *J. Gen. Virology*	
Public health and safety	*Am. J. of Pub. Health* *J. of Milk and Food Tech.* *J. of Trop. Med. Hygiene*	3
Food and industry	*J. of Milk and Food Tech.* *J. of Food Sci. and Tech.*	2
Science—comprehensive work	*Science* *Nature*	2
Agriculture—food production and soil	*J. of Agric. Food Chem.*	1
Agriculture—poultry and livestock	*Bull. Epizool. Dis. Afric.*	1
Agriculture—dairy and dairy products	*J. of Milk and Food Tech.*	1
Physical fitness and hygiene	*J. Hygiene Cambridge*	1
Veterinary science	*Res. in Vet. Sci.*	1
Water resources	*Vet. Record*	1

lished in the journal was carried out. Addresses of these source authors appeared at the beginning of every article. From these addresses, the authors were grouped according to institutions from which they sent their articles for publication.

Table 6 shows the institutions where source authors were based. Also, the number of source authors in each institution, and the cumulative numbers percentages were shown. The highest number of source authors (33) were from University of Lagos. The lowest number were from University of Ilorin, which had only three source authors. The highest number of source authors from research institutions was from the Nigerian Institute of Veterinary and Trypanosomiasis Vom (6). The lowest number from a particular research institution was one, from Moore Plantation in Ibadan. Two articles did not give the author's addresses, so they were deleted from this aspect of the survey.

For comparison of sources of contribution, authors from institutions outside Nigeria were also cross checked. Source articles were received from five foreign countries. Ten source authors were based in the United Kingdom, and seven in the United States. One contribution was made from the United Nations Children's Emergency Fund (UNICEF).

Institutions and the cumulative percentages of the source authors are displayed in the graph in Fig. 3. Fifty percent of the articles came from only 16 institutions in Nigeria, but the upper quartile of the graph shows that only two institutions, University of Lagos and University of Benin, contributed 33 and 23 articles, respectively. The implication of this result is that these institutions are the areas where research in the field of microbiology is very strong. In foreign countries, only the United Kingdom and the United States appeared above the 50% mark.

From the above it has become evident that not all staff of universities and research institutions in Nigeria have their papers published in this journal. It may be that the institutions from which no articles have been received do not offer microbiology-related courses. Or perhaps the journal has not been well advertised to them. The rate of publication, high number of rejected articles and/or the quality of the journal may be other factors that scare

Table 6. Geographical location of source authors

Institutions	No. of source authors	Cumulative no. of source authors	Cumulative percentage
Nigerian			
1. University of Lagos	33	177	100.00
2. University of Benin	22	144	81.355
3. Ahmadu Bello University	22	122	68.926
4. University of Ife	18	100	56.497
5. Universityof Nigeria, Nsukka	13	82	46.327
6. University of Calabar	13	69	38.983
7. University of Ibadan	13	56	31.638
8. Anambra State University of Science & Technology	11	43	24.293
9. University of Jos	6	32	18.079
10. Nigerian Inst. of Vet. and Trypanosomiasis, Vom	6	26	14.689
11. University of Port Harcourt	5	20	11.299
12. Rivers State University of Science & Technology, Port Harcourt	3	15	8.474
13. University of Ilorin	3	12	6.779
14. National Inst. for Medical Research, Yaba	3	9	5.084
15. Stored Product Institute, Ibadan	2	6	3.389
16. Address not stated	2	4	2.259
17. Polytechnic, Owo	1	2	1.129
18. Moore Plantation, Ibadan	1	1	0.564
Foreign			
1. United Kingdom	10	27	100.00
2. United States	7	17	62.962
3. Japan	5	10	37.037
4. Egypt	3	5	18.518
5. Syria	1	2	7.407
6. UNICEF	1	1	3.703

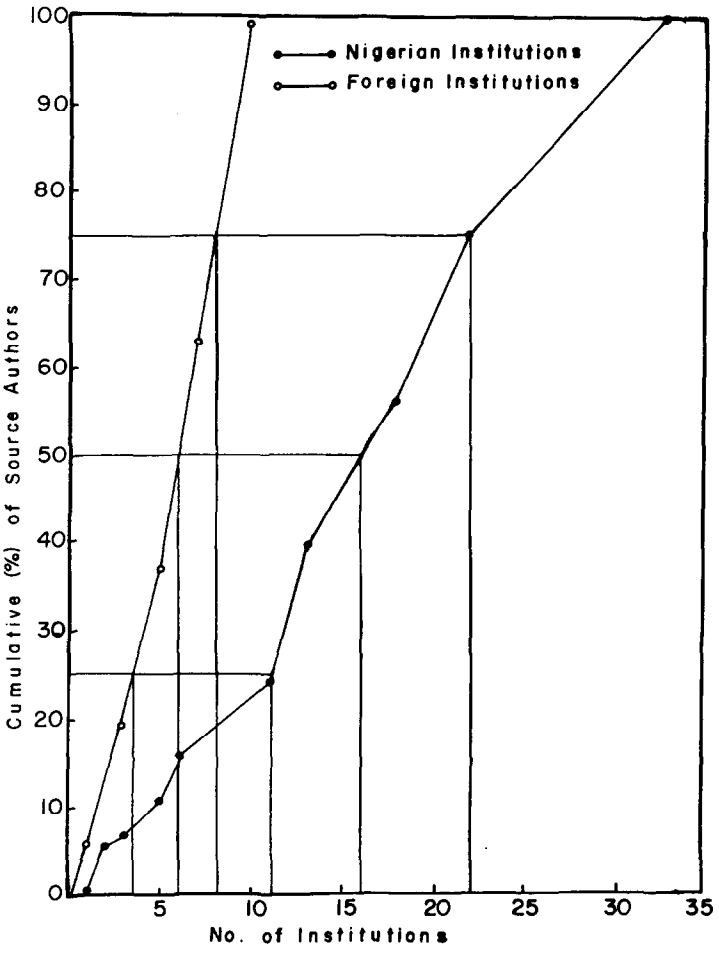

Fig. 3. Institutions and cumulative percentages of source authors.

away potential contributors. There is still a lot to be done by the editor to brighten the image of the journal, since it is the only journal of the association.

3.6 *Academic discipline base of source authors*

Microbiology covers a number of subjects within the discipline. To find out the subject areas in which writers of the articles were based, the department of each contributor was taken from the addresses at the beginning of the articles.

Table 7 shows that 77 of the authors were from microbiology departments, while 39 were from medicine. Some organisations like the Japanese International Co-operation and UNICEF, that are not based in specific academic departments, contributed 12 articles. The least came from geology and forestry. On the whole, departments in about 10 different disciplines have contributed articles so far.

The position of these departments as regards their contribution is shown in Fig. 4. Only one department, microbiology, appeared in the upper quartile. The median of the graph show that only microbiology and medicine contributed more than 50% of all the papers. Many departments fell below the lower quartile. The majority of the source authors were from microbiology departments. Contributions from other departments showed how closely microbiology is related to other science subjects.

Table 7. Subject base of source authors

Subject	No. of source authors	Cumulative no. of authors from the department	Cumulative percentage
Microbiology	77	209	100
Medicine	39	132	63.159
Biology (Botany and Zoology)	26	93	44.497
Veterinary pathology	24	67	32.057
Food science	14	42	20.045
Not specified (e.g., Japanese International Co-operation, UNICEF, etc.)	12	29	13.875
Biochemistry	9	17	8.133
Pharmacy	4	8	3.827
Geology	2	4	1.913
Forestry	2	2	0.956

4. CONCLUSION

The volumes of the *Nigerian Journal of Microbiology* so far studied have demonstrated a remarkable effort by microbiologists to publish their research findings locally. The source articles and the citations made were found to be valuable in directing the informa-

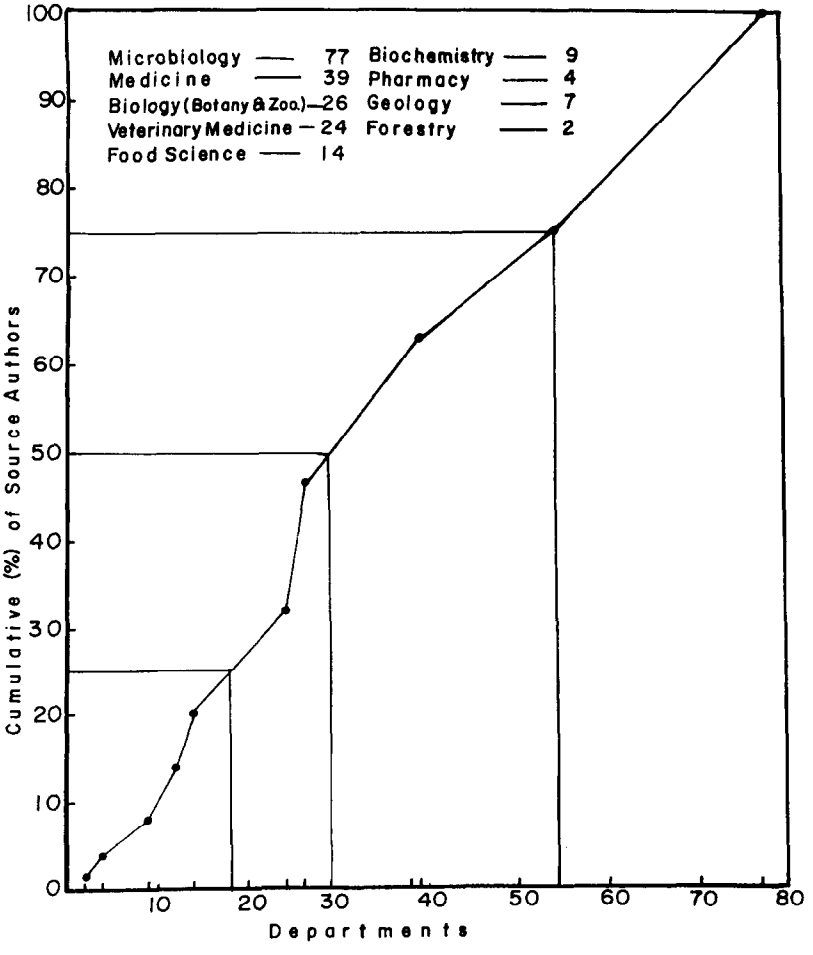

Fig. 4. Cumulative percentage of number of source authors and their departments.

tion provider to areas where the literature could be located. The ages of the literature referred to also reminds us of the needs for backfiles as an indispensible tool in retrospective searches.

Almost all science departments have made contributions to the publications in this journal. There is no university in Nigeria which does not offer a number of these subjects. Not all universities and research institutions have made contributions to the journal. The editor still has much work to do to make the journal popular. Much still has to be done to bring the publication up to date, improve its quality, and brighten its image.

The results from Fig. 2 will aid librarians and information scientists to select journals for acquisition. Under normal circumstances, there will be rationalisation of available funds. Journals in the upper quartile can comfortably be accommodated. These will serve the need of most researchers.

The result in Fig. 3 is very essential when zoning of subjects is being considered. The institutions in the upper quartile may be considered for the subject of microbiology, while other institutions may be considered for other courses. Similarly, when one seeks foreign aid/training, the foreign countries that have shown more interest will readily come to mind.

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