Information Processing & Management Vol. 23, No. 6, pp. 629–638, 1987
Printed in Great Britain.

0306-4573/87 $3.00 + .00

SELECTING LIVESTOCK PERIODICALS THROUGH CITATION ANALYSIS TECHNIQUE

SEGUN ADEWOLE
Ahmadu Bello University, Zaria, Nigeria

(*Received* 11 *July* 1986; *accepted in final form* 4 *March* 1987)

Abstract—This paper describes a study using the citation analysis technique to select journals that would be used in the livestock industry. The study determines the principal journals to which a livestock library should subscribe, thus obtaining the highest possible utility of materials.

By using a data base of 114 journals for a period of four years (1980–83), citation data were applied on the Bradford bibliograph and Bradford–Zipf distribution to determine the ranking of journals in the industry and the "core journals."

It was discovered that the *Journal of Animal Science* is the most cited journal, with 889 citations, and the core journals were 18 in number, having 11,070 citations representing 32.3% of the total citations.

INTRODUCTION

The major problem of research libraries all over the world is deciding which serials should be bought to meet the needs of their specialized users, without subscribing to any unnecessary journals. This problem has become more complex with the growth in publications and literature, accompanied by the problems of bibliographic control. The problem has recently been aggravated by shortage of funds and subsequent cuts in library book budgets.

In order to operate effectively, libraries must identify literatures of high utility to their clients, and must acquire and organize this literature in such a way as to optimize its usefulness.

One of the generally accepted methods of scientific investigation is, indeed, to follow the scientific literature by the simplest means. Various sources are used by scientists to gather information—regular reading of all available texts, recommendation of colleagues and superiors and references or citations in other relative publications. One of the pressing problems of librarians today is what Bradford has termed "quantitative untidiness of scientific documentation" [1]. While the primary function of the librarian is the provision of effective access to knowledge, as recorded in all forms, it becomes a great task of filtering between users, information needs available and the information materials in their disorganized state.

Cole, in a study examining the published works of university physicists, concluded that relatively few physicists actually make significant contribution in the subject field, and that these contributing physicists themselves base their work wholly or partially on research produced by a relatively small number of scientists [2]. Many researchers thus rely on the cited works of previous researchers to go about their own work.

With the ever-increasing "storm" of publications, the equally increasing demand for more by clients and the increasing fiscal pressures on most libraries today, the librarian has an important function of filtering between the avalanche of information and users. This function becomes more complex, more demanding and more frustrating, particularly in the hands of a novice. Rawski [3] observed that intelligent filtering requires some scientific and objective method of investigation into the subject literature and an extensive study and use of bibliography.

While Bradford investigated the extent of scattering of articles in bibliographies of applied geophysics and lubrication, he established the law of scattering. The theory states that every scientific subject is related more or less remotely to every other scientific sub-

ject. He established that articles of interest to a specialist must occur, from time to time, in other periodicals. The number of these periodicals grows as the relation of their fields to that of the research subject lessens, and the number of the articles on the subject in each periodical diminishes, when the numbers of periodicals in the nucleus and succeeding zone will be as in $1:n:n^2: \ldots$ "[4]. In other words, it is to be expected that articles relating to livestock science, say, can be found in the *Journal of Soil Science,* or *Journal of Chemistry*, etc., but the more related to a subject a journal is, the more the tendency for that journal to carry more articles on the subject than any other journal. According to Bradford, it is possible to arrange journals in zones of decreasing productivity in regard to the amount of papers carried on a given subject and the number of journals in each zone will increase as their productivity decreases.

Libraries must therefore identify literature of high utility to their clients and must acquire and organize this literature in such a way as to optimize its usefulness. It is assumed that effectiveness and economy cannot be developed by relying on informal and intuitive selection procedures. This is the concern of citation analysis.

In the course of this study, the following definitions and explanations are pertinent.

DEFINITION OF TERMS

Bibliometrics

Pritchard, in 1969, coined the word bibliometrics to mean "shedding light on the process of written communication and of the nature and course of development of discipline by means of counting and analyzing the various facets of written communication" [5]. Several definitions have thereafter been given. For the purpose of this study, however, Donohue's 1973 definition will be adopted: "The application of mathematical and statistical techniques to books and other media of communication" [6].

Citation analysis

This is regarded as the analysis or investigation of materials which have been cited by writers in a subject field, such as form, date of use and publications, country of origin, related subject fields and level of analysis.

Livestock

The term has been used from the agricultural point of view. (It is therefore taken to include the poultry species.) The study of livestock is the study of the diseases and health of all nonhuman animals that are kept for use as food or for profit. They are taken to mean farm animals, such as cattle, sheep, goats, pigs, fowl, and guinea-fowl. It also includes their products, such as milk, fat and eggs, and the study of their anatomy, physiology and pathology.

LIMITATIONS OF THE STUDY

In 1983, the subscription list for journals in the National Animal Production Research Institute (NAPRI) library was 125 titles. This list has continued to increase yearly, and has now grown to 250 titles (1986 figure). For the purpose of this research, the 125 titles were subjected to citation test, 114 of which were cited.

For uniform and comparative examination, the 1985 journal list of 201 titles could not be taken (as it contained over 70 titles not in the 1983–85 sample). This study is thus based on the 114 titles cited from the 125 titles of 1983. The results of the study have continued to influence the acquisition policy of the library since after the 1983 subscription exercise.

This study is therefore limited to the 114 journals cited from amongst the library holding of the NAPRI, which in itself was based on its 1983 subscription level. It is again further limited to the four year period (1980–1983).

Finally, because of these limitations, the result of citation analysis is limited to the base of study and obviously on the incompleteness of the citation data itself; not all informa-

tion that is consulted or used by authors gets cited. Hence, the data that is being analysed is in itself limited. However, the conclusion of the study has been carefully drawn to meet the test of outer situations within the same industry.

PURPOSE OF THE STUDY

This study is necessary because of the difficult financial situations that research libraries are constantly finding themselves in during these days of budget cuts and austerity. The percentage of material utilization must be seen to measure with that of acquisition.

Secondly, much time is wasted searching for specific information by scientists. The problems entailed in browsing through heaps of literature that have a relatively insignificant relation to need cannot be overestimated.

Hence the main purpose of the study is to bring into focus those journals that are necessary in the livestock sector, avoiding a waste of funds to the library and of time to the users. This fact has thus formed the basis of different investigations aimed at selecting relevant journals in special subject fields, and bibliometrics has proved a useful tool for this purpose.

Brookes [7] attributed the problem of untidiness in scientific documentation to a lack of methods for determining the minimum size or lower limits of a useful collection.

Through bibliometrics, Aiyepeku [8], among others, noted that Nigeria's geographical literature is more concentrated on the human aspects of the subject than on the physical.

Lawani [9] and Afolabi [10] applied bibliometrics to the studies of agriculture and of economic and social studies, respectively.

This paper therefore attempts to apply bibliometrics to the literature of livestock science. The following will be determined:

(a) Which livestock journals are most frequently cited and thus form the central journal collection of a useful livestock library?
(b) What is the "core journal" percentage for a livestock library?
(c) What are the factors (if any) affecting the use of livestock journals?
(d) Are foreign livestock journals relegating "local" ones? The focus of study is, of course, Nigeria. However, the model of study is the library of the National Animal Production Research Institute, Shika-Zaria. It is the first and only institute involved in production and research into the livestock sector in Nigeria.

METHODOLOGY

Citations in the journal literature of the 114 journals selected for the study were examined, and all references were collated. At the end, a list of the citations received by the journals was arranged in descending order as presented in Table 1.

All issues of the journals (12, 4 or 1, i.e. monthly, quarterly or yearly, respectively) for four years (1980 through 1983) were searched for the purpose of identifying citations. In the process, journals in languages other than English were included, while incomplete journals were dropped. The table of citation scores is represented in Table 2. This is the table of distribution which is further presented as a bibliograph (i.e. the Bradford-Zipf distribution) shown as Fig. 1. The typical Bradford-Zipf bibliograph is reproduced in Fig. 2 for the purpose of comparison. The following results are obtained.

RESULTS/DISCUSSION

The 114 journals produced more than 34,000 citations in four years. The *Journal of Animal Science* received the highest citation of 889 (average of 222/yr.). The least-cited journal was the *Ondersteport Journal of Veterinary Research*, which was cited only 3 times within the same four-year period. The top ten journals, with citation ranges of 600–889, have a total of 6789 citations and represent about 20% of total citations. The bottom ten journals have a total of 198 citations (i.e. 0.31%).

Table 1. Table of citations to journals

Serial no.	Title of journals	No. of citations
1	*Journal of Animal Science*	889
2	*Journal of Animal Production*	830
3	*Journal of Dairy Science*	822
4	*Journal of Reproduction and Fertility*	618
5	*Journal of Dairy Research*	615
6	*Veterinary Record*	610
7	*World Animal Review*	602
8	*Journal of Range Management*	601
9	*Tropical Agriculture* (Trinidad)	601
10	*Tropical Animal Health Science Journal*	601
11	*Theriogenology*	598
12	*Journal of Agricultural Science* (Cambridge)	590
13	*World Poultry Science Journal*	586
14	*Poultry Science Journal*	508
15	*British Veterinary Journal*	503
16	*Indian Journal of Veterinary Science and Animal Husbandry*	502
17	*British Journal of Nutrition*	498
18	*Animal Breeding Abstract*	496
19	*Indian Journal of Animal Science*	493
20	*Animal Production Science*	489
21	*British Poultry Science Journal*	487
22	*Indian Journal of Dairy Science*	481
23	*Animal Production Journal*	481
24	*Livestock Production Science*	480
25	*Ghana Journal of Agriculture*	480
26	*Nigerian Journal of Animal Production*	446
27	*Canadian Journal of Animal Science*	443
28	*Australian Journal of Experimental Agriculture and Animal Husbandry*	440
29	*Journal of Fertility and Sterility*	412
30	*Australian Journal of Agricultural Research*	411
31	*Veterinary Review*	410
32	*Nigerian Veterinary Journal*	410
33	*Proceedings of the British Society of Animal Science*	410
34	*Veterinary Bulletin*	408
35	*Animal Research Development*	408
36	*Indian Journal of Veterinary Science*	407
37	*Israel Journal of Agriculture Research*	407
38	*Indian Journal of Agriculture*	402
39	*East African Agriculture and Forestry Journal*	398
40	*Tropical Animal Health and Production*	396
41	*Grass and Forage Science Journal*	394
42	*Australian Veterinary Journal*	394
43	*Journal of Endocrinology*	394
44	*Egyptian Journal of Animal Production*	389
45	*Tropical Pest Management*	388
46	*Queensland Journal of Agriculture and Animal Husbandry*	386
47	*Journal of Biological Chemistry*	381
48	*Netherlands Milk and Dairy Journal*	380
49	*Nigerian Agricultural Journal*	360
50	*Nigerian Journal of Agricultural Extension*	324
51	*Journal of British Grassland Society*	321
52	*Journal of Agricultural Research*	320
53	*Nigerian Journal of Agricultural Science*	320
54	*Netherland Journal of Agricultural Science*	318
55	*Tropical Grassland*	318
56	*Veterinary Immunology and Immunopathology*	318
57	*Farming in South Africa*	318
58	*Samaru Agriculture Newsletter*	310
59	*Israel Journal of Agricultural Research*	310
60	*Nature*	309
61	*Philippine Journal of Veterinary Medicine*	309
62	*Advanced Animal Breeder*	309
63	*Advances in Veterinary Science*	309
64	*Bulletin of Animal Health Production in Africa*	309
65	*Australian Journal of Zoology*	306
66	*Samaru Miscellaneous papers*	305
67	*Nigerian Journal of Nutritional Science*	297
68	*Journal of Animal Production Research*	290
69	*Journal of Animal Ecology*	211

continued

Table 1. continued

Serial no.	Title of journals	No. of citations
70	*Journal of Food Protection*	211
71	*Poultry Digest*	211
72	*Bulletin of Entomological Research*	210
73	*Nigerian Journal of Plant Protection*	168
74	*Avian Diseases*	161
75	*The Indersteport Journal of Vet. Research*	160
76	*International Livestock Centre for Africa (ILCA) Bulletin*	159
77	*Animal Reproduction Science*	149
78	*Bulletin of Epizootic Diseases in Africa*	140
79	*African Journal of Agric. Science*	129
80	*S.P.A.N. Progress in Agriculture*	128
81	*Journal of Soil Science*	121
82	*Association of Official Analytical Chem. Journal*	116
83	*The Analyst*	112
84	*Endeavour*	110
85	*Journal of Experimental Agriculture*	108
86	*Biochemical Journal*	102
87	*Rhodesian Agricultural Journal*	98
88	*Journal of Avian Pathology*	96
89	*Agriculture System International Journal*	95
90	*Outlook in Agriculture*	75
91	*Journal of Chlomatography*	68
92	*Pastosy Forages*	67
93	*Phytophylactical*	60
94	*Journal of Chromatographic Science*	58
95	*Analytical Chemistry*	58
96	*I.T.C. Journal*	56
97	*Journal of West African Science Association*	55
98	*Analytical Prochemistry*	51
99	*Journal of Field Crop Abstract*	49
100	*Journal of Field Crop Research*	48
101	*Agricultural System*	43
102	*Revenue Deledge et de medicine Vet. Research Pays Tropicaux*	30
103	*Beitrage Zur Tropichen*	29
104	*Journal of Agric. Food Chemistry*	25
105	*de Survenamse Landbouw*	18
106	*Milking Feed and Farm Supplies*	15
107	*International Fertilizer Correspondence*	13
108	*Milling Feed and Fertilizer*	11
109	*Forest Products Abstract*	8
110	*Sorghum and Millet Abstract*	7
111	*Experimental Husbandry*	4
112	*Tropical Science*	4
113	*Forestry Abstract*	4
114	*The Ondersteport Journal of Veterinary Research*	3

Table 2. Table of distribution of citations among serials in livestock science

Frequency of citation per title	Number of titles	Cumulation of title	Cumulative frequency of citation	Log of title	Cumulation of σ_0
889	1	1	889	0.006	087
830	1	2	1719	0.301	1.75
822	1	3	2541	0.477	2.63
618	1	4	3159	0.602	3.50
615	1	5	3774	0.699	4.38
610	1	6	4384	0.778	5.26
602	1	7	4986	0.845	6.13
601	3	10	6789	1.000	8.77
598	1	11	7387	1.041	9.64

continued

Table 2. continued

Frequency of citation per title	Number of titles	Cumulation of title	Cumulative frequency of citation	Log of title	Cumulation of %
590	1	12	7977	1.079	11.40
586	1	13	8563	1.114	12.27
508	1	14	9671	1.146	13.15
503	1	15	9574	1.176	14.03
502	1	16	10076	1.204	14.90
498	1	17	10574	1.230	15.78
496	1	18	11070	1.255	16.66
493	1	19	11563	1.279	17.54
489	1	20	12052	1.301	18.41
487	1	21	12539	1.322	19.29
481	2	23	13501	1.362	21.04
480	2	25	14461	1.398	22.80
446	1	26	14907	1.415	23.68
443	1	27	15350	1.431	24.55
440	1	28	15790	1.447	25.43
412	1	29	16202	1.462	26.31
411	1	30	16613	1.477	27.18
410	3	33	17843	1.519	29.82
408	2	35	18659	1.544	31.51
407	2	37	19473	1.568	33.32
402	1	38	19875	1.580	34.20
398	1	39	20273	1.591	35.08
396	1	40	20669	1.602	35.95
394	3	43	21851	1.633	38.59
389	1	44	22240	1.643	39.46
388	1	45	22628	1.653	40.34
386	1	46	23014	1.663	41.22
381	1	47	23395	1.672	42.09
382	1	48	23775	1.681	42.97
360	1	49	24135	1.690	43.85
324	1	50	24459	1.699	44.73
321	1	51	24780	1.708	45.60
320	2	53	25420	1.724	47.36
318	4	57	26692	1.756	50.87
310	2	59	27312	1.771	52.62
309	5	64	28857	1.806	57.01
306	1	65	29163	1.813	57.88
305	1	66	29468	1.820	58.76
297	1	67	29765	1.826	59.64
290	1	68	30055	1.833	60.51
211	3	71	30688	1.851	63.14
210	1	72	30898	1.857	64.02
168	1	73	31066	1.863	64.90
161	1	74	31227	1.869	65.78
160	1	75	31387	1.875	66.65
159	1	76	31546	1.881	67.53

continued

Table 2. continued

Frequency of citation per title	Number of titles	Cumulation of title	Cumulative frequency of citation	Log of title	Cumulation of %
149	1	77	31695	1.886	68.41
140	1	78	31835	1.892	69.28
129	1	79	31964	1.898	70.16
128	1	80	32092	1.903	71.04
121	1	81	32213	1.908	71.92
116	1	82	32329	1.914	72.79
112	1	83	32441	1.919	73.67
110	1	84	32551	1.924	74.55
108	1	85	32659	1.929	75.42
102	1	86	32761	1.934	76.30
98	1	87	32859	1.940	77.18
96	1	88	32955	1.944	78.06
95	1	89	33050	1.949	78.93
76	1	90	33126	1.954	79.81
68	1	91	33194	1.959	80.69
67	1	92	33261	1.964	81.56
60	1	93	33321	1.968	82.44
58	2	95	33437	1.978	84.19
56	1	96	33493	1.982	85.07
55	1	97	33548	1.987	85.95
51	1	98	33599	1.991	86.83
49	1	99	33648	1.996	87.70
48	1	100	33696	2,000	88.58
43	1	101	33739	2.004	89.46
30	1	102	33769	2,009	90.33
29	1	103	33798	2.015	91.21
25	1	104	33823	2.017	92.09
18	1	105	33841	2.021	92.97
15	1	106	33856	2.025	93.84
13	1	107	33869	2.029	94.72
11	1	108	33880	2.033	95.60
8	1	109	33888	2.037	96.47
7	1	110	33895	2.041	97.35
4	2	112	33903	2.049	99.11
3	1	113	33909	2.053	99.98

This distribution is represented by the Bradford-Zipf bibliograph for journal citations from journals (see Fig. 1).

Consideration was given as to which formula to employ to find the core journals: verbal or graphical formula. Samuel Bradford was interested in finding out the most useful journals for a field as far back as 1948. He arranged the journals into a list with the most productive numerically at the top, followed by the next most productive and so on. He reasoned that by the end of the day those at the top would form a nucleus of most useful sources for that area of study. This top nucleus was later referred to as the "core journals."

Today, this technique has gained general acceptability among information scientists. It was acknowledged for its applicability to bibliographic work by Brookes in 1969, who concluded: "It seems to offer the only means discernible at present of reducing the pres-

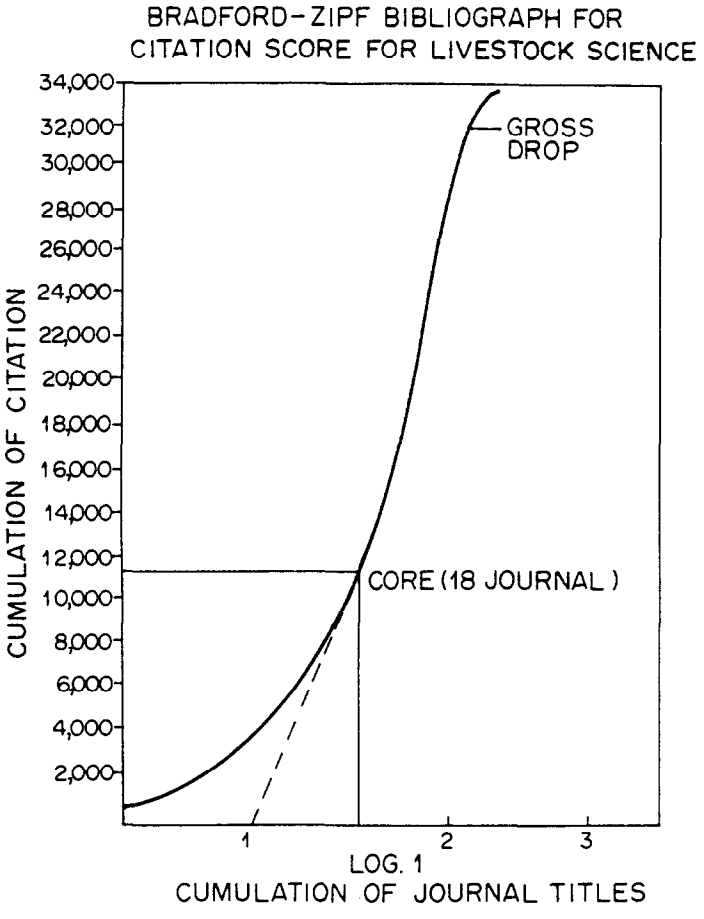

Fig. 1. Bradford-Zipf bibliograph for citation score for livestock science.

ent quantitative untidiness of scientific documentation, information systems and library services to a more orderly state of affairs capable of being rationally and economically planned and organized" [7].

The graphical formulation of the Bradford's law is more consistent with the practical situation. Elizabeth Wilkinson's observation was in this direction [11]. The same view was shared by Andrew Pope, who suggested that "realizing the fact that not all bibliographies are complete, potential for application should be considered, and these criteria if applied will make graphical analysis superior" [12].

According to Brookes, therefore, the point where the initial curvature ends, and where the linear portion of the graph takes off, is the demarcation of the core. This idea of core has thus been applied not only to literature but also to authors. Toye [13] and Aiyepeku [8] applied the core principle to evaluate entomological and geographical authors, respectively. This paper does not intend to delve into that aspect.

Finding the core journals by the graphical formulation (see Fig. 1) shows that the first eighteen journals with 496–889 citations are the core-journals for the livestock journals. These 18 journals have a total of 11,070 citations representing 32.3% of total citations. This is the minimal or lower limit of the library's most useful collection. It is represented in the nucleus zone of the distribution. From this point subsequent zones can be formed.

The second zone will be the next eighteen journals listed 19–36 times, with a total of 7996 citations representing about 22% of the total citations. Hence the first and second zone, comprising 36 journals (i.e. 31%) with a total of 19,066 citations, satisfy about 55% of the citation needs of the industry.

The third zone includes the next 36 journals listed 36–72 times. It has a total of 11,438 citations representing 33.4% of the recorded citations. The first three zones, comprising

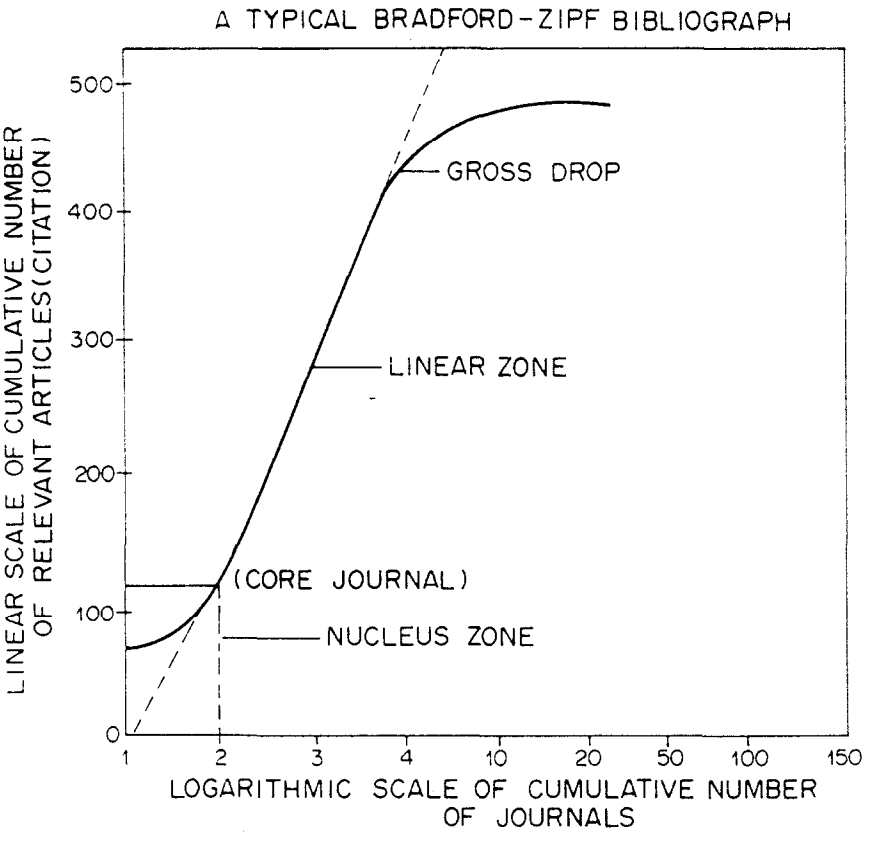

Fig. 2. A typical Bradford-Zipf bibliograph.

72 journals (i.e. 63%), have a total citation of 30,898, which represents over 90% of the total citation needs from the clients. A library will thus satisfy as much as 90% of the user needs by citations, subscribing to 63% of the collections used for this study. The remaining 42 journals (i.e. 36%) accounted for the remaining 9.8% of the total citations. Hence the library's budget would dictate whether to aim at "comprehensive acquisition" of everything as represented by 114 journals or acquire the first 72 journals, which satisfy over 90% as presented by 72 journals.

USE OF JOURNALS

It is pertinent to put on record the following salient observations from the study:

Journals of a specific discipline within the industry record lower citations when compared to their generalized counterparts because of their restrictive nature and contributors. *Journal of Range Management* and *Journal of Poultry Science*, for example, are restricted to pasture agronomists and poultry farmers, respectively. General journals like *Journals of Animal Science*, say, have contributors among all the specialists within the livestock sector (veterinary, animal scientists or agriculturalists).

Livestock scientists have a peculiar flair for certain journals in relation to their orientation to the industry. Veterinarians, for example, prefer journals like the *Vet, Records, Theriogenology* and *Endocrinology*, while animal scientists prefer general livestock journals like *Journal of Animal Science, Journal of Agricultural Science* and *Journal of Dairy Science*.

The *Journal of Animal Science*, which was first published in 1908, is more cited than the *Veterinary Record*, first published in 1888. Both journals are published monthly. The former journal is used by both veterinarians and animal scientists, while the latter tends to attract only veterinarians.

The same argument extends to the journal *World Animal Review*, which ranked seventh on the table. This is a more recent publication (1972) than the *World Poultry Science Journal*, first published in 1944.

Nigerian livestock journals ranked low on the citation table. This is due to the fact that journal productivity in Nigeria is a new development. The earlier attempts were not of international standards. They lacked vital impetus required by indexing and abstracting agencies such as ISSN. The first Nigerian livestock journal to be published is the *Nigerian Veterinary Journal*, first published in 1971 with no standard serial number (ISSN). The highest cited Nigerian journal is the *Nigerian Journal of Animal Production*. Publishing since 1974, this journal is internationally exposed with an ISSN.

Finally, the English language was found to be the most widely used language in the livestock sector in Nigeria. The highest cited non-English journal ranked 102 on the table. This journal has its summary in English.

CONCLUSION

Considering the different applications of Bradford's law to different literature, it has been noted that, in the majority of cases, these applications have not obeyed the law completely. However, in many cases there have been genuine explanations for the deviation from the law of one parameter or another.

An analysis of the bibliograph shows that only 18 journals are theoretically calculated to be the core. This appears rather low, but the fact that they alone contributed 32.3% of the total citation recorded in the subject field leaves little room for complaint.

The *Journal of Animal Science* received the highest citation, making its acquisition by a livestock research library in Nigeria a near must. (NAPRI is the first and only research institute of this kind in Nigeria.) Livestock librarians should therefore do their journal selection guided by the derived calculated zone, depending of course on their budget.

In conclusion, therefore, citation study is a useful means of measuring the use of materials and of utilizing scarce resources in a meaningful way, since it enables materials that frequently get cited to be determined. The ultimate aim of the librarian is to provide access to useful information; citation analysis helps bring to light useful information known or otherwise to the user.

REFERENCES

1. Bradford, S. C. Sources of information on specific subjects. Engineering, 137:85-86; 1934.
2. Cole, J. Pattern of intellectual influence in scientific research. Sociology of Education, 43; Fall 1970.
3. Rawski, C. The scientific study of subject literatures. In Chesier, R., ed. Proc. of a symposium in the health sciences: working to the future. Cleveland, OH: Cleveland Medical Library Association.
4. Bradford, S. C. Documentation. Crossby-Lockwood; 1948.
5. Pritchard, A. Statistical bibliography or bibliometrics. Journal of Documentation, 25:348; 1969.
6. Donohue, Joseph. Understanding scientific literatures: A bibliometric approach. Cambridge, MA: M.I.T. Press; 1973.
7. Brookes, B. C. Bradford's law and the bibliography of science. Nature, 224(6):953; Dec. 1969.
8. Aiyepeku, W. O. The language and format of geographical literature: a comparative study. Int. Library Review, 5:53-60; 1973.
9. Lawani, S. M. Bradford's law and the literature of agriculture. Int. Lib. Rev., 5:341-50; 1973.
10. Afolabi, M. Citation patterns in Nigerian Journal of Economic and Social Studies, 1963-73.
11. Wilkinson, E. Bradford's law of scatter. Journal of Documentation, 28(2); 1972.
12. Pope, A. Bradford's law and the periodical literature of Information Science. J. American Soc. Inf. Science, 20(4); 1973.
13. Toye, O. Some characteristics of the Nigerian entomological literature. *Nigerian Journal of Entomology*, 3:173-80; 1975.
14. Adewole, O. A comparative study of the citation analysis technique . . . in livestock science. MLS thesis, A.B.U., Zaria; 1984.
15. Ekere, F. A citation study of the Journal of Documentation Literature, as published in the years 1950, 1960, and 1970. MLS Ind. study, A.B.U. Zaria; 1980.