A COMPARATIVE STUDY OF THE CITATION ANALYSIS TECHNIQUE OF SELECTING JOURNALS AND THE ACTUAL USAGE OF JOURNALS IN LIVESTOCK SCIENCE

BY

OLUSEGUN SAMSON ADEWOLE
(B.L.S) A.B.U.

A thesis submitted to the Postgraduate School, Ahmadu Bello University in partial fulfillment of the requirements for the Award of Degree-

MASTER OF LIBRARY SCIENCE
(M.L.S.)

Department of Library Science
Ahmadu Bello University

Zaria

AUGUST, 1984

DECLARATION

I hereby declare that the work in this thesis for the degree Master of Library Science has not been presented either wholly or partly for any degree, and is not being concurrently submitted for any other degree. It is therefore entirely my own work.

SIGNED: _____ 12/10/84

SEGUN ADEWOLE(CANDIDATE)

SIGNED: _____

DR. M. AFOLABI (1ST SUPERVISOR)

SIGNED: _____

M.B. KHAN (2ND SUPERVISOR)

SIGNED: _____

PROFESSOR NITECHY (EXTERNAL EXAMINER)

DEDICATION

This work is dedicated to my children - Tai and Ken, and their mother Iyabo, for her care, concern and upkeep of the house.

TABLE OF CONTENTS

	Page
Dedication	i
Acknowlegement	ii
Abstract	iii
CHAPTER ONE:	
Introduction.....	1
Statement of problem.....	3
Objectives.....	5
Research Questionnaire.....	6
Scope and limitation of study.....	6
Need for study.....	6
Assumptions.....	7
Methodology.....	8
Analysis of data.....	9
Definition of Terms.....	9
Footnotes.....	11
CHAPTER TWO:	
Review of related literature.....	12
Footnotes.....	23
CHAPTER THREE:	
Ranking of the journals used by the NAPRI Scientists..	27
Background information on NAPRI library.....	27
The optimal point of journal collection.....	28
Use patterns of NAPRI Scientists.....	29
The typical Bradford-Zipf distribution.....	37
The Bradford-Zipf bibliograph for journal usage in NAPRI	40
Analysis of pattern of journal usage in NAPRI.....	57
References.....	58
CHAPTER FOUR:	
Citation Patterns in the livestock periodical literature	59
Analysis of Citations.....	74
Core journals for livestock industry.....	76
Comparative analysis of use and Citation Scores.....	99

Page

Core journals of NAPRI and Citations in livestock industry 102
References..... 107

CHAPTER FIVE:

Summary of findings conclusion and Recommendation
Summary of findings..... 109
Conclusions..... 115
Recommendations..... 117
Bibliography..... 119

ABSTRACT

This study is to determine the Principal Journals that a livestock library should subscribe to, obtaining the highest possible Optimum utility of material usage.

Using a data base of 114 Journals titles for a period of four years (198O-1983), citation and questionaire datas were used to test for association between two independent means of Journal selection. Would the most frequently cited Journals in livestock industry differ from those actually used in the N.A.P.R.I. Library?

The Bradford principle was applied to the data gathered and the result is remarkably ccrralative. Again, the Bradford-Zipf distribution was used to determine the core Journals under the two situations, though the distribution couldn't hold well for the 'use analysis' because of the small data, it however still showed that the "Core Journals" determined for the industry are those ranked higher in the ranking list derieved.

Using the ranked list of Journals in the two approaches, it was discovered that the Journal of Animal Science is the most popular Journal in the industry and NAPRI Library with citations of 889 and use score of 36 respectively.

The result further shows that 72 Journals from 144 *(63%)* would satisfy over 90% of the needs of livestock scientists. The principle was used to the data on departmental basis, and it showed that for all the departments about 50% of the Journals cited were actually cited and used.

It was observed that Nigeria Journals generally ranked low in the industry. They need the necessary exposure for international recognition. Finally, recommendations are then given.

ACKNOWLEDGEMENT

In the course of this research, many people have played one role or the other towards its success.

I am sincerely indebted to the Director, National Animal Production Research Institute, Professor Saka Nuru for his keen interest in this project and for making the facilities at the Institute readily available to me; my principal supervisor, Dr. Michael Afolabi for allowing me to tap from his immense wealth of knowledge in bibliometrics and for interest, and useful criticisms of the manuscript.

I am also grateful to Mr. M.B. Khan, my second supervisor and Mr. Felix Ekere for their advice and criticisms. I am indebted to Mr. O. Okanlawon, the Veterinary Medical Librarian, Ahmadu Bello University, for his very useful suggestions and provision of very useful references.

I must also acknowledge the excellent typing of Mr. A.O. Oochi and of course that of Mrs Grace Jatto, who typed the initial manuscripts.

I am most grateful to my wife, Iyabo, for her concern, encouragement, and good care of the twins who came just at the very beginning of this project.

I am also indebted to very many others that I classify as "silent innovators".

- SEGUN ADEWOLE

CHAPTER ONE

INTRODUCTION

One problem continually faced by libraries, particularly research libraries is which serials in a given discipline they should buy to meet the needs of their users, without subscribing to any unnecessary journals. Over the years, the amount of published scientific information has steadily increased. This growth of literature has been accompanied by problems of bibliographic control, access to the literature, and the sheer impossibility of any one person being able to absorb all the information relevant to his work.

In order to operate effectively, libraries must identify literatures of high utility to their clienteless and must acquire and organise these literatures in such a way as to optimize their usefulness. It is assumed that effectiveness and economy cannot be developed by relying on informal and intuitive selection procedures.

Information needs and gathering behaviour differ with discipline; 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 text on their field, recommendation of colleagues and superiors, and references or citations in other relative publications are known methods used in information gathering.

Not all that is published is of high quality, nor every contribution necessarily add something appreciably new to the state of knowledge in a particular field

Much that is reported is repetitions to varying extents, or of low significant information.

One of the pressing problems of the librarian 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 unorganized form.

Cole, in a study examining the published works of university physicists, concluded that relatively few physicists actually make significant contribution, and that these contributing physicists themselves base their work almost wholly on research produced by a relatively small number of scientists. (2)

When a library has a dwindling journal budget, staff salary and other library needs, the librarian is forced to re-evaluate his journal collection and selection patterns. This is why William and others (3) would prefer journal borrowing rather than owning the low-demand journal items, provided of course that an efficient lending library system is available.

The simple mechanistic procedure which provides an objective index to the store, and which guarantees optimum utilization of materials, without much loss of useful information is the citation analysis technique. A citation analysis is the analysis of the citation or references which form part of the scholarly apparatus of primary communication. Citation analysis, as presently practised is largely used for putting things in order.

The things ordered can be journals, papers in journals, authors of papers in journals, etc. Weinstock observes that scientific tradition requires that when a reputable scientist publishes an article, he should refer to earlier articles which relate to his theme(4). These references are supposed to identify those earlier works whose concepts, methods, apparatus etc. inspired the author in developing his own article. Published journal articles that are cited more frequently will tend to be judged more important than articles of lesser citations. This is the pattern in the literature of the humanities, spcoe; and natural science. It is against this background that this study is being contemplated to determine the citation patterns in the journal literature of livestock industry and compare the findings with those of actual library usage.

Statement of the problem

An analysis of the literature cited in livestock journal literature has not been conducted to elicit the most and least frequently cited journals in the field. Although there are lists of journals in the field of livestock science, the librarian of a livestock industry cannot determine from such lists what are the most important journals by way of their frequency of citation (usage) so as to place these journals on their priority list for acquisition.

Special libraries are frequently faced with the problem of providing maximum service on limited budget. The realities of the present time have shown that there are serious budgetary constraints and an ever-increasing cost in journal subscription prices.

This problem has compelled some libraries to cancel some of their journal subscriptions, and confine their journal acquisition to a group of journals likely to be used.

In their search for journals of potential utility libraries have either conducted in-house studies of journal usage patterns or relied on list of journals based on citation analysis. The latter category does not depend entirely on citation analysis result,but use the ranked list of cited journal to supplement those determined in their individual libraries as needed by their users. Citation studies have been conducted in many subject fields, but so far, none has been done in the livestock industry to reveal the citation patterns in the field.

The question to be asked at this point is that, would the most frequently cited journals in livestock industry differ from those actually used? (used in a livestock library)?. Would there be certain frequently cited journals that researchers in the livestock industry library may not be aware of? Answers to these questions would provide useful information to librarians of livestock industry libraries on whether the results of citation analysis are related to those of actual usage of journals in a library situation.

This study seeks to provide answers to the following specific questions:-

1. Which livestock journals are most frequently used and therefore constitute the central journal collection in the NAPRI library?

2. Which livestock journals are most frequently cited?

3. Do the most cited journals in the literature on livestock industry differ significantly from those actually used in a livestock industry library?

4. Which livestock industry journals are less used and therefore could be considered for either remote storage, discard or cancellation?

5. Does the pattern of journal usage in the NAPRI library conform with the pattern of journal citations in livestock industry?

These and other relevent problems worth investigating form the core of the problem statements of this study. It is hoped that answers will be adequately given at the end of the study.

Objectives

The purpose of this study is to test for association between two independent means of selecting important literature. The testing involves comparing the ranked list of cited journals in livestock industry, and the ranked list of journals used by researchers in a livestock industry library. Specifically, it is a test for association between the ranks of journals determined in the core zone for the two approaches. In addition, the following will be examined:

The percentage of the 'Core journals in relation to the total number of journals for each of two approaches. This distribution of journals in the ranked lists by subject, and the distribution of journals by language.

Research question

This study seeks to provide answer to the following research question: Is there a difference in the ranked list of core journals derived from citation analysis and the ranked list of core journals derived from the researchers ranking?

Delimitation of the study

The focus of this study is on the livestock journals avaiable in the NAFRI library from 1980 to 1983, a period of four (4) years. To analyse back issues further would tend to reduce the ranks of new journals, compared to the older ones. It will also mean including too many journals that have since ceased publication. Furthermore, the period before 1980 was "unrealistic" to the researcher in terms of periodical collection in NAFRI library, as the library(s subscription position before 1980 was porous.

Need for the study

This study is necessary because of the harder financial situation which research libraries, as others are constantly finding themselves in these days of budget cut and austerity. The percentage of material utilization must be seen to measure with that of acquisition.

A lot of time is used-up in the search for specific information by scientists. The problems entailed in browsing through a heap of literature with relatively insignificant relation to need, and the low utility content materials cannot be over estimated.

Scientists in livestock industry should be aided in limiting search to only highly-optimum journals.

Citation frequency is an indicator of an article's importance in a particularly given field. Scientists and sociologists have accepted the number of times an author's works is cited as an indicator of the importance of his contribution to his field.

Finally, this study will help librarians in livestock libraries to arrive at managerial and professional decision, as to the estimated number of journals that could be reasonably stocked, particularly in critical periods of journal budget incursion into the library's total vote. Libraries are already having heavy dosage of such financial situations.

Assumptions

1. It is assumed that the frequency of citation is a measure of significance.
2. It is also assumed that a small number of journals account for the greater percentage of information relevant to the livestock industry.
3. Finally, that citation study is a useful means of reducing waste in resources and materials to both the library and the users on the one hand, and curtail managerial expenses of the librarian on the other hand.

Methodology

The methodology used in this study is the documentary research method.

Data Collection

Citation data

Researchers in the National Animal Production Research Institute (NAPRI) were requested through a simple questionaire to list in ranked order of importance, the journals held by the NAPRI library that were relevant to their research work. The journals were then categorized into specific areas that reflected the specializations among the researchers in the Institute. The journals devoted to each area of specialization were ranked in order of importance, based on the questionaire response.

The articles published in the journals for each specialized area during the period covered by this study were examined for evidence of references at the end or as foot notes of those articles. The references were then examined and citations to any journal title was recorded.

Questionnire data

Questionaire were sent to all the researchers of the Institute, who are the principal library users, and to the non-research staff (so designated as "Users") to ask for their listing of the journals used by them in the NAPRI Library, in order of their importance to their research endeavours since 1980.

Analysis of data

Citation data

The citation recorded for each journal cited were counted and the total score represented the total citations received by the journal for the period covered by the study. The journals were then ranked in descending order of citations received. The Bradford-zipf bibliograph was applied to the data to test whether the data conformed to the graphical model or not.

Actual use data

The data gathered from the respondents to the survey questionaire were treated as follows.

The journals ranked by researchers according to their degree of importance were categorized into specific areas of specialities. The journals in each category were then ranked on the basis of their ranking by researchers.

Definition of Terms

Citation Analysis

This is the analysis of the citations or references found as foot notes or at the end of papers.

Serials

Serial publications are publications brought out in running numbered sequence, generally at regular intervals of usually not

more than one year, and determined to be continued indefinitely. Iregularity in frequency of publication, and abortive continuation of title are not ruled out. The term journal is used synonymously in this study as serials.

Livestock

The term livestock has been used from its 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 non-human animals that are kept for use as food, or for profit. They are taken to mean farm animals, as Cattle, Sheep, Goats, Pigs, Fowl Guinea-fowl, etc. It also includes their products such as milk, fats, and Eggs. The study also includes the study of their biology (anatomy and physiology), as well as the pathology of such animal.

Literature

The literature of a subject as used in this study refers to the body of thought about the subject of livestock as expressed in published writings. This implies among others a body of ideas, or their expression in published form, or even the physical record themselves.

Core journals

This is used to mean the journals determined to be in core zone of the Bradford's distribution.

Cited Documents

For the purpose of this study, cited documents refer to the publications cited by the main literature, that is, livestock literature.

N.A.P.R.I.

The accronym NAPRI as used in this study stands for National Animal Production Research Institute.

FOOTNOTES

1. BRADFORD, S.C. (1948). Documentation. London: Crosby Lockword; 1948.

2. COLE, JONATHAN (1970). Pattern of intellectual influence in scientific Research. *Sociology of Education* Vol. 43. fall 1970. p. 377.

3. WILLIAM GORDON *et al .(1968)*. Library cost model: Owning versus borrowing serial publications. National Science foundation, Nov. 1968.

4. WEINSTOCK, Melvin. Citation indexes *in* encyclopaedia of library and information science. Vol.5, p.16.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The essence of literature review in science is to homage to pioneers, giving credit to related works, providing background reading on which one's own work was built, and correcting one's work John Martyn (1) in his analysis on progress in documentation, states that "Citation analysis is used among others to correcting the work of others, criticising previous works, substantiating claims, alerting researchers to forthcoming work, authenticating data and classes of fact, and disputing priority claims of others. He also include as part reason, that of identifying the original publication describing an eponymic concept or term". As with this study, I shall identify with all these.

Pritchard(2) is generally credited with coining the term "bibliometrics" to describe "all studies which seek to quantify the processes of written communication". He define it as" the application of mathematical methods of books and other media of communication

In recent years, formal analytic and predictive techniques have developed from the study of bibliometrics. Certain of these techniques have been used previously to elucidate the nature of one or another subject literature. One method that seeks to perfect this researchers yearning of the subject matter is the citation studies.

Martyn (3) defined citation analysis as the "Analysis of the citations or references which form part of the scholarly apparatus of communication".

The importance of this technique to the bibliometrian cannot be underestimated. According to Joseph Donohue[4] it is a "technique for the identification of a 'Core' literature that segment which is potentially most useful" , further that it is 'a method for ranking publications in zones of diminishing importance", and this author wish to state that it is a means of finding the break-even-point between the higher zone of utility, and other succeeding zones.

One of the pioneers of citation analysis studies, Gross and Gross[5] came out with a study, after visiting the chemist library in 1926. They entitled the study "Determining the periodicals used most by the chemists". They confined themselves to reference citation in the journal of the American Chemical Society for 1916-1925, a period of ten years. Though a use study analysis, a particular area of concentration of this present work. The result of their work has been quite important to the field. It was discovered that only about 25% of the journal collection of the chemistry library were fully utilized. The Gross's study was followed by several other studies on this area of bibliometrics.

The problem of growth of literature was first examined by scientists, before they were keenly followed by the information scientist and librarians. In a recent article, B.C. Brookes[6] pointed out that Bradford's law of disperson seemed to offer the only means discernible at present of reducing the present mess posed by quantitative untidiness of scientific documentation and information system in the library, to a more orderly state of affairs capable of being rationally and economically planned and organized. These observations have become applicable to many library situation today, because of the need to apply economy and optimum utility in acquisition.

Donohue[7] observed that the librarian's desire would be to provide journals of most likely interest to users in a given subject area, to stock possibly only those journals that fall into the first zone (or minimal nucleus), and if the library budget permits, it may be desirable to extend the purchase list to include journals in succeeding zones.

The survey by Buckland and Hindle[8] attempted at identifying the minimum size or what they called "the lower limits of a useful collection of information sources". With the opening up of a chapter of knowledge in the information sciences, several other studies have continued to be developed in this direction. As far back as 1917, Cole and Eales worked on bibliometric studies, while Hulmes studies of 1923, Henkle's of 1938, Crane's of 1944 and those of Fussler and Simmon's in 1961 provided excellent examples of bibliometric studies.

Kaplan[9] saw the practice of citing other works as almost second nature to anyone writing a scholarly or a scientific paper. Price in his brilliant exposition on the subject wrote that "the most obvious manifestation of this scholarly bricklaying is the citation, consistent and conscientious in noting their sources. Some have done too little, others too much. But it is generally evident from a long run of any scientific periodical that around 1850, there appears the familiar modern pattern of explicit reference to previous work on which rests the distinct, well-knit addition that is the ideal burden of each paper[10]".

Writing on bibliometric techniques, Stevens,[11] as far back as 1953 identified two basic types: The first involves counting and analysing the number of publications in a given field, for the purpose of examining some basic characteristics, such as amount of research in different countries, amount produced during different periods, etc. The data base herein being a bibliography. The second type is the citation analysis of references in selected journals.

Steven has given the works of Cole and Eales (1917), Hulmes (1923), Bradford (1934), Henkle (1938), Crane (1944) and Bradford again (1948) as early examples of first type of bibliometric study.

The recent work of Lawani[12] on periodical literature of tropical and sub-tropical agriculture belongs to this early works, but improved on the methodology. Lawani applied the Bradford's law of distribution to make analysis on the literature of tropical and sub-tropical agriculture, as well as the world literature of agricultural economics and rural Sociology. His analysis on both literature confirmed the applicability of Bradford's law.

Bibliometric techniques have also been applied to studies in the social sciences and Humanities Mc Anally (1951), chapman and woods (1972) applied this techniques to study the characteristics of literature in history, while Afolabi (1975) uses the same on librarianship, and the Nigerian Economic and Social studies (1976).

Several works on citation studies are woth mentioning: Afolabi's works of 1975 and 1976, Cave's tropical literature citation of 1963, Britain line's sources of citations and references for analysis purposes of 1973 and small's co-citation in the scientific literature are relative examples.

Goffman and Morris[13] studied the applicability of Bradford's law on library acquisitions and agreed that lower limit were used for the purpose of maintaining a dynamic library collection. The upper limits they identified being essentially a function of budget.

It might suffice for this present study to re-state the Bradford's law, as its principle is the conerstone of this study: "If the journals containing articles on a given subject are arranged in descending order of the number of articles they carried on the subject, the successive

zone of periodical containing the same number of articles on the subject form the simple geometric series 1. n2: n3: .....the first of such zone Bradford called the nucleaus of periodicals particularly devoted to the given subject[14].

B.C. Brokes in 1969 pointed out that the Bradford's distribution can be used to estimate the total size of a Bibliography, and to guide the selection of fewer than the total number of contributing journals. To discover the maximum limit for acquisition, Goffman[15] had used the discoveries by Zipf (1935) and Booth (1967) to suggest a method for determining the maximal limit. Zipf's first law was developed in relation to the "frequency of use of given word". In zipf's study, words were ranked from high to low frequency of occurance in a given text; that is from common to rare. His second study on the subject brought into being Zipf's second law. Booth (1967)[16] restated this second law relating it to low-frequency word occurances.

Discussing the subject from another point of view, Brok (1969[17] puts it thus "The Bradford - Zipf's distribution can be expected to arise when selection is made of items. Characteristised by some common element, which are all equally open to selection for an equal period and subject to the success breeds success' mechanism, but when the selection of most popular group is also, but to a weaker extent, subject to restriction".

Weinstock[18] has produced a comprehensive description of I.S.I's citation index, and analysed the relationship between referencing and cited papers, and relationship between how frequently a paper is cited and its significance. The science citation index itself contains a list of approximately 200 papers on the subject of citation analysis.

Inhaber and przednowek[19] have used bibliometric techniques to scrutinize the quality of research papers being published by Nobel prize winners.

Defining the "Impact factor", Garfield[20] used it to measure the influence of individual scientific journals. He defined it as the "average number of citations received by an article during a specified time period". The concept was further developed by Raisig[21] in 1960. He suggested the used of citations per articles as a measure of journal importance. The impact factor for one particular journal only has meaning in relation to the impact factor for another journal.

Bush *et al, (22)* compared citation rankings of journals in economics with a study using expert opinions to obtain similar rankings, and found that the two rankings were remarkably close.

Martino[23] in an article advocating use of citation data for research and development (R&D) management, reviewed a number of studies correlating citation frequency with quality of research and reported a study of work evaluation by the Air force office of Scientific Research. He concluded that citation patterns correlate with the quality of work.

Cole and Cole[24] in 1972 refuting the generally accepted "Ortega hypothesis" that the majority of active scientists contribute to the advance of science concluded that only a few elite scientists produce work that becomes the base for future discoveries. Yet as they pointed out in their 1974 studies, the probability of an important paper going uncited in the entire body of literature is low; most scientist do not waste their time citing erroneous or trivial work; and higher citation to one particular speciality over another within a field may mean that the more highly cited speciality is addressing a set of questions more crucial to the advancement of the field.

Hussler[25] reviewed previous studies and introduced the idea of using the references in one journal to develop a definition of the core journals within a field. In turn, references in the core journals could be used to measure the importance of more peripheral journals to the field in question.

Baughmnn [26] explored some structural properties of the literature of sociology, and retrived for bibliometric analysis, citation from journal articles list under sociology and found that the use patterns for sociology corresponds reasonably well to the citation pattern.

Yong-ja Cho[27] in 1977 carried out a citation characteristics of periodical literature in veterinary science. He attempts at measuring the usage of periodical literature in the veterinary science by means of citation analysis and found that seventy (70) out of the seven hundred and fourty three (743) periodical titles cited, i.e. (9.4%) contributed 66% of the total periodical citations.

Subramanyam[28] stated in his "criteria for journal selection" that citation frequency alone may not demonstrate the absolute value or significance of a periodical, but may indicate how a given periodical has been used in a particular situation. It is within this background that the citation pattern of livestock literature generally is being compared with the analysis of use of journals in the NAPRI Library.

A study was conducted by Carolyn Frost[29] on the "use of citations in literary research". Frost attempted to classify the functions of citation, and to examine schemes that have been created for this purpose. She also aimed at considering the differences in research methods between scientific and humanistic disciplines, vis-a-vis influence on citation practices.

In the end Frost proposed a preliminary model of a scheme for the classification of citation in literary research. Applying bibliometric technique practically on a library's function is the study of Goffman and Morris[30]. Their study was to apply the Bradford's law on library acquisitions. The lower limit of users in a medical library, of journal literature was obtained, a small core of journals which must belong to the library's collection was defined and this "Core" was found to consist of the minimal nucleus of periodicals circulating in the library plus the minimal nucleus journals devoted to users.

And writing under the title "A statistical procedure for evaluating the importance of scientific paper", Julie Virgo[31] set out to test that more important papers on the average are cited in the published literature more frequently than papers perceived as less important. Her aim in this regard was to examine the relation between perceived importance of papers and their citedness. The experiment found that citation frequency was able consistently to predict the more important papers of a pair at least as well as and usually better than a second set of judges.

Also using the citation analysis technique, Ching-chih Chen[32] attempted investigating the use patterns of the physics journals in the M.I.T. Science Library. Where the Science Library contained some 220 physics journals; and the study reveals that only 136 journals of the 220 (62.7%) were used even once during the 3½ month study period. A core of 49 journals account for 90% of use. Chih was concerned about the relatively large number of unsolicited journals at M.I.T. Science Library, and came to concluding characteristics as, use cost, period and languages of the physics journals that journals do very in accordance of content from year, and by other variables such as author's reputation, currency and presentation of facts etc.

Graeme Hirst[33] in his "Discipline impact factors" attempted at determining core journals for a discipline. Using data from the journal citation report to generate what he termed "Discipline impact factor", core list construction was developed from which Hirst came to the conclusion that it is more accurate and less time consuming to use this method than other bibliometric techniques. It can be performed manually by the librarian himself, but it however has its own limitations. It requires very small parameters of titles for effectiveness, may be say some fifty titles or so. He summed up his study with a formulae for using the techniques That being DIF=nc/ns, where DIF represents "Discipline impact, and nc denotes number of citation over the number of citable items (ns).

Providing a general exposure on citation techniques and uses, was the focus of Price[34] in one of his studies on the subject matter. According to him, the pattern of bibliographic reference indicates the nature of the scientific research front. He tried to picture, in the context of that special relationship which is given by the citation of one paper by another in its foot notes or bibliography, the work of scientific papers which is obtained by linking each published paper to the other papers directly associated with it.

Ekere[35] set out to identify the properties of the literature of information science, as published in the journal of documentation as in the ten years intervals 1950, 1960, and 1970, a total of three years. He concluded that the literature of information science had completed transformation from the soft science to the hard science.

Citation analysis can be used to identify the productivity of research institutes. Cited works are usually acceptable additions to particular fields of endeavour.

Westbrook[36] in 1960 studied the use of citations in identifying significant research and uses the ratio of citations to papers published for ranking the institutions involved in the research in ceramics according to performance.

As far back as 1955, Priis[37] studied the used of citation analysis as a research technique and its implication for libraries. Priis observes that the citation approach provides the librarian with

objective approach in identifying some structural properties of the subject literatures he is handling. By tabulating the collective thinking of most writers through citation analysis, he is of the opinion that it is possible to identify the most productive or most used journals, and the isolation of core literature units. The attempt in this study is not only to analyses the use pattern of livestock journals of the NAPRI Library users, but to compare such an analysis with what is obtainable in the large livestock industry in general.

Small[38] in 1973 moved a step up in the studies of citation analysis. He was concerned with co-citation, which he explains as the frequency with which two documents are cited together. Its application as reported by Small in 1973, and followed by Griffith in 1974, Co-citation unlike other citation measures, is constantly changing values, and the patterns (of co-citation) change with time as new discoveries are made and introduced through the literature. The strength of co-citation increases as new authors recognize relationships between papers by citing them together, and the patterns change as new authors make new linkages of concepts, and cited previous papers with new companions.

And recently, Okanlawon[39] examined the characteristics and bibliographic control of the literature of Veterinary Medicine in Nigeria. Using a data base bibliography of 1519 entries, he observed that 1,319 (86.8%) were in periodical articles, and dispered among 180 periodical titles. From 1970-80, the literature output was more than any other period in the Veterinary medcine. He also provided a ranked list of periodicals in order of diminishing productivity for journal selection in the Veterinary medicine. Okanlawon's study is a twin-purpose one. An attempt to combine citation and productivity studies.

In conclusion, there has been no attempt at the study of citation analysis of the literature of livestock science. From the reviews so far, it is evident that no study has been carried out on a citation study of livestock industry. This pioneer attempt, however, does not lay claim to originality of its findings.

FOOTNOTES

1. John Martyn, Progress in documentation: Citation analysis. Journal of Documentation Vol.31 (4), (1975) pp. 290-7.
2. A. Pritchard, Statistical bibliography or bibliometric? Journal of Documentation Vol. 25 pp.358-9.
3. John Martyn, Op Citation.
4. Joseph Donohue, Understanding Scientific literature: A bibliometric approach. Cambridge: The M.I.T. Press, 1973.
5. P.C. Gross and E.M. Gross, College libraries and chemical education Science Vol. 66, (1927) pp. 385-9.
6. B.C. Brookes, Bradford's law and the bibliography of Science. Nature, Vol. 224 (6) (1969) pp. 953.
7. Joseph Donohue, Op Citation.
8. M.C. Buckland and A.J. Hindle, Lower and Upper limits of Journals of Documentation Vol. 25 (154) (1969).
9. N. Kaplan, The norms of Citation behaviour: Protegomena to the footnote. American Documentation Vol. 16(3) (1965) p. 179
10. Derek Price, Little Science big Science. New York, Columbia University Press, 1963, pp. 64-5.
11. R.C. Steven, Characteristics of subject literature. P.hd. dissertation, University of Chicago, Chicago.
12. S.M. Lawani, Periodical literature of tropical and subtropical Agriculture. UNESCO Bulletin for libreries.Vol.26(2) (1972) pp. 88-93.
13. W. Goffman and T. Morris, Bradford's Law and Library acquisitions. Nature Vol. 226(6) (1970) pp. 922.

14. S.C. Bradford, Documentation 2nd ed. Crossby lockwood, London: 1948.

15. Goffman and Morris, Op. Citation.

17. B.C. Brookes, Bradford's Law and the bibliography of Science. Nature Vol. 224 (6) (1969) p. 953.

18 Melvin Weinstock, Citation Indexes. In Encyclopedia of library and Information Science. New York, N.Y: Marcel Dekker, Inc; Vol.5 pp.16-40.

19. Inhaber and Przednowek, Quality of research and the nobel prices. Social Studies of Science Vol.6 (1) (1976) pp.33-50.

20. E.C. Garfield, Citation analysis as a tool in journal evaluation. Science Vol. 178 (4060) (1972) pp. 471-9.

21. L. Raisig, Mathematical evaluation of the Scientific Serial. Science Vol. 131(3411) (1960) pp. 1417-19

22. Bush, et al., A quality Index for Economic journal Review of Economics and Statistics Vol. 56(1) (1974) pp. 123-5

23. J.P. Martino, Citation Indexing for research and development Management. IEEE Transactions on engineering management Vol. 18(4) (1971) pp. 146-51.

24. Jonathan Cole and S. Cole, Citation analysis Science Vol. 183 (4120) (1974) pp. 32-3.

25. Herman H. Fussler, Characteristics of the research literature used by chemists and physicists in the United States. Library Quarterly Part I: Vol. 19(1) (1949) pp. 19-35.

26. J.C. Raupman, A structural analysis of the literature of Sociology. Library Quarterly Vol. 44(4) (1974) pp.293-308.

27. Cho Yong-ja, Citation characteristics of periodical literature in Veterinary Science. American Journal of Veterinary Research Vol. 38(1) (1977) pp. 131-3.

28. K. Subramanyan, Criteria for journal selection. - Special libraries. vol. 66(1975) pp. 367-71

29. Carolyn Frost, The use of Citation in literary research; A preliminary classification of citation functions library Quarterly Vol. 49 (4) (1979) pp. 399-414.

30. Morris and Goffman, Bradford's Law and library Acquisitions. Nature Vol. 226 (1970) pp. 922-3.

31. Julie Virgo, A Statistical procedure for evaluating the importance of Scientific papers. Library Quarterly Vo.477 (4) (1977) pp. 415-29.

32. Chen Ching Chih, The use pattern of physics journals in a large academic research library. Journal of American Society of Information Science Vol. 23 (4) (1972) pp. 224-65.

33. Graeme Hirst, Discipline Impact factor: A method for determining core journal list. Journal of American Society of Information Science Vol. 29(4) (1978) pp. 171-2.

34. Derek Price, Network of Scientific paper: The pattern of bibliographic references indicates the nature of the Scientific research front. Science Vol. 149 (1965) pp. 570-5.

35. Felix C. Ekere, A citation study of the Journal of Documentation literature, as published in the year 1950, 1960 and 1970. M.L.S. Independent Study, A.B.U., Zaria; 1980.

36. J.H. Westbrook, Identifying Significant Research. Science Vol. 132 (1960) pp. 1229

37. In Friis, The use of Citation analysis as a research technique and its Implications for Libraries. South Africa libraries Vol. 23 (1955).

38. H. Small, Co-citation in the Scientific literature: A new measure of the relationship between two documents. Journal of American Society for Information Science July-August 1973 pp 265-9.

39. Olukayode Okunlawon, Some characteristics and bibliographic control of the literature of Veterinary medicine in Nigeria. M.L.S. Thesis, A.B.U. Zaria: 1984.

REFERENCES

40. AFOLABI, M. L. (1975). The literature of librarianship in Nigeria, 1950-73; a bibliometric and documentation study. B.L.S. Thesis, A.B.U. Zaria, 1975,

41. AFOLABI, M.L. (1976). Citation patterns in Nigeria Journal of Economic and Social Studies, 1963-73. Unpublished Study 1976. pp 1-9.

42. GARFIELD, E. (1972). Citation analysis as a tool in Journal evaluation. Science Vol. 178 (1972) pp. 471-9.

CHAPTER THREE

RANKING OF THE JOURNALS USED BY THE NATIONAL ANIMAL PRODUCTION RESEARCH INSTITUTE SCIENTISTS

Background information on NAPRI library

The NAPRI library is one of the autonomous libraries within the Ahmadu Bello University library complex. It contains some 4,000 volumes, including a journal collection of nearly 150 titles in the field of livestock science.

The library is the central core of the institute's research activities, as it is expected to stock the most up-to-date data in various forms, as they relate to the livestock industry.

In order to be able to relate the data to the actual library situation, some pertinent information is necessary:

1. No livestock journal circulates, except on very rare circumstances. All scientists thus have access to all the available journals.

2. Library privilages are extended to all members of staff of the institute, but only research staff (Scientists) make use of the journal collections.

3. Not all the journal requirement of NAPRI scientists are ever met by the library. This is moreso in a research environment.

4. The library is opened from 8.00 a.m to 8.00 p.m. Monday through Saturdays except on public holidays.

Once, librarians prided themselves on the sheer size of their collections; even today some colleges boast of the number of library accessions, as though somehow it were better to have an enormous number of less useful items than a small number of useful volume. The more sophisticated and more objective librarian today looks for some means of tailoring his library's collection to the current and ;otential needs of its users. Users gain much in a well tailored collection because their often limited time is scholarly utilized.

Because of the harder financial position that many libraries as other institutions find themselves nowadays, it is obvious that a more rationale means of reducing journal subscription price becomes paramount to the librarian, without much loss to the clienteless. What determines the point or level at which a library stops making addition to its journals collection?

The optimal point of journal collection

The optimal point of journal collection is that point that the library's journal acquisition satisfies the greatest number of its users, and provides the greatest satisfaction to the library ~~equally~~, particularly in terms of its vote. At this point, the library does not put in any unnecessary funds of its lean funds. In determining the point, Bradford's technique was applied. It was found that this technique provides a means of establishing a lower limit, it does not, however, provide for an upper limit. The lower limit which is that small protion of the library's journal collection that provides the most useful proportion of the journals usefulness. This lower limit could be used on a small library to determine which journals are most needed, but could not be used to determine what point to stop having

addition into the stock of a growing library.

Use Patterns of the NAPRI Scientists

Using the response from the questionnaire data, the pattern of journals actual usage in NAPRI library was analysed to show the pattern of use of the scientist. It was discovered that use pattern was dictated by two or more means - availability of the journals themselves, scientists orientation and training, etc. As soon as a library satisfies a good proportion of the users journal demand, say 85%-95%, further additions may not necessarily provide the required high journal usage level.

Using citation analysis technique, this chapter attempts at identifying the most frequently used journals through their usage score by the livestock scientist of a particular library - the National Animal Production Research Institute (NAPRI).

There is at the time of this study a total of 58 researchers in the National Animal Production Research Institute[1], 8 Researchers are currently away on study leave, while the remaining 50 (86.2%) scientists were served with questionnaires for this study, out of whom 36 (72%) responded.

The 36 researchers belong to 7 different departments, showing the disciplines under which the institute's objectives are pursued.

This is represented by the table of distribution of researchers in the institute (Table 3:1).

1. NAPRI Publications Unit. NAPRI December 1983 Staff list.

Table 3:1. Table of Distribution of Researchers in NAPRI.

Department/ Discipline	No. of Researchers	Percentage (%) of Total	No. of Researchers that Participated in the study	Percentage (%) of departmental staff
1. Animal Reproduction and Artificial Insemination	12	24	8	66.66
2. Cattle Production	8	16	7	87.50
3. General Services and Administration.	5	10	4	80.00
4. Livestock Econs. and Rural Sociology.	4	8	3	75.00
5. Pasture Agronomy	9	18	6	66.66
6. Poultry and Swine	6	12	4	66.66
7. Small Ruminants	6	12	4	66.66
Total	50	100	36	72.72*

*Average % of total participating researchers.

NAPRI library's total journal collection is 120 titles from which Fourteen 14 journals have low or no use score from the researchers. The absence of any use score was a result of the following facts: 4 of the journals were in foreign language from any used by the scientists; and the remaining 10 are journals of other disciplines but livestock and related areas.

These journals with no use score are obviously the most likely candidates for weeding, discard, cancellation or remote storage when necessary.

However, this is not to conclude simply that a journal with low utility to a particular library, at a given time, is generally an unimportant one.

In the course of this study, the following journals stocked by the NAPRI library have remained unused by the researchers.

Unused journals available in NAPRI library

Journal Titles	Cost of yearly subscription
1. Beitrage zur tropschen and sub tropschen	₦57.97
2. Experimental Husbendry	₦26.25
3. Forestry Abstract	67.81
4. Forest Product Abstract	104.24
5. Institute delevage ex de medicine vet.	53.03
6. International fertilizer correspondence	16.57
7. Journal of soil science	55.51
8. Milling feed and fertilizer	56.00
9. Nigerian Journal of Natural Science	32.81
10. Nigerian Journal of plant protection	65.63
11. Revue delevage medicine...pays trop.	33.85
12. Sorghum and millet Abstract	35.05
13. Tropical Science	20.45
14. Tussock grassland romtain Institute	19.79
Total	₦644.90

The essence of calculating the cost of unused journal is to identify pertinent area of waste to the library, being one of the objectives of this study.

The remaining 104 journals received between 36 and 1 use scores; that is getting used by all the 36 scientists and only 1 scientist respectively. This used score is arranged in a ranked order of diminishing usefulness of journals to scientists in Table 3: II.

Table 3: II. Table of used score of journals in NAPRI library.

Title of Journals	number of use scores
1. Journal of Animal Science	36
2. Journal of Animal Production	31
3. Tropical Agriculture (Trinidad)	24
4. Journal of Reproduction and Fertility	18
5. Tropical Animal Health and Production	18
6. Journal of Dairy Research	18
7. Journal of Dairy Science	18
8. Nigerian Journal of Animal Production	16
9. Theriogenology	16
10. World Review of Animal Production	16
11. Journal of Range Management	14
12. Journal of Agricultural Science (Cambridge)	14
13. Australian Journal of Experimental Agric. and Animal Animal Husbandry	
14. East African Agricultural Journal	12
15. Canadian Journal of Animal Science	12
16. Journal of Animal Production Research	12
17. Veterinary Record	12
18. Animal Breeding Abstract	10
19. British Poultry Science Journal	10
20. Poultry Science Journal	10
21. Australian Journal of Agricultural Research	9

Table 3:II (Contd).

	Title of Journals	Number of use scores
22.	Endocrinology	9
23.	Animal Reproduction Science	8
24	British Veterinary Journal	8
25	Herbage Abstract	8
26	Samaru Agric. Newsletter	8
27	Samaru Miscellaneous paper	8
28	Samaru Research Bulletin	8
29	Tropical Grassland	8
30	Indian Journal of Animal Science	7
31	Livestock Production Science	7
32	Nigerian Veterinary Journal	7
33	Tropical Veterinary Journal	7
34	World Animal Review	7
35	British Journal of Nutrition	6
36	Australian Journal of Animal Science	5
37	International Journal of Sheep and Goat Research	5
38	Journal of British Grassland Society	5
39	Nigerian Agricultural Journal	5
40	Veterinary Bulletin	5
41	World Poultry Science Journal	5
42	Journal of American Veterinary Medical Association	4
43	Ghana Journal of Agriculture	3
44	Indian Veterinary Journal	3
45	Indian Veterinary Science Journal	3
46	Livestock Farming	3
47	Poultry Digect	3

Table 3:II (Contd.)

	Title of Journals	Number of use Scores
48	Poultry International	3
49	Queensland Agricultural Journal	3
50	African Technical Review	2
51	Animal Production and Health in the Tropics	2
52	Arian Diseases	2
53	Bulletin of Epizootic Diseases in Africa	2
54	Ceres	2
55	Dairy Abstract	2
56	Dryland Farming	2
57	Feed Science and Technology	2
58	Hoards Dairyman	2
59	Journal of Agriculture and Food Chemistry	2
60	Journal of Analytical Chemistry	2
61	Journal of Animal Research	2
62	Journal of Animal Reproduction	2
63	Journal of Food Science and Technology	2
64	Journal of Soil and Fertility	2
65	Journal of Veterinary Research	2
66	Journal of Veterinary Science	2
67	Nature	2
68	New Scientist	2
69	Research in Veterinary Science	2
70	Rhodesian Agricultural Journal	2
71	Tropical Agricultural Science Journal	2
72	West African Farming	2

Table 3:II (Contd.)

	Title of Journals	Number of use Scores
73	African Technical Review	1
74	Agricultural Business - World -Wide	1
75	Agricultural Engineering	1
76	American Journal of Clinical Pathology	1
77	Annals of Biological Animal Biochem.and Biophysics	1
78	Australian Journal of Biological Science	1
79	Australian Veterinary Journal	1
80	Biochemical Journal	1
81	Bulletin of Entomological Research	1
82	Canadian Journal of Zoology	1
83	East African Journal of Rural Development	1
84	Egyptian Journal of Animal Production	1
85	Feed International	1
86	I.L.C.A. Research Report	1
87	Journal of Animal Ecology	1
88	Journal of Applied Animal Ethology	1
89	Journal of Chromatographic Science	1
90	Journal of Chromatography	1
91	Journal of Clinical Pathology	1
92	Journal of Comparative Pathology	1
93	Journal of Food Technology	1
94	Journal of Land Public Utility Econs.	1
95	Journal of Parasitology	1
96	Milling Feeds and Farm Supplies	1
97	Modern Veterinary Practice	1
98	Nutrition Abstracts and Review	1
99	Prostagladions	1

Table 3:II (Contd.)

	Title of Journal	Number of use Scores
100	Protozoological Abstract	1
101	Research in Veterinary Science	1
102	Science	1
103	S.P.A.N. Journal	1
104	World Farming	1

The Journal of Animal Science is ranked the highest in terms of usefulness, with a total of 36 researchers making use of the journal, followed by the Journal of Animal Production with 31 use scores. The journals ranging from African Technical Review down to the journal World Farming (32 journals) in the table received only 1 use score. The distribution is represented in the table below:

Table 3:III. Table of distribution of use score among serials.

Frequency of use per Title	Number of Titles	Cummulation of Titles	Cummulation frequency of use	Log of Title
36	1	1	36	0.000
31	1	2	67	0.301
24	1	3	91	0.477
18	4	7	119	0.845
16	3	10	135	1.000
14	3	13	149	1.114
12	4	17	161	1.230
10	3	20	171	1.301
9	2	22	180	1.342
8	7	29	188	1.462
7	5	34	195	1.531
6	1	35	201	1.544
5	6	41	206	1.613

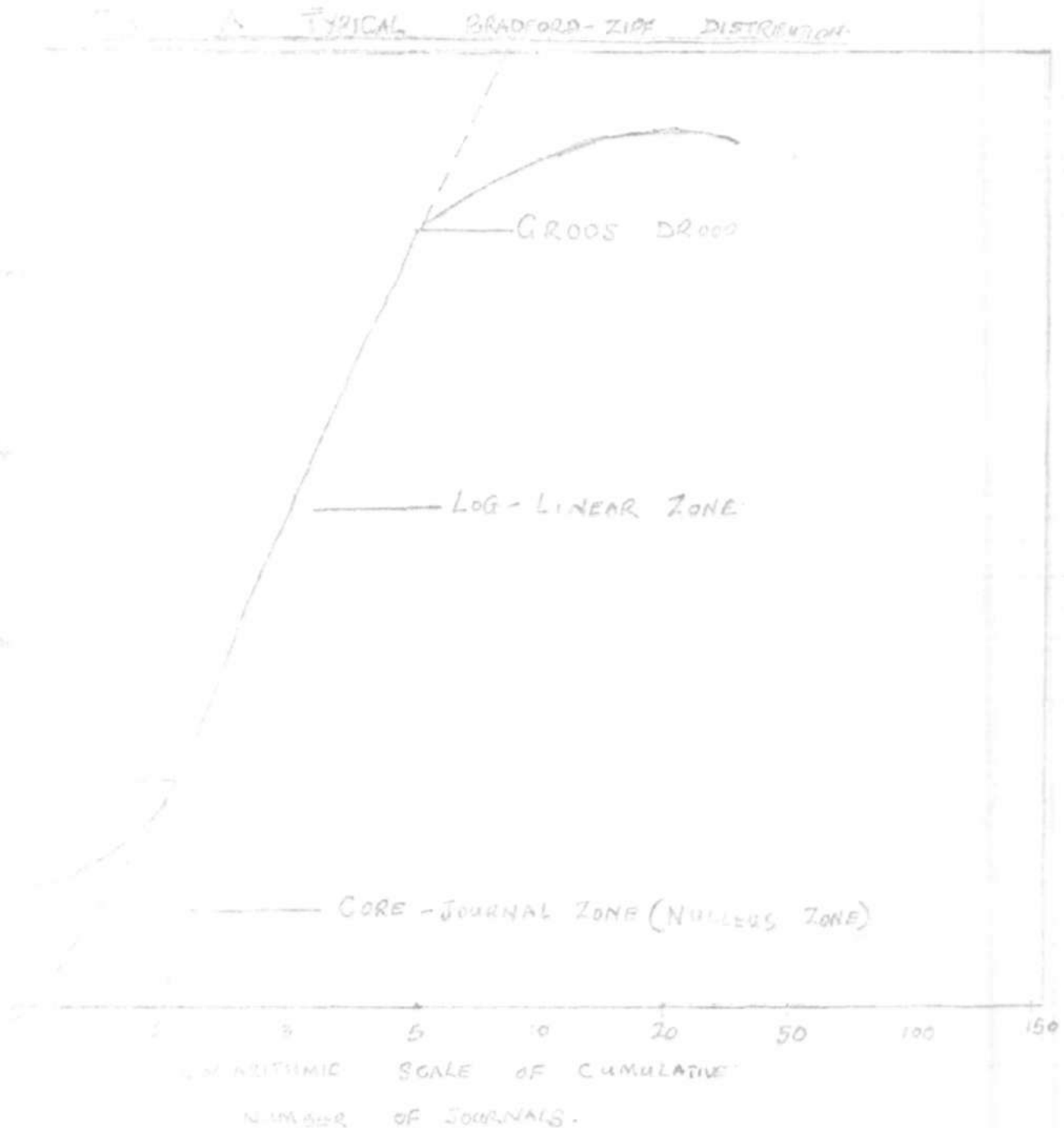
Table 3:III (Contd.)

Frequency of use per Title	Number of Titles	Cummulation of Titles	Commulation frequency of use	Log of Title
4	1	42	210	1.623
3	7	49	213	1.690
2	23	72	215	1.857
1	32	104	216	2.017

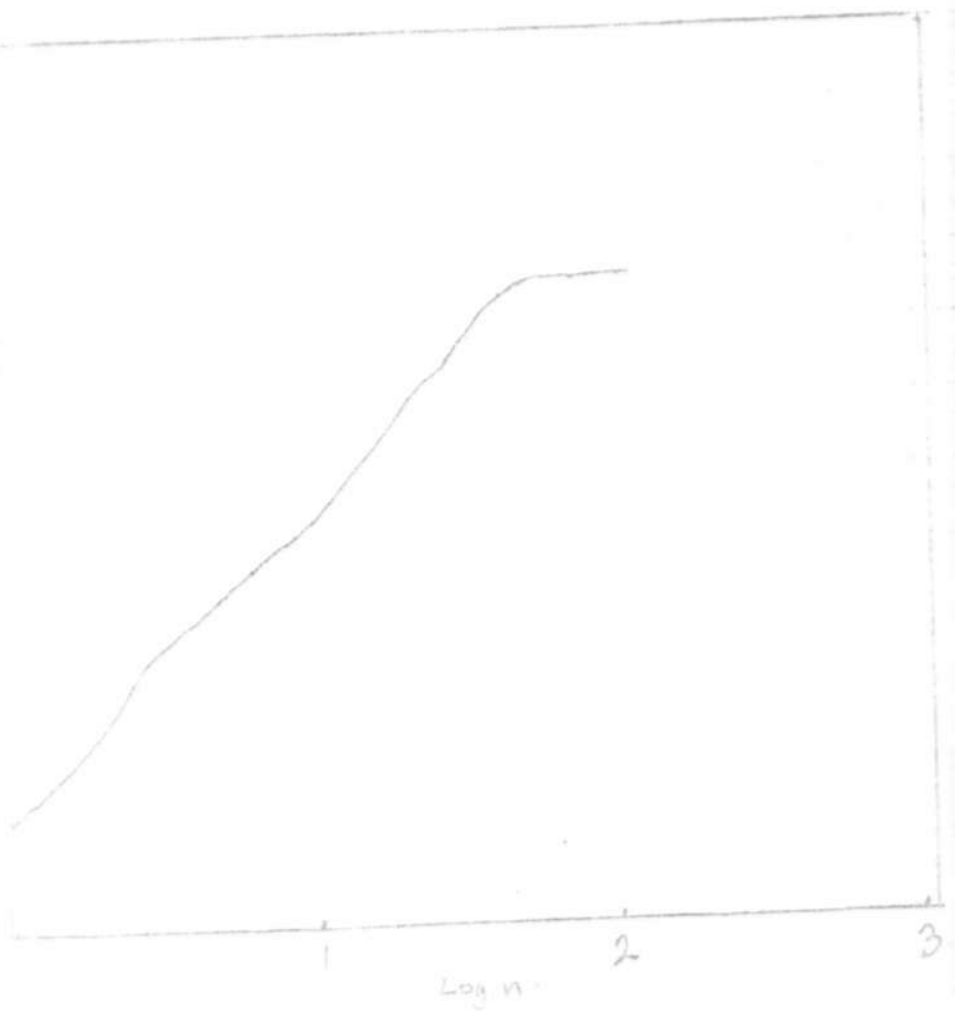
Some 36 researchers have used 104 journals with a total use score of 579. The Journal of Animal Science was used 36 times, i.e. it was used by all the livestock scientists of NAPRI. This was closely followed by the Journal of Animal Production with 31 use scores.

The typical Bradford-Zipf Distribution

Before continuing with the analysis from Tables 3:II and 3:III, it is pertinent to briefly explain the principles employed: the Bradford-Zipf bibliograph will be applied to the groups of data gathered for this chapter and the next, to determine if they conform to the bibliograph as shown in the graph (Fig.1) is a plot of the cummulative number of articles versus the logarithm of the cummulative number of journals in which the articles appear. The plot as depicted in figure 1 shows an initial concave curve which runs into a straight line, then a deviation to the right. The upward curving bottom of the curve represents the small nuclear zone or "core journals" which represents the most useful journals, and the upper curve (usually termed the Groos droop) represents the peripheral zone.


TYPICAL BRADFORD-ZIPF DISTRIBUTION.
GROOS DROOP
LOG-LINEAR ZONE
CORE-JOURNAL ZONE (NUCLEUS ZONE)
5
10
20
50
100
150
LOGARITHMIC SCALE OF CUMULATIVE
NUMBER OF JOURNALS.

3.2.2 BRADFORD-ZIPF DISTRIBUTION FOR JOURNAL USAGE



CUMULATION OF JOURNAL TITLES.

The Bradford-Zipf bibliograph for Journal usage in NAPRI

The use score as presented in Table 3:III (Table of distribution of use score among serials) is represented in figure 2 providing the graphical illustration of this distribution.

The figure shows a marked deviation from the typical Bradford-Zipf distribution. The initial curve which is an important part of the curve is missing; also the straight central portion (i.e. the linear zone) is also missing with perhaps the upper curve only conforming. The reasons for this departure could be explained as being caused by the small size of the data involved in Table 3: II. There are only 216 frequencies, spread among only 17 use scores. The Bradford-Zipf distribution requires a reasonably large data for effective presentation. The figure only points out that the "use" data did not conform to the typical Bradford-Zipf distribution.

It is important to examine the use pattern of journals in NAPRI on departmental basis. There are six departments with different emphasis in livestock science. There is also an additional department whose activities cut accorss departmental boundaries. The departments are: Small Ruminants; Cattle production, Poultry and Swine, Pasture Agronomy, Livestock Economics and Rural Sociology, Animal Reproduction and Artificial Insemination and the General services department.

The journals used or referred to in some of these departments remain an exclusive monopoly of such departments. The Poultry Science Journal and British Poultry Science, are journals mostly used by researchers in the department of Poultry and Swine. Scientists in the department of Pasture Agronomy are known with such Journals as Journal of Range Management; Journal of British Grassland Society, etc.

However, these departmental journal compactments are occassionally broken into. The Journal of Animal Science cuts across departmental journal usage and belonging.

The breakdown and usage are as follows:

Distribution of journal usage in the department of Small Ruminants

There are six research staff in this department, with four participating in the study. The pattern of their use of journals is as shown in Table 3:IV below:

Table 3:IV. Journal usage of the department of Small Ruminants.

Serial No.	Title of Journals	No. of Scores
1	Journal of Animal Production	4
2	Journal of Animal Science	4
3	Journal of Dairy Research	3
4	Journal of Dairy Science	3
5	Journal of Reproduction and Fertility	3
6	Tropical Agriculture (Trinidad)	3
7	World Review of Animal Production	3
8	Animal Breeding Abstract	2
9	Australian Journal of Agric. Research	2
10	British Journal of Nutrition	2
11	Canadian Journal of Animal Science	2
12	International Journal of Sheep and Goat Research	2
13	Journal of Agric. Science (Cambridge)	2
14	Journal of Tropical Animal Health and Production	2

Table 3:IV. (Contd.)

Serial No.	Title of Journals	No. of Scores
15	Theriogenology	2
16	East African Agric. and Forestry Journal	1
17	East African Agric. Journal	1
18	Ghana Journal of Agriculture	1
19	Herbage Abstract	1
20	Indian Journal of Animal Science	1
21	Indian Journal of Veterinary Science	1
22	Journal of Animal Production Research	1
23	Journal of Range Management	1
24	Journal of Wild-Life Management	1
25	Nigerian Agricultural Journal	1
26	Nigerian Journal of Animal Production	1
27	Poultry Science Journal	1
28	Tropical Grassland	1
29	World Animal Review	1
Total use Scores		53

There is a total use score of 53 from 29 journals from the Small Ruminants department. The journals: Journal of Animal Production, and Journal of Animal Science have the highest use score of 4 each. The first fifteen journals representing 51.7% of the total journals used in the department have a total of thirty nine (39) use scores or about 74% of the total use scores. There is no journal that can be termed as

a departmental special journal for the Small Ruminants department.

Cattle Production Department

There are eight research staff on the roll of the cattle production department. Seven of them were involved in this study with the following results:

Table 3:V. Journal usage of the Cattle production department.

Serial No.	Title of Journals	No. of Scores
1	Journal of Animal Science	7
2	Journal of Animal Production	6
3	Dairy Science Abstract	5
4	Journal of Dairy Science	5
5	Tropical Agriculture	5
6	Australian Journal of Experimental Agric. Animal Husbandry	4
7	Journal of Dairy Research	4
8	Tropical Animal Health and Production	4
9	World Review of Animal Production	4
10	British Journal of Nutrition	3
11	Animal Breeding Abstract	3
12	Canadian Journal of Animal Science	3
13	Journal of Animal Production Research	3
14	Indian Journal of Animal Science	3
15	Journal of Reproduction and Fertility	3

Table 3: V. (Contd.)

Serial No.	Title of Journals	No. of Scores
16	Nigerian Journal of Animal Production	3
17	Nigerian Veterinary Journal	3
18	Veterinary Record	3
19	Animal Feed Science and Technology	2
20	Animal Production and Health in the Tropics	2
21	Australian Journal of Animal Science	2
22	British Veterinary Journal	2
23	Dairy Abstract	2
24	Indian Journal of Animal Husbandry	2
25	Indian Veterinary Journal	2
26	Journal of Agric. Science (Cambridge)	2
27	Journal of Range Management	2
28	Livestock Production Science	2
29	Nutrition Abstracts and Review	2
30	Queensland Agric. Journal	2
31	Samaru Agric. Newsletter	2
32	Samaru Miscellaneous paper	2
33	Samaru Research Bulletin	2
34	Theriogenology	2
35	Tropical Veterinary Journal	2
36	World Animal Review	2
37	Animal Reproduction Science	1
38	Australian Journal of Agricultural Research	1

Table 3:V. (Contd.)

Serial No.	Title of Journals	No. of Scores
39	British Poultry Science Journal	1
40	East African Agricultural Journal	1
41	Ghana Journal of Agriculture	1
42	Herbage Abstract	1
43	International Journal of Sheep and Goat Research	1
44	Journal of American Vet. Medical Association	1
45	Journal of Applied Animal ethology	1
46	Nature	1
47	Nigerian Agricultural Journal	1
48	Poultry Science Journal	1
49	S.P.A.N. Journal	1
50	Tropical Grassland	1
51	Veterinary Bulletin	1
52	World Poultry Science Journal	1
Total use scores		121

There is a total use score of 121 from 52 journals from the cattle production department. Here also, the Journal of Animal Science got the highest score of 7 followed closely by the Journal of Animal Production with 6 scores. Twenty six journals or 50% recorded 87 use scores or 71.9% of the use scores for the department.

Department of Poultry and Swine

There are six researchers out of which four were involved in this study. Their pattern of use of journals is as represented in the Table 3: VI below:

Table 3:VI. Journal usage of the Poultry and Swine department.

Serial No.	Title of Journals	No. of scores
1	British Poultry Science Journal	4
2	Journal of Animal Science	4
3	Poultry Science Journal	4
4	Journal of Nutrition	3
5	Poultry Digest	3
6	Poultry International	3
7	Tropical Agriculture (Trinidad)	3
8	World Poultry Science Journal	3
9	Canadian Journal of Animal Science	2
10	Journal of Animal Production	2
11	Livestock Production Science	2
12	Nutrition Abstract	2
13	Theriogenology	2
14	Tropical Animal Health and Production	2
15	Animal Reproduction Science	1
16	Australian Journal of Animal Science	1
17	British Journal of Nutrition	1
18	East African Agric. Journal	1
19	Journal of Dairy Research	1

Table 3:VI (Contd.)

Serial No.	Title of Journals	No. of use scores
20	Journal Food Science and Agriculture	1
21	Journal of Food Technology	1
22	Journal of Range Management	1
23	Samaru Research Bulletin	1
24	Samaru Miscellaneous paper	1
25	World Animal Review	1
Total use scores		50

There is a total of fifty use scores from twenty five journals. The British Poultry Science Journal, have the highest use score of four score followed of course by other Poultry Journal with three use scores. The Poultry Science Journal has clearly emerged as the departmental special journals. Twelve journals or 48% of the total journals used in the department accounted for 70% of the total use scores.

Table 3:VII. Department of Pasture Agronomy.

Serial NO.	Title of Journals	No. of use score
1	Journal of Animal Science	6
2	Journal of Range Management	6
3	Tropical Grassland	6
4	Australian Journal of Experimental Agric. Animal Husbandry	5
5	Grass and Forage Science Journal	5
6	Herbage Abstract	5
7	Journal of Animal Production	5
8	East African Agric. and Forestry Journal	4
9	Proceedings of the International Grassland Congress	4
10	Tropical Agriculture (Trinidad)	4
11	Canadian Journal of Animal Science	3
12	Journal of Agric. Science (Cambridge)	3
13	Australian Journal of Agric. Research	2
14	Dryland Farming	2
15	Journal of Animal Production Research	2
16	Journal of Dairy Research	2
17	Nigerian Journal of Animal Production	2
18	Rhodesian Agric. Journal	2
19	Samaru Miscellaneous papers	2
20	Samaru Newsletters	2
21	Samaru Research Bulletin	2
22	Journal of Soil and Fertility	2

Table 3:VII (Contd.)

Serials No.	Title of Journals	No. of use scores
23	Tropical Animal Health and Production	2
24	World Review of Animal Production	2
25	Animal Farming	1
26	Australian Journal of Agric. Science	1
27	Ghana Journal of Agriculture	1
28	Journal of Dairy Science	1
29	Nigerian Agric. Journal	1
30	Plant and Soil Journal	1
31	Queensland Agricultural Journal	1
32	Seed and Soil Journal	1
33	World Farming	1
Total use Scores		89

Six pasture agronomists have used thirty three journals with eighty nine total use scores. The Journal of Range Menagement; Tropical Grassland and Journal of Animal Science were the most used journals with six use scores each. Sixteen or 48.5% of the thirty-three used journals have a total of sixty four use scores representing 71.9% of the total use scores of the department.

Table 3: VIII. Journal usage of the Department of Livestock Economics and Rural Sociology.

Serial No.	Title of Journals	No. of Scores
1	Journal of Animal Science	4
2	Journal of Animal Production Research	4
3	Nigerian Journal of Animal Production	4
4	World Review of Animal Production	4
5	African Technical Review	3
6	Journal of Animal Production	3
7	Journal of Range Management	3
8	I.L.C.A. Research Report	3
9	Tropical Agriculture (Trinidad)	3
10	Tropical Animal Health and Production	3
11	West African Farming	3
12	African Journal of Medical Science	2
13	Ife Journal of Agriculture	2
14	Journal of Dairy Research	2
15	Poultry Science Journal	2
16	Australian Journal of Agricultural Research	1
17	Australian Journal of experimental Agric and Animal Husbandry	1
18	British Poultry Science Journal	1
19	East African Agric. Journal	1
20	East African Journal of Rural Development	1
21	Herbage Abstract	1
22	International Sheep and Goat Research Journal	1

Table 3: VIII (Contd.)

Serial No.	Title of Journals	No. of use Scores
23	Journal of Agric. Science	1
24	Journal of Land and Public Utility Econs	1
25	Livestock Farming	1
26	Livestock Production Science	1
27	World Animal Review	1
Total use Scores		57

The four researchers in this department have used twenty seven journals producing fifty seven use scores. The journals Animal Science, Animal Production Research, Animal Production and World Review of Animal Production recorded the highest use scores of four scores each. Thirteen journals or about 48% of the total department used journals produced 41 use scores representing about 72% of the journal use of the department.

Department of Animal Reproduction and Artificial Insemination

The department of Animal Reproduction and Artificial Insemination is the largest department in NAPRI. It has twelve researchers on its roll. Eight of these participated in the study. The journals used are arranged as shown in the Table 3: IX.

Table 3:IX. Journal usage of the Department of Animal Reproduction and Artificial Insemination.

Serial No.	Title of Journals	No. of Scores
1	Journal of Animal Science	8
2	Journal of Reproduction and Fertility	8
3	Theriogenology	8
4	Veterinary Record	7
5	Journal of Animal Reproduction	7
6	Journal of Dairy Science	6
7	Animal Reproduction Science	5
8	Endocrinology	5
9	British Veterinary Journal	4
10	Journal of Dairy Research	4
11	Nigerian Journal of Animal Production	4
12	Tropical Agriculture	4
13	Australian Journal of Agric. Research	3
14	British Poultry Science Journal	3
15	Journal of Fertility and Sterility	3
16	Veterinary Bulletin	3
17	Tropical Animal Health and Production	3
18	Tropical Veterinary Journal	3
19	Animal Breeding Abstract	2
20	Australian Journal of Animal Science	2
21	Australian Journal of Experimental Agric and Animal Husbandry	2
22	Canadian Journal of Animal Science	2
23	Indian Journal of Animal Science	2

Table 3:IX. (Contd.)

Serial No.	Title of Journals	No. of Scores
24	Journal of Agriculture (Cambridge)	2
25	Journal of Animal Production Research	2
26	Journal of Animal Reproduction	2
27	Journal of Veterinary Research	2
28	Journal of Veterinary Science	2
29	Livestock Production Science	2
30	Nature	2
31	Nigerian Veterinary Journal	2
32	Research in Veterinary Science	2
33	World Poultry Science Journal	2
24	World Review of Animal Production	2
25	American Journal of Clinical Pathology	1
26	American Journal of Veterinary Research	1
37	Annals of Biological and Animal Biochemistry	1
38	Australian Journal of Biological Sciences	1
39	Australian Veterinary Journal	1
40	Australian Journal of Zoology	1
41	Biochemical Journal	1
42	Bulletin of Epizootic diseases in Africa	1
43	Canada Journal of Zoology	1
44	International Sheep and Goat Research Journal	1
45	Journal of Agric. Science	1
46	Journal of American Vet. Medical Association	1

Table 3:IX (Contd.)

Serial No.	Title of Journals	No. of Scores
47	Journal of Comparative Pathology	1
48	Journal of Range Management	1
49	Journal of Parasitology	1
50	Modern Veterinary Practice	1
51	Poultry Science Journal	1
52	Prostagladions	1
53	Science	1
54	Samaru Miscellaneous paper	1
55	Samaru Newsletter	1
56	Samaru Research Bulletin	1
57	World Animal Review	1
Total usage score		143

There is a total of 143 use scores from 57 journals recorded by eight researchers of the Animal Reproduction and Artificial Insemination. The Journal of Animal Science, Journal of Reproduction and Fertility, and the Journal of Theriogenology have the highest use score of eight each. 28 journals representing 49% of the total use scores for the department.

General Services/Administration Department

Four researchers whose activities cut across departmental barriers took part in this study from a departmental staff strength of five. The usage pattern is as below:

Table 3:X. Journal usage of the Department of General Serives and Administration.

Serial No.	Title of Journals	No. of use scores
1	Journal of Animal Production	4
2	Journal of Animal Science	4
3	Journal of Dairy Research	3
4	Journal of Dairy Science	3
5	Journal of Reproduction and Fertility	3
6	Tropical Animal Health and Production	3
7	Animal Breeding Abstract	2
8	Australian Journal of Experimental Agric.and Animal Husbandry	2
9	British Veterinary Journal	2
10	British Poultry Science Journal	2
11	Nigerian Journal of Animal Production	2
12	Nigerian Veterinary Journal	2
13	Samaru Agric. Newsletter	2
14	Samaru Research Bulletin	2
15	Samaru Miscellaneous paper	2
16	Tropical Agriculture (Trinidad)	2
17	Tropical Veterinary Journal	2

Table 3:X. (Contd.)

Serial No.	Title of Journals	No. of use Scores
18	Theriogenology	2
19	Veterinary Record	2
20	Animal Reproduction Science	1
21	British Grassland Society	1
22	Bulletin of Epizootic diseases in Africa	1
23	Indian Journal of Animal Science	1
24	Journal of Agric. Food Chemistry	1
25	Journal of Analytical (Cambridge)	1
26	Journal of Agric. Science	1
27	Journal of American Veterinary Medicine	1
28	Journal of Chromatography	1
29	Journal of Chromatographic Science	1
30	Journal of Clinical Pathology	1
31	Journal of Range Management	1
32	Journal of Science, Food and Agric.	1
33	Livestock Farming	1
34	Nigerian Agricultural Journal	1
35	Protozoological Abstract	1
36	Veterinary Bulletin	1
37	World Animal Review	1
38	World Review of Animal Production	1
Total usage score		65

Some thirty eight journals have been used by four scientists sixty five times. The Journals of Animal Production and Journal of Animal Science got the highest scores of 4 each, while Ninet een journals or 50% of the total used journals in the department accounted for about 68% of the total use score for the department.

Analysis of the pattern of Journal usage in NAPRI

The following salient observations can be deduced from the patterns of journal usage in NAPRI:-

1. A high frequency of usage of any journal does not in itself reflects a high quality of the journal. Availability of a given journal contributes to its usage. Most journals that are used in NAPRI library by researchers are those that are readily avaiable.

2. Through a use-study analysis, it is also discovered that staff strength affects the total journal usage of any department on a given journal. The score recorded for the Journal of Reproduction and Fertility (8) was by far greater than what was received by the Poultry Science Journal (4). The differences being one of size of researchers of the Animal Reproduction and Artificial Insemination, and the Poultry and Swine departments respectively.

3. The pattern of journal usage in NAPRI reflects the training and background of the scientists. The Veterinary researchers tend to use journals in the Veterinary Science and research, while the Animal Scientists use mostly the abstract journals of livestock science. The Veterinarian is trained for the research and animal health aspects of the industry, while the animal scientists has his own training for research and production.

4. Finally, current journals are often preferred to retrospective ones in NAPRI, as in other research institutes. This may be attributed to the simple fact that research in the field of Science tend to use more current sources than retrospective ones.

REFERENCES

1. Publications Unit, National Animal Production Research Institute, December 1983 staff. NAPRI Staff list.
2. Publications Unit, National Animal Production Research Institute, NAPRI Newsletter December 1983.
3. S.C. Bradford, Documentation. 2nd ed.; London: Crossby Lockwood. 1953.
4. Joseph C. Donohue (1972) understanding Scientific Literatures: A bibliometric Approach. Cambridge: The M.I.T Press, 1973.

CHAPTER FOUR

CITATION PATTERNS IN THE LIVESTOCK PERIODICAL LITERATURE

The techniques used in bibliometic analysis today have grown in sophistication and complexity far beyond simple publication and citation counting. Some of these techniques have been developed to aid in the organization and classification of scientific publications.

As early as 1936, Cason and Lubotsky (1) recognized and described the use of citations to measure the interdisciplinary influence of and the dependency relationships among journals. Bibliographic studies using citations have investigated the relationships among scientific journals, often for purposes of journal selection through mapping and clustering of similar journals within a given field.

The citations in the journal literatures of the 114 journals subscribed to by the NAPRI library have been examined for the purpose of identifying what is the 'core' journals for the field and industry? which is the most cited journals in the field of livestock science, and other pertinent purposes. In finding answers to these questions, the following analysis was done.

All the references at the end of all the livestock articles in the 114 journals were examined. All the citing journal were recorded and added together. At the end, a list of all the cited journals was compiled with the citations each journal received.

This was later arranged in a ranked order, first departmentally and later generally as shown in the first and subsequent tables. The citation period covered journals of 1980, 1981, 1982 and 1983, a period of four years. Self-citing of journals were of course included. The result showed that the Journal of Animal Science was cited 889 times by livestock scientists as shown in their references (and footnotes) in the 114 livestock periodicals including the Journal of Animal Science itself. This is tabulated as follows:

Table IV: I. Table of citations to journals stocked by NAPRI library.

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	60[illegible]
9	Tropical Agriculture (Trini[illegible]d)	601
10	Tropical [illegible] Health Science Journal	601
11	Theriogenology	598
12	Journal of Agric. Science (Cambridge)	590
13	World Poultry Science Journal	586
14	Poultry Science Journal	508
15	British Veterinary Journal	503

Table IV:I. (Contd.)

Serial No.	Title of Journals	No. of citations
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 Agric and Animal Husbandry	440
29	Journal of Fertility and Sterility	412
30	Australian Journal of Agric. 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

Table IV:I (Contd.)

Serial No.	Title of Journals	No. of citations
37	Isreal Journal of Agricultural Research	407
38	Indian Journal of Agriculture	402
39	East African Agric 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 Agric and Animal Husbandry	386
47	Journal of Biological Chemistry	381
48	Netherland 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 Agric. Research	320
53	Nigerian Journal of Agric. Science	320
54	Netherland Journal of Agric. Science	318
55	Tropical Grassland	318
56	Veterinary Immunology and Immunopathology	318
57	Farming in South Africa	318
58	Samaru Agric. Newsletter	310
59	Isreal Journal of Agric. Research	310

Table IV:I. (Contd.)

Serial No.	Title of Journals	No. of Citations
60	Nature	309
61	Phillipine 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
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

Table IV:I. (Contd.)

Serial No.	Title of Journals	No. of Citations
84	Endeavour	110
85	Journal of Experimental Agriculture	108
86	Biochemical Journal	102
87	Rhodesian Agric. Journal	98
88	Journal of Avian Pathology	
89	Agric. 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 Tropischen	29
104	Journal of Agric. Food Chemistry	25
105	de Survenamse Landbouw	18

Table IV. I. (Contd.)

Serial No.	Title of Journals	No.of Citations
106	Milking feed and farm supplies	15
107	International Fertilizer Corespondence	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

For each journal title, all the issues - 12, 3 or 1, i.e. monthly, quarterly, or yearly, respectively for the years 1980, 9181, 1982 and 1983 have been searched for the purpose of identifying citations to journals listed at the end of each livestock literature they carry. Journals whose issues are incomplete, and those in foreign language have all equally been examined for the possibility of citations. These (where they occur) have been reported. they have been included in the study too to enable one determine their potentiality in the industry in terms of citation. The result of the citation counting show the following, as represented in the Table below:

Table IV:II. Table of Distribution of Citations among Serials in Livestock Science.

Frequency of citation per title	Number of titles	Cummulation of title	Cummulation frequency of citation	Log of Title
889	1	1	889	0.006
830	1	2	1719	0.301
822	1	3	2541	0.477
618	1	4	3159	0.602
615	1	5	3774	0.699
610	1	6	4384	0.778
602	1	7	4986	0.845
601	3	10	6789	1.000
598	1	11	7387	1.041
590	1	12	7977	1.079
586	1	13	8563	1.114
508	1	14	9671	1.146
503	1	15	9574	1.176
502	1	16	10076	1.204
498	1	17	10574	1.230
496	1	18	11070	1.255
493	1	19	11563	1.279
489	1	20	12052	1.301
487	1	21	12539	1.322
481	2	23	13501	1.362
480	2	25	14461	1.398
446	1	26	14907	1.415
443	1	27	15350	1.431
440	1	28	15790	1.447
412	1	29	16202	1.462
411	1	30	16613	1.477
410	3	33	17843	1.519
408	2	35	18659	1.544
407	2	37	19473	1.568
402	1	38	19875	1.580
398	1	39	20273	1.591

Table IV:II. (Contd.)

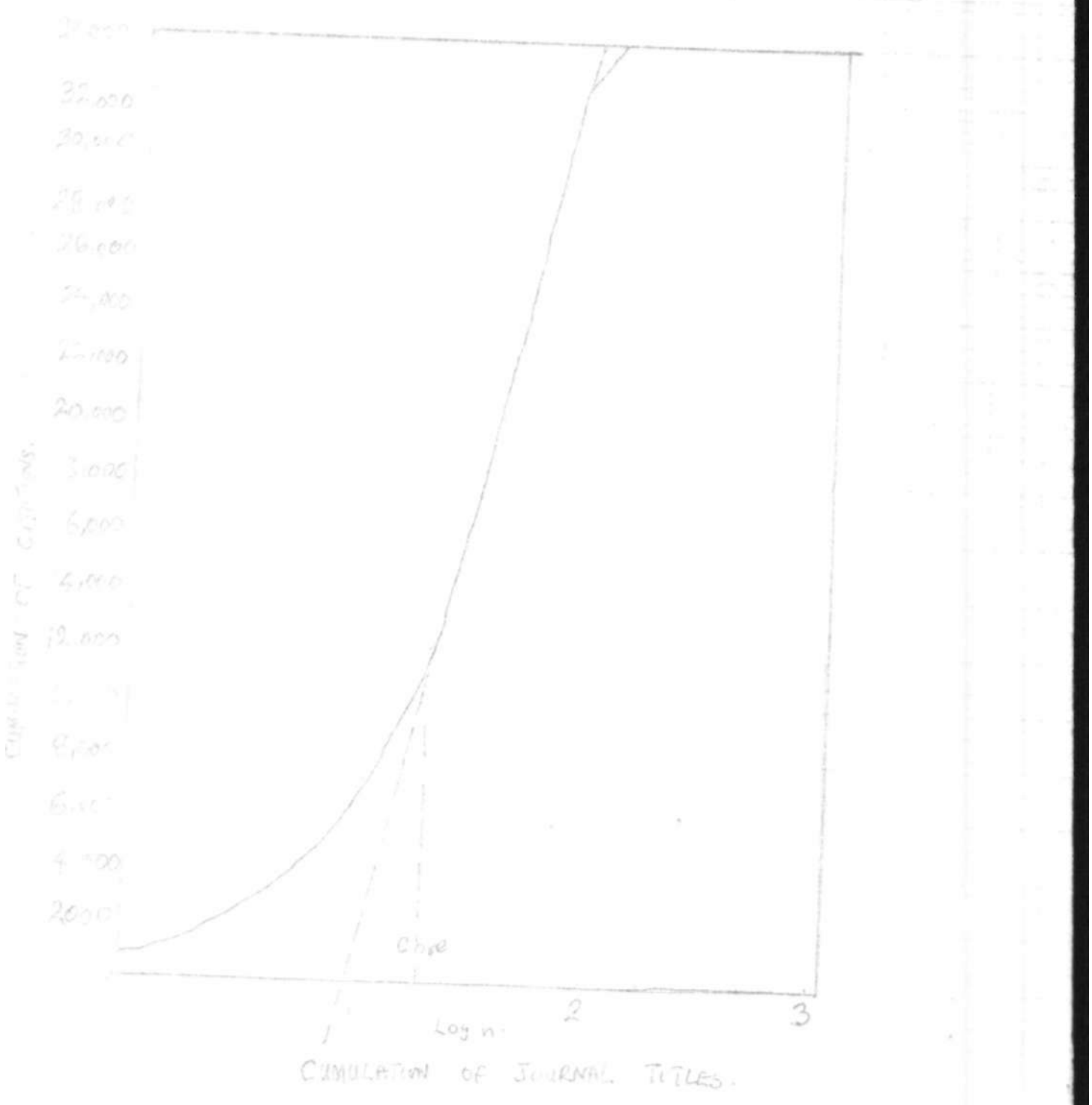
Frequency of Citation per title	Number of title	Commulation of title	Cummulation frequency of citation	Log of title
396	1	40	20669	1.602
394	3	43	21851	1.633
389	1	44	22240	1.643
388	1	45	22628	1.653
386	1	46	23014	1.663
381	1	47	23395	1.672
380	1	48	23775	1.681
360	1	49	24135	1.690
324	1	50	24459	1.699
321	1	51	24780	1.708
320	2	53	25420	1.724
318	4	57	26692	1.756
310	2	59	27312	1.771
309	5	64	28857	1.806
306	1	65	29163	1.813
305	1	66	29468	1.820
297	1	67	29765	1.826
290	1	68	30055	1.833
211	3	71	30688	1.851
210	1	72	30898	1.857
168	1	73	31066	1.863
161	1	74	31227	1.869
160	1	75	31387	1.875
159	1	76	31546	1.881
149	1	77	31695	1.886
140	1	78	31835	1.892
129	1	79	31964	1.898
128	1	80	32092	1,903
121	1	81	32213	1,908
116	1	82	32329	1.914
112	1	83	32441	1.919
110	1	84	32551	1.924

Table IV:II. (Contd.)

Frequency of Citation per title	Number of title	Cummulation of title	Cummulation frequency of citation	Log of title
108	1	85	32659	1.929
102	1	86	32761	1.934
98	1	87	32859	1.940
96	1	88	32955	1.944
95	1	89	33050	1.949
76	1	90	33126	1.954
68	1	91	33194	1.959
67	1	92	33261	1.964
60	1	93	33321	1.968
58	2	95	33437	1.978
56	1	96	33493	1.982
55	1	97	33548	1.987
51	1	98	33599	1.991
49	1	99	33648	1.996
48	1	100	33696	2,000
43	1	101	33739	2,004
30	1	102	33769	2,009
29	1	103	33798	2.013
25	1	104	33823	2.017
18	1	105	33841	2.021
15	1	106	33856	2.025
13	1	107	33869	2.029
11	1	108	33880	2.033
8	1	109	33888	2.037
7	1	110	33895	2.041
4	2	112	33903	2.049
3	1	113	33909	2.053

This distribution is represented in the following Bradford-Zipf bibliograph for journal citations in the journals used by researchers i.e. Fig.3.

2.3 BRADFORD-ZIPF DISTRIBUTION FOR CITATION SCORES FOR LIVESTOCK INDUSTRY.



CUMULATION OF JOURNAL TITLES.

For more exposition, Table IV: I is represented on a departmental basis, showing among others, the number of citations that each journal has generated on these departmental levels of approach.

The departments are as follows: Small Ruminants, represented by the initials S.R., Cattle production (C.P.), Poultry and Swine (P.A.S.), Pasture Agronomy (P.A.), Animal Reproduction and Artificial Insemination (ARAAI), and the General Services department (G.S.D).

Table IV:III. Table of Distribution of citations by Department.

	DEPARTMENTS							
Title of Journals	S.R.	C.P.	P.A.S	P.A.	LEARS	ARAAI	G.S.D	T
Journal of Animal Science	90	170	88	164	92	195	90	889
Journal of Animal Production	90	165	80	155	80	180	80	830
Journal of Dairy Science	89	203	68	134	81	166	79	830
Journal of Reproduction Fert.	89	143	67	135	79	225	79	820
Journal of Dairy Research	67	137	56	82	65	123	78	618
Veterinary Record	56	126	45	63	54	190	81	615
World Animal Review	66	115	64	100	64	131	70	610
Journal of Range Management	35	44	63	228	53	90	69	602
Trop. Agricultural (Trinidad)	64	113	64	98	63	128	71	601
Trop. Animal Health Science	64	124	63	89	62	130	69	601
Theriogenology	44	93	55	78	63	189	79	601
Journal of Agric. Science (Canib)	64	112	65	98	63	127	69	601
World Poultry Science Journal	34	73	194	65	63	96	65	590
Poultry Science Journal	34	62	223	53	64	85	65	586
British Veterinary Journal	55	95	54	52	56	139	57	508
Animal Husbandry	54	93	54	61	55	128	58	503
British Journal of Nutrition	54	112	45	70	55	106	60	502
Animal Breeding Abstract	54	91	53	79	56	105	60	498
Indian Journal of Ani. Science	53	92	54	78	57	103	59	496
Animal Production Science	52	91	53	79	56	101	61	493

Table IV:III(Contd.)

Title of Journals	S.R	C.P.	P.A.S	P.A	LEARS	ARAJI	G.S.D	T
British Poultry Science Journal	72	40	182	58	56	60	60	489
Indian Journal of Dairy Science	52	99	41	69	55	111	59	487
Animal Production	51	88	60	78	54	81	68	481
Livestock Production Science	50	89	61	77	55	80	68	481
Ghana Journal of Agriculture	50	88	62	76	56	89	68	480
Nigerian Journal of Animal Prod.	48	84	49	72	48	97	48	446
Canadian Journal of Animal Science	46	83	48	62	49	98	108	443
Australian Journal of Experimental Agric. and Animal Husbandry	46	82	47	71	49	97	48	440
Journal of Fertility and Sterility	34	68	23	-	35	189	63	412
Australian Journal of Agric.Res.	44	76	44	90	46	67	44	411
Veterinary Review	23	75	-	-	35	177	100	410
32 Nigerian Vet. Journal	13	85	26	25	25	163	73	410
Proc. of the British Society of Animal Science.	43	85	46	55	45	93	43	410
Veterinary Bulletin	33	73	45	47	43	125	42	408
Animal Research Development	43	74	43	66	44	96	42	408
Israel Journal of Agric. Research	63	72	43	65	43	76	42	407
Indian Journal of Vet. Science	23	72	63	-	43	126	73	407
Indian Journal of Agriculture	43	71	42	64	42	95	43	402
East African Agric & Forestry Jour	24	50	42	103	42	84	53	398
Tropical Ani. Health and Prod.	40	70	41	62	42	94	43	396
Grass and Forage Science Journal	-	59	11	213	43	43	25	394
Australian Vet. Journal	44	69	61	-	23	123	62	394
Journal of Endocrinology	42	89	60	0	-	138	65	394
Egyptian Journal of Animal Prod.	41	68	39	60	43	93	45	389
Tropical pest Management	21	58	39	90	42	83	55	388
Queensland Journal of Agric. and Animal Husbandry	41	68	39	60	43	92	43	386
Journal of Biological Chemistry	34	67	48	29	-	131	72	381
Netherland milk and Dairy Journal	-	209	-	18	33	70	50	380
Nigerian Agric. Journal	40	68	38	58	38	79	39	360
Nigerian Journal of Agric. Exten.	15	50	36	63	54	60	46	324
Journal of British Grassland Soc.	-	20	-	192	14	50	45	321

Table IV:III (Contd.)

Title of Journals	S.R.	C.P	P.A.S	P.A.	LEARS	ARMAI	G.S.D	T
Journal of Agric. Research	32	59	37	53	34	70	35	320
Nigerian Journal of Agric.Science	35	60	35	50	35	71	34	320
Netherland Journal of Agric.Sci.	34	59	35	55	30	70	35	318
Tropical Grassland	-	19	-	184	34	50	31	318
Vet Immunology & Immunopathology	24	59	35	-	-	155	45	318
Farming in South Africa	34	59	35	51	34	70	35	318
Samaru Agric. Newsletter	33	58	30	54	33	68	34	310
Isreal Journal of Agric. Research	33	54	34	54	33	68	34	310
Nature	32	54	34	54	33	61	39	309
Phillipine Journal of Vet. Med.	32	54	44	-	-	127	52	309
Advanced Animal Breeder	32	54	34	57	30	63	37	309
Advances in Vet. Science	28	58	49	-	-	112	62	309
Bulletin of Ani. Health Prod. in Africa.	32	56	35	52	33	64	37	309
Australian Journal of Zool.	32	56	35	52	35	62	34	306
Samaru Misc. paper	32	56	35	52	34	61	35	305
Nigerian Journal of Nutrit. Sci.	30	75	34	30	32	60	36	297
Journal of Ani. Prod. Research	29	54	33	49	31	61	33	290
Journal of Animal Ecology	22	39	23	36	22	46	23	211
Journal of Food Protection	-	-	60	43	59	-	50	211
Poultry Digest	13	-	155	-	23	-	20	211
Bulletin of Entomological Res.	23	38	23	30	28	46	23	210
Nigerian Journal of Plant Prot.	-	-	-	142	16	-	10	168
Avian Diseases	12	30	20	-	8	77	14	161
The Ondesteport Journal of Vet.Res	15	30	18	-	18	61	18	160
I.L.C.A. Bulletin	18	8	17	25	39	34	18	159
Animal Reproduction Science	16	28	16	-	17	56	16	149
Bulletin of Epizootic Disease in Africa	15	27	15	-	-	68	15	140
African Journal of Agric. Sci.	14	24	14	21	14	29	13	129
Span-Progress in Agric.	13	24	13	22	14	22	20	128
Journal of Soil Science	-	-	-	108	-	-	13	121
Association of Official Analytical Chemist Journal	11	16	36	14	-	27	12	116

Table IV:III (Contd.)

Title of Journals	S.R.	C.P	P.A.S	P.A	LEARS	ARAAI	GSD	T
The Analgst	8	12	20	8	-	52	12	112
Endeavour	10	20	11	19	12	24	14	110
Journal of experimental Agric.	10	18	12	16	14	20	18	108
Biochemical Journal	10	17	26	10	-	34	15	102
Rhodesian Agric. Journal	9	16	9	15	13	24	12	98
Journal of Avian Pathology	-	16	12	-	-	44	14	96
Agricultural System Int.Journal	9	16	9	15	12	22	12	96
Outlook on Agriculture	8	14	8	12	11	14	8	75
Journal of Chromatography	8	11	9	8	-	14	18	68
Pastosy Forages	-	-	-	59	4	-	4	67
Phytophylatical	6	14	-	-	-	28	12	60
Journal of Chromatographic Science	9	6	14	3	-	17	10	58
Analytical Chemistry	9	6	12	5	-	18	8	58
I.T.C.Journal	-	-	25	-	-	16	15	56
Journal of West African Science	8	9	11	4	6	10	7	55
Analytical Biochemistry	5	9	7	6	-	13	11	51
Journal of Field Crop Abstract	-	-	-	31	9	-	9	49
Journal of Field Crop Research	-	-	-	29	10	-	9	48
Agricultural System	6	5	6	7	7	6	6	43
Revue Deldgge et de Medicine Vet.	-	-	-	-	-	-	-	
Des pays tropicaix	6	5	4	-	-	8	7	30
Journal of Agric.Food Chemistry	-	8	2	-	-	12	3	25
de suvinamese lanbouw	1	3	-	4	-	5	5	18
Milling feed and farm sup.	-	2	-	8	4	-	1	15
International Fertilizer corresp.	-	-	-	13	-	-	-	13
Milling feed and Fertilizer	-	4	-	7	-	-	-	11
Forest Products Abstract	-	-	-	8	-	-	-	8
Sorghum and Millet Abstract	-	-	-	7	-	-	-	7
Experimental husbandry	1	1	-	-	1	-	1	4
Tropical Science	-	1	-	2	1	-	-	4
Forestry Abstract	-	-	-	3	-	-	-	3
Beitrage zur tropisclen	-	-	-	19	5	-	5	29
Total citation/Department	3085	6025	4068	5489	3404	7949	4273	34293

Analysis of citations

Some 113 journals have been cited more than 34,000 times. The departmental breakdown shows that the department of Animal Reproduction and Artificial Insemination has the highest citation of 7,949, representing about 23% of the total citations for the industry. It was closely followed by the department of cattle production with 6,025 or 17.56% citations. This is represented in the Table IV:IV.

Table IV:IV. Distribution of citations among departments.

	Total Citation	% of Total	Total Journal	Citation % of Journal
Small Ruminants	3085	8.99	91	80.53
Cattle Production	6025	17.56	99	87.61
Poultry and Swine	4068	11.86	93	82.30
Pasture Agronomy	5489	16%	93	82.30
Livestock Econ. & Rural Sociology	3404	9.96	89	7876
Animal Reproduction and A.I.	7949	2317	96	84.95
General Services Department	4273	1246	106	93.80

The departmental analyses are also presented graphically (Bradford's bibliograph) as in the following Tables and corresponding figures 4-10.

Department of Small Ruminants

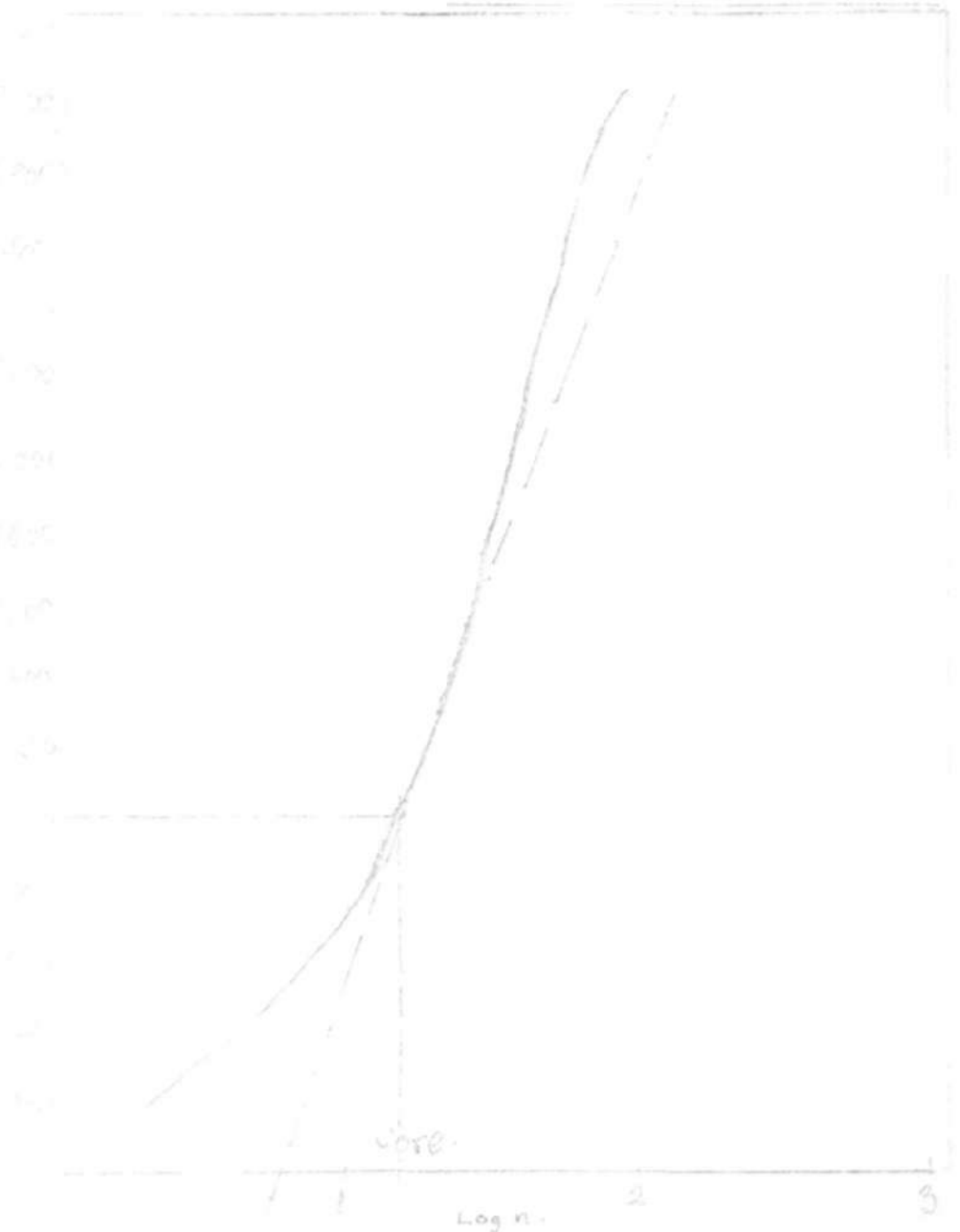
Table IV:V. Table of Distribution of Citation score among serials.

Frequency of Citation Titles	Number of Titles	Cummulation Titles	Cummulation Frequency of citation	Log of Titles	Cummulation of Citation
90	2	2	180	0.301	2.95
89	2	4	358	0.602	2.92
67	1	5	425	0.699	2.20
66	1	6	491	0.778	2.17
64	3	9	683	0.954	2.10
63	1	10	746	1.000	2.07
56	1	11	802	1.041	1.84
55	1	12	857	1.019	1.80
54	3	15	1019	1.176	1.77
53	1	16	1072	1.204	1.74
52	2	18	1176	1.255	1.70
51	1	19	1227	1.279	1.67
50	2	21	1327	1.322	1.64
48	1	22	1375	1.342	1.57
46	2	24	1467	1.380	1.51
44	2	26	1555	1.415	1.44
43	3	29	1684	1.462	1.41
42	1	30	1726	1.477	1.38
41	2	32	1808	1.505	1.34
40	2	34	1888	1.531	1.31
35	2	36	1958	1.556	1.15
34	6	42	2162	1.623	1.11
33	3	45	2261	1.653	1.08
32	8	53	2517	1.724	1.05
30	1	54	2547	1.732	0.98
29	1	55	2576	1.740	0.95
28	1	56	2604	1.748	0.92
24	2	58	2652	1.763	0.78
23	3	61	2721	1.785	0.75

Table IV:V. (Contd.)

Frequency of citation Titles	Number of Titles	Cummulation Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation of Citations
22	1	62	2743	1.792	0.72
21	1	63	2764	1.799	0.69
18	1	64	2782	1.086	0.59
16	1	65	2798	1.813	0.52
15	3	68	2843	1.833	0.49
14	1	69	2857	1.839	0.46
13	3	72	2896	1.857	0.42
12	1	73	2908	1.863	0.39
11	1	74	2919	1.869	0.36
10	3	77	2949	1.886	0.32
9	3	80	2976	1.903	0.29
8	5	85	3016	1.929	0.26
6	3	88	3034	1.944	0.19
5	1	89	3039	1.949	0.16
1	2	91	3041	1.959	0.03

BRADFORD-ZIPF DISTRIBUTION FOR CITATION SCORES FOR SMALL [illegible] DEPARTMENT.



CUMULATION OF JOURNAL TITLES.

Department of Cattle Production

Table IV:VI. Table of Distribution of Citation Score among Serials.

Frequency of Citation Titles	Number of Titles	Cummulation Titles	Cummulation Frequency of Titles	Log of Titles	Cummulation % of Citation
209	1	1	209		
203	1	2	412	0.301	
170	1	3	582	0.377	
165	1	4	747	0.602	
143	1	5	890	0.699	
137	1	6	1027	0.778	
126	1	7	1153	0.845	
124	1	8	1277	0.903	
115	1	9	1392	0.954	
113	1	10	1505	1.000	
112	2	12	1729	1.079	
99	1	13	1828	1.114	
95	1	14	1923	1.204	
92	1	17	2201	1.230	
91	2	19	2383	1.279	
89	2	21	2561	1.322	
88	2	23	2737	1.362	
85	2	25	2907	1.398	
84	1	26	2991	1.415	
83	1	27	3074	1.431	
82	1	28	3156	1.447	
76	1	29	3232	1.462	
75	2	31	3382	1.491	
74	1	32	3456	1.505	
73	2	34	3602	1.531	
72	2	36	3746	1.556	
71	1	37	3888	1.568	
70	1	38	4028	1.580	
69	1	39	4097	1.591	

Table IV:VI.(Contd.)

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Titles	Log of Titles	Cummulation % of Citation
68	4	43	4369	1.6333	
67	1	44	4436	1.643	
62	1	45	4498	1.653	
60	1	46	4558	1.663	
59	5	51	4853	1.708	
58	3	54	5027	1.732	
56	3	57	5195	1.756	
54	5	62	5465	1.792	
50	1	63	5515	1.799	
44	1	64	5559	1.806	
40	1	65	4499	1.813	
39	1	66	5638	1.820	
38	1	67	5676	1.826	
30	2	69	5706	1.839	
28	1	70	5734	1.845	
27	1	71	5761	1.851	
24	2	73	5809	1.863	
20	2	75	5849	1.875	
19	1	76	5868	1.881	
18	1	77	5886	1.886	
17	1	78	5903	1.892	
16	4	82	5967	1.914	
14	2	84	5995	1.924	
12	1	85	6007	1.929	
11	1	86	6018	1.934	
9	2	88	6036	1.944	
8	2	90	6052	1.954	
6	2	92	6064	1.964	
5	2	94	6074	1.973	
4	1	95	6078	1.978	
3	1	96	6081	1.982	
2	1	97	6083	1.987	
1	2	99	6085	1.996	

Fig 5. BRADFORD – ZIPF DISTRIBUTION FOR CITATION SCORES FOR CATTLE PRODUCTION DEPARTMENT.



Department of Poultry and Swine

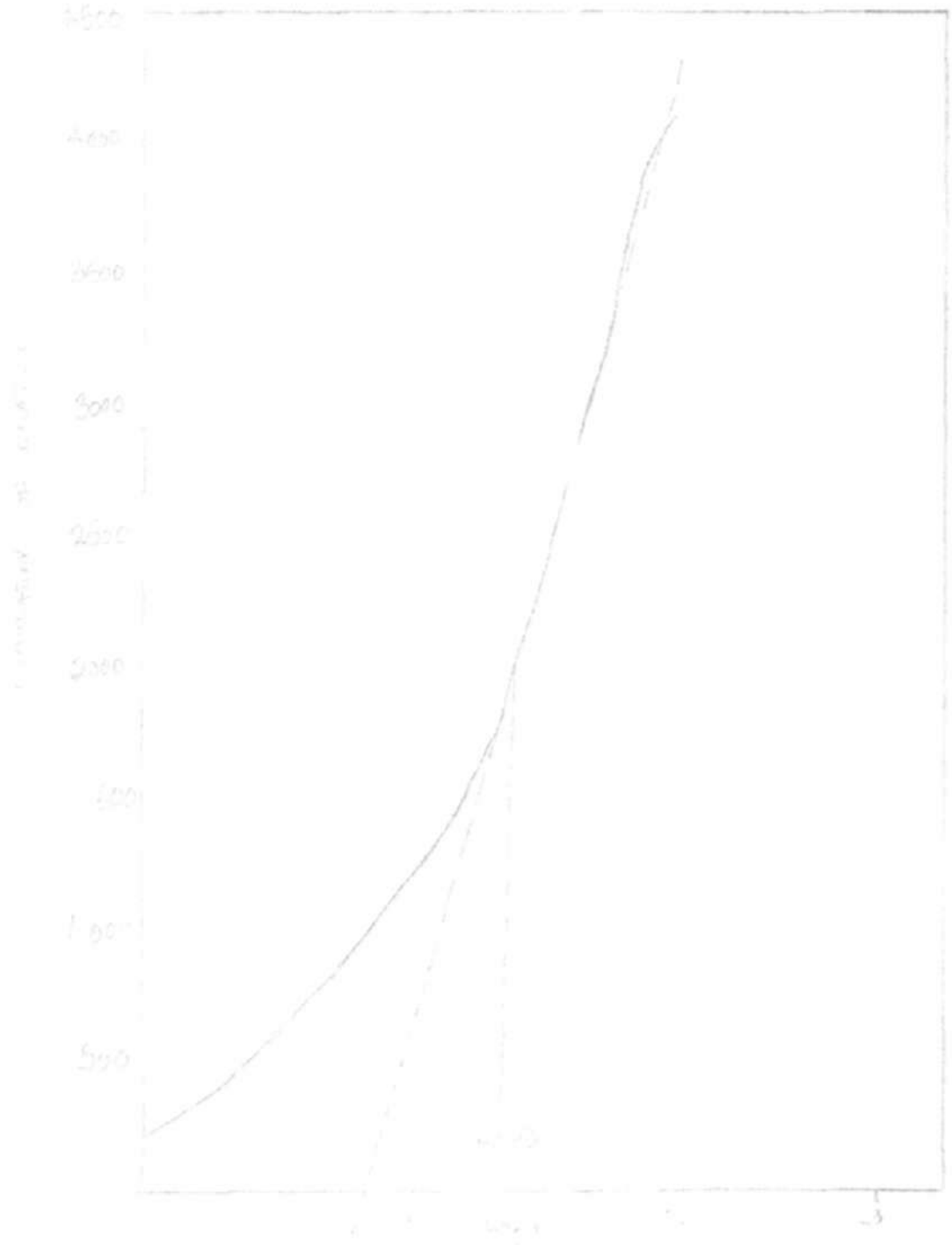
Table IV.VII. Table of Distribution of Citation Score among Serials.

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citations
223	1	1	223	0.000	
194	1	2	417	0.301	
182	1	3	599	0.477	
155	1	4	754	0.602	
88	1	5	842	0.699	
80	1	6	922	0.778	
68	1	7	990	0.845	
67	1	8	1057	0.903	
65	1	9	1122	0.954	
64	2	11	1250	1.041	
63	3	14	1439	1.146	
62	1	15	1501	1.176	
61	2	17	1623	1.230	
60	3	20	1803	1.301	
56	1	21	1859	1.322	
55	1	22	1914	1.342	
54	3	25	2076	1.398	
53	2	27	2182	1.431	
49	2	29	2280	1.462	
48	2	31	2376	1.491	
47	1	32	2423	1.505	
46	1	33	2469	1.519	
45	3	36	2604	1.556	
44	2	38	2692	1.580	
43	2	40	2778	1.602	
42	2	42	2862	1.623	
41	2	44	2944	1.643	
39	3	47	3061	1.672	
38	1	48	3099	1.681	
37	1	49	3136	1.690	

Table IV:VII(Contd.)

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citation
36	2	51	3208	1.708	
35	7	58	3453	1.763	
34	4	62	3589	1.792	
33	1	63	3622	1.799	
30	1	64	3652	1.806	
26	2	66	3704	1.820	
25	1	67	3729	1.826	
23	3	70	3798	1.845	
20	2	72	3838	1.857	
18	1	73	3856	1.863	
17	1	74	3873	1.869	
16	1	75	3889	1.875	
15	1	76	3904	1.881	
14	2	78	3932	1.892	
13	1	79	3945	1.898	
12	3	82	3981	1.914	
11	3	85	4014	1.929	
9	3	88	4041	1.944	
8	1	89	4049	1.949	
7	1	90	4056	1.954	
6	1	91	4062	1.959	
4	1	92	4066	1.964	
2	1	93	4068	1.968	

Fig 5. BRADFORD - ZIPF DISTRIBUTION FOR CITATION SCORES FOR POULTRY AND SWINE DEPARTMENT.



Department of Pasture Agronomy

Table IV:VIII. Table of Distribution of Citation Score among Serials.

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citations
228	1	1	223	0.000	
213	1	2	541	0.301	
192	1	3	733	0.477	
184	1	4	917	0.602	
164	1	5	1081	0.699	
155	1	6	1236	0.778	
142	1	7	1378	0.845	
135	1	8	1513	0.903	
134	1	9	1647	0.954	
108	1	10	1755	1.000	
103	1	11	1858	1.041	
100	1	12	1958	1.079	
98	2	14	2154	1.146	
90	2	16	2334	1.204	
89	1	17	2423	1.230	
82	1	18	2505	1.255	
79	2	20	2663	1.301	
78	3	23	2897	1.362	
77	1	24	2974	1.380	
76	1	25	3050	1.398	
72	1	26	3122	1.415	
71	1	27	3193	1.431	
70	1	28	3263	1.447	
69	1	29	3332	1.462	
66	1	30	3398	1.477	
65	2	32	3528	1.505	
64	1	33	3592	1.519	
63	2	35	3718	1.544	
62	2	37	3842	1.568	
61	1	38	3903	1.580	
60	2	40	4023	1.602	

Table IV:VIII (Contd.)

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citations
59	1	41	4082	1.613	
58	2	43	4198	1.633	
57	1	44	4255	1.643	
55	2	46	4365	1.663	
54	3	49	4527	1.690	
53	2	51	4633	1.708	
52	4	55	4841	1.740	
51	1	56	4899	1.748	
50	1	57	4949	1.756	
49	1	58	4998	1.763	
47	1	59	5045	1.771	
42	1	60	5087	1.778	
36	1	61	5123	1.785	
31	1	62	5154	1.792	
30	2	64	5214	1.806	
29	2	66	5272	1.820	
25	1	67	5297	1.826	
22	1	68	5319	1.833	
21	1	69	5340	1.839	
19	2	71	5378	1.851	
18	1	72	5396	1.857	
16	1	73	5412	1.863	
15	2	75	5442	1.875	
14	1	76	5456	1.881	
13	1	77	5469	1.886	
13	1	78	5481	1.892	
10	1	79	5491	1.898	
8	4	83	5523	1.919	
7	3	86	5544	1.934	
6	1	87	5550	1.940	
5	1	88	5555	1.944	
4	2	90	5563	1.954	
3	2	92	5569	1.964	
2	1	93	5571	1.968	

Fig. 7. BRADFORD - ZIPF DISTRIBUTION FOR CITATION SCORES FOR PASTURE AGRONOMY DEPARTMENT.

Department of Livestock Economics and Rural Sociology.

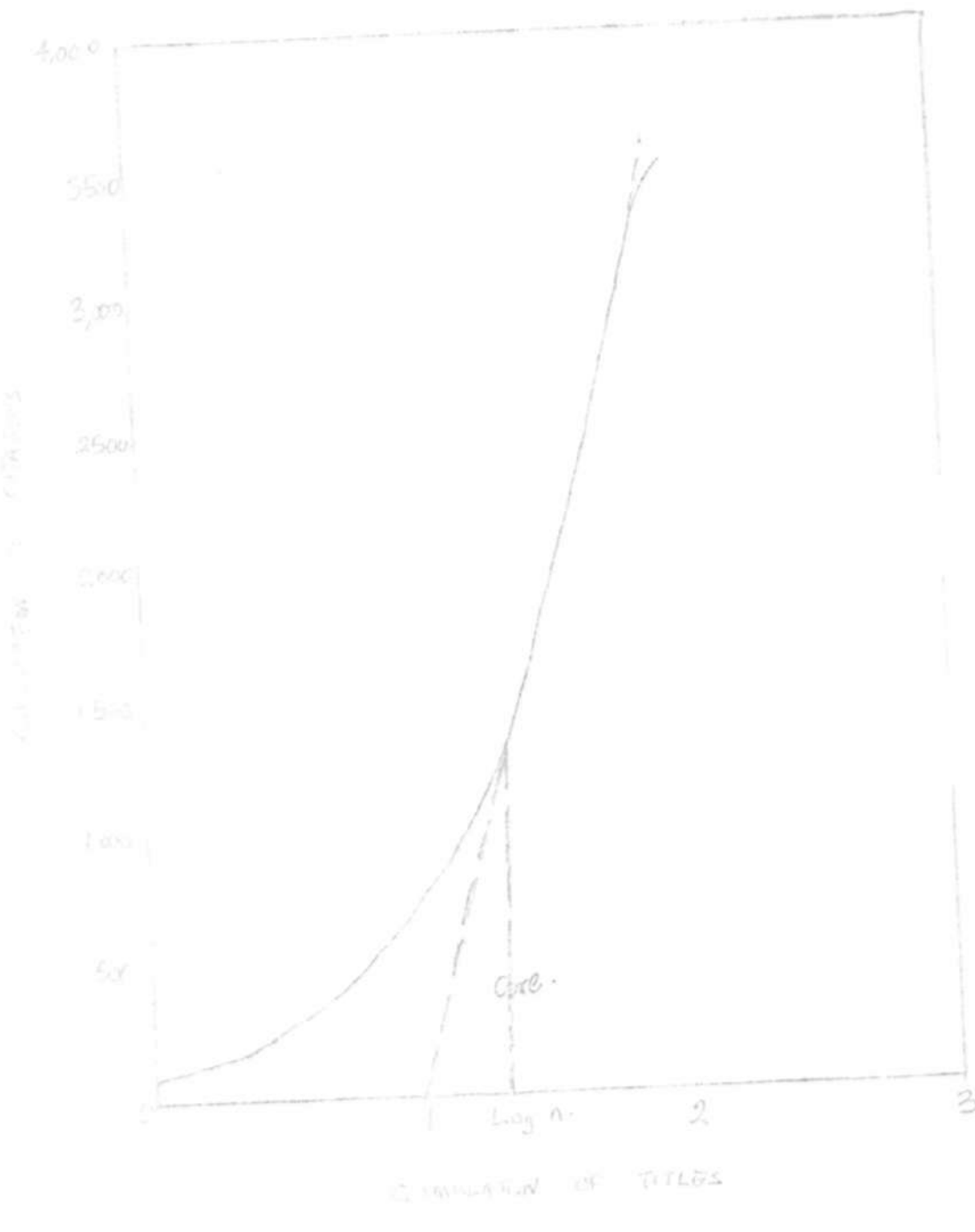
Table IV:IX. Table of Distribution of Citation Score among Serials.

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citations
92	1	1	92	C.000	
81	1	2	173	0.301	
80	1	3	253	0.477	
79	1	4	332	0.602	
65	1	5	397	0.699	
64	2	7	525	0.845	
63	4	11	777	1.041	
62	1	12	839	1.079	
59	1	13	898	1.114	
57	1	14	955	1.146	
56	5	19	1235	1.279	
55	4	23	1455	1.362	
54	3	26	1617	1.415	
53	1	27	1670	1.431	
49	2	29	1768	1.462	
48	1	30	1816	1.477	
46	1	31	1862	1.491	
45	2	33	1952	1.519	
44	1	34	1996	1.531	
43	6	40	2254	1.602	
42	4	44	2422	1.643	
39	2	46	2500	1.663	
38	1	47	2538	1.672	
35	4	51	2678	1.708	
34	3	55	2814	1.740	
33	5	61	2979	1.785	
32	1	62	3011	1.792	
31	1	63	3042	1.799	
30	2	65	3102	1.813	
28	1	66	3130	1.820	
25	1	67	3155	1.826	
23	2	69	3201	1.839	
22	1	70	3223	1.845	
18	1	71	3241	1.851	
17	1	72	3258	1.857	
16	1	73	3274	1.863	

Table IV:IX. (Contd.)

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citations
14	4	77	3330	1.886	
13	1	78	3343	1.892	
12	2	80	3367	1.903	
11	1	81	3378	1.908	
10	1	82	3388	1.914	
9	1	83	3397	1.919	
8	1	84	3405	1.924	
7	1	85	3412	1.929	
5	1	86	3417	1.934	
4	2	87	3421	1.940	
1	2	89	3423	1.949	

Fig. 8. BRADFORD - ZIPF DISTRIBUTION FOR CITATION SCORES FOR LIVESTOCK ECONOMICS AND RURAL SOCIOLOGY DEPARTMENT.



Department of Animal Reproduction and Artificial Insemination.

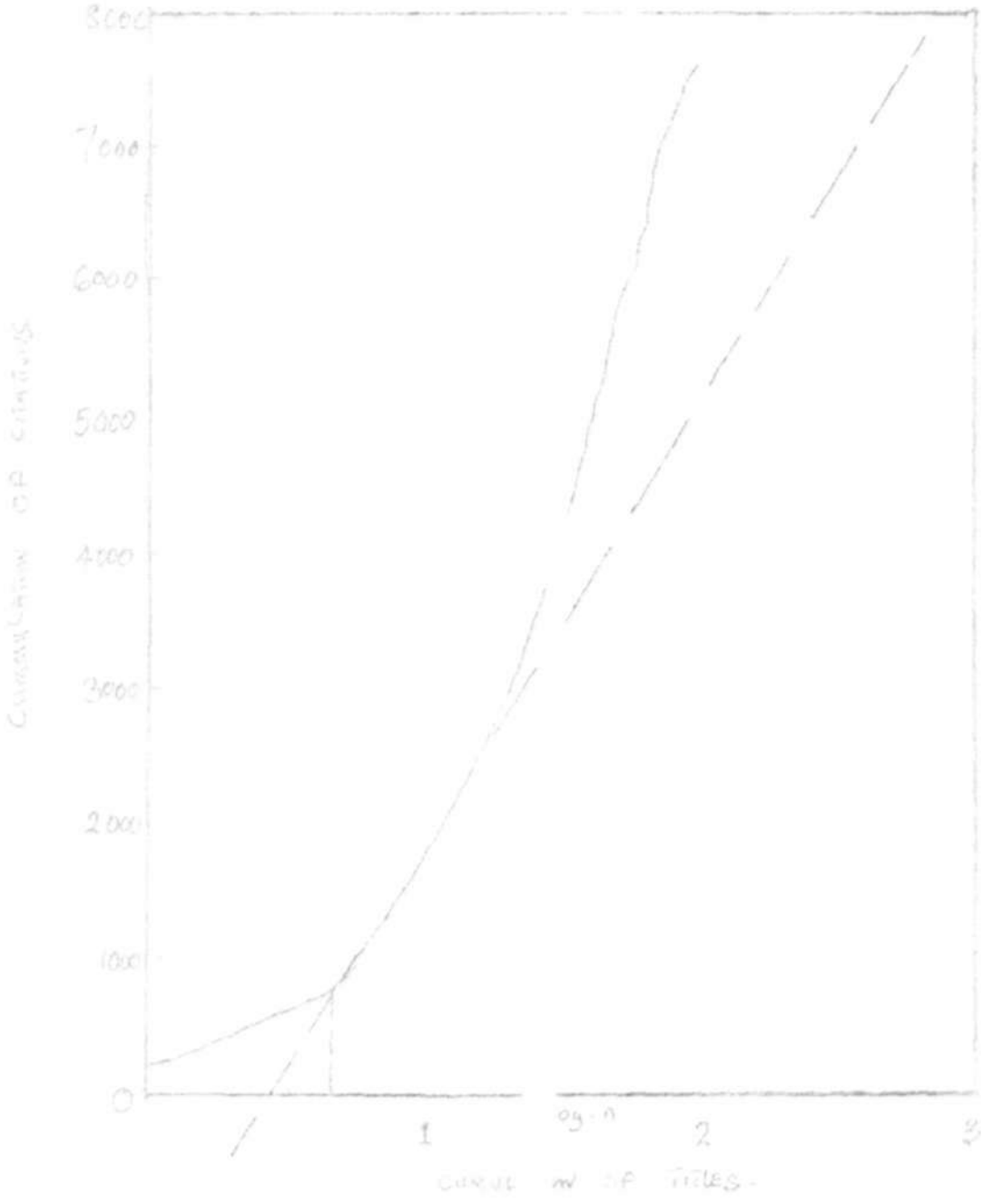
Table IV:X. Table of Distribution of Citation Score among Serials.

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of citations
225	1	1	225	0.000	
195	1	2	420	0.301	
190	1	3	610	0.477	
189	2	5	799	0.699	
180	1	6	1159	0.778	
177	1	7	1336	0.845	
166	1	8	1502	0.903	
163	1	9	1665	0.954	
155	1	10	1820	1.000	
139	1	11	1959	1.041	
138	1	12	2097	1.079	
135	1	13	2232	1.114	
131	2	15	2494	1.176	
130	1	16	2624	1.204	
128	2	18	2880	1.255	
127	2	20	3134	1.301	
126	1	21	3260	1.322	
125	1	22	3375	1.342	
123	1	23	3498	1.362	
112	1	24	3510	1.380	
111	1	25	3621	1.398	
106	1	26	3727	1.415	
105	1	27	3832	1.431	
103	1	28	3935	1.447	
101	1	29	4036	1.462	
98	1	30	4134	1.477	
97	2	32	4328	1.505	
96	2	34	4520	1.531	
95	1	35	4615	1.544	
94	1	36	4709	1.556	
93	2	38	4895	1.580	
92	1	39	4987	1.591	
90	1	40	5077	1.602	
89	1	41	5166	1.613	
85	1	42	5251	1,623	
83	1	43	5334	1.633	
81	1	44	5415	1.643	
80	1	45	5495	1.653	
79	1	46	5474	1.663	
77	1	47	5551	1.672	
76	1	48	5627	1.681	
71	1	49	5698	1.690	
70	4	53	5978	1.724	
68	3	56	6182	1.748	
67	1	6249	1.756		

Table IV:X. (Contd.)

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation Frequency of Citation	Log of Titles	Cummulation % of Citations
64	1	58	6313	1.763	
63	1	59	6376	1.771	
62	1	60	6438	1.806	
61	4	64	6680	1.806	
60	3	67	6860	1.826	
56	1	68	6916	1.833	
52	1	69	6968	1.839	
50	2	71	7068	1.851	
46	2	73	7160	1.863	
44	1	74	7204	1.869	
43	1	75	7247	1.875	
34	2	77	7315	1.886	
29	1	78	7344	1.892	
28	1	79	7372	1.898	
27	1	80	7399	1.903	
24	2	82	7347	1.914	
22	2	84	7391	1.924	
20	1	85	7411	1.929	
18	1	86	7429	1.934	
17	1	87	7446	1.940	
16	1	88	7462	1.944	
14	2	90	7490	1.954	
13	1	91	7503	1.959	
12	1	92	7515	1.964	
10	1	93	7525	1.968	
8	1	94	7533	1.973	
6	1	95	7539	1.978	
5	1	96	7544	1.982	

FIG. 9. BRADFORD-ZIPF DISTRIBUTION FOR CITATION SCORES FOR ANIMAL REPRODUCTION AND ARTIFICIAL INSEMINATION DEPARTMENT



General Services Department

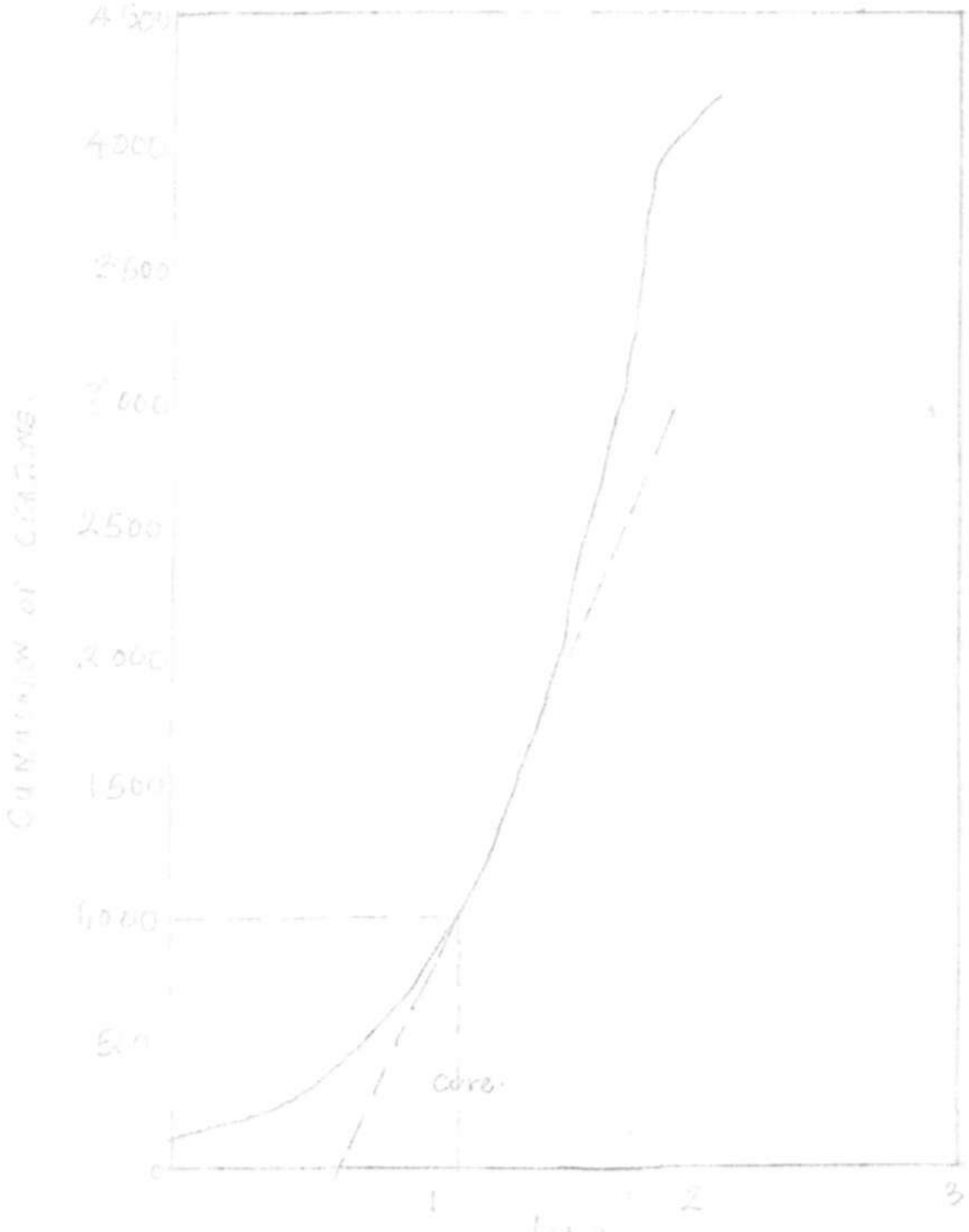
Table IV:XI. Table of Distribution of Citation Score among Serials.

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation frequency of citation	Log of Titles	Cummulation % of citations
108	1	1	108	0.000	
100	1	2	208	0.301	
90	1	3	298	0.477	
81	1	4	379	0.602	
80	1	5	459	0.699	
79	2	7	617	0.845	
73	2	9	763	0.954	
72	1	10	835	1.000	
71	1	11	906	1.041	
70	1	12	976	1.079	
69	3	15	1183	1.176	
68	2	17	1319	1.230	
65	3	20	1514	1.301	
63	1	21	1577	1.322	
62	2	23	1701	1.362	
61	1	24	1762	1.380	
60	3	27	1942	1.431	
59	2	29	2060	1.462	
58	2	31	2176	1.491	
57	1	32	2233	1.505	
55	1	33	2288	1.519	
53	1	34	2341	1.531	
52	1	35	2393	1.544	
50	2	27	2493	1.568	
48	2	39	2589	1.591	
46	1	40	2635	1.602	
45	3	43	2770	1.633	
44	1	44	2814	1.643	
43	4	48	2986	1.681	
42	3	51	3112	1.708	
39	2	53	3190	1.724	
37	2	55	3264	1.740	
36	1	56	3300	1.740	
35	4	60	3440	1.778	
34	4	64	3576	1.806	
33	1	65	3609	1.813	
31	1	66	3640	1.820	
25	1	67	3665	1.826	
23	2	69	3711	1.839	
20	2	71	3751	1.851	
18	4	75	3823	1.875	

Table IV:XI. (Contd.)

Frequency of Citation Titles	Number of Titles	Cummulation of Titles	Cummulation frequency of citation	Log of Titles	Cummulation % of citations
15	3	79	3884	1.898	
14	3	82	3926	1.914	
13	2	84	3952	1.924	
12	5	89	4012	1.949	
11	1	90	4023	1.954	
10	2	92	4043	1.964	
9	2	94	4061	1.973	
8	2	96	4077	1.982	
7	2	98	4091	1.991	
6	1	99	4097	1.996	
5	2	101	4107	2.004	
4	1	102	4111	2.009	
33	1	103	4114	2.013	
1	2	105	4116	2.021	

Fig. 10. BRADFORD--ZIPF DISTRIBUTION FOR JOURNAL CITATIONS IN THE JOURNALS USED BY RESEARCHERS IN THE GENERAL SERVICES DEPARTMENT.



Cumulative of Titles.

Core Journals for the livestock industry

The idea of "Core" literature - that segment of a library's collection that is potentially most useful, was borne out of the desire of librarians to stock only those materials of high utility to their clienteles and that would ease organisation, and optimise use by the library and users respectively.

Samuel Bradford was interested in finding out which journals were most important for certain fields of study. He arranged the journals into a list, with the most productive numerically at the top, followed by the next most productive, and so on to the least productive. He reasoned that 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. The statistical distribution which followed this is known as the Bradford distribution.

The Bradford technique of determining "Core journals" has been used in this study to determine the core journals first for citations on livestock industry and later for the journals used in NAPRI. This technique has gained general acceptability among information scientists. It was acknowledged for its applicability to bibliographic work by Brookes in 1969. He concludes "It seem to offer the only means discernible at present of reducing the present quantitative untideness of scientific documentation, information systems and library services to a more orderly state of affairs capable of being rationally and economically planned and organized"(2).

The ranking as shown in Table IV:I shows the total citation from all the 144 journals.

This has been broken down according to departments. The Journal of Animal Science tops the list of cited journals with 889 citations from a total of 34,308 citations, gathered from 114 journals for the years 1980-1983. This is followed by the Journal of Animal Production with 830 citations.

The first ten (10) journals received between 600 and 889 citations, with a total of 6,789 or 19.78% of the citations received. The last ten (10) journals had a total of 108 citations representing only 0.31%.

From Table IV:II and the graph in Fig.3, the first eighteen (18) journals have emerged as the core journals for the livestock industry, with a total of 11,070 citations representing 32.26%. Subsequent zones can be formed from this, with the second zone as the first thirty six (36) journals, and the third zone being the first seventy two journals.

The first and second zones accounted for 19,067 citations representing over 55% of the total citations. That is to say, about 31% of the total journal collection in the field accounted for more than 55% of the cited journals in the field. For a comprehensive coverage, the zone is increased to the third zone which puts the first seventy two (72) journals or 63% of the journals as the required level. These seventy two journals account for 30,898 citations representing over 90% of the total citations. Hence, 72 (63%) journals from 114 satisfies over 90% of the citation need of the industry.

On departmental basis, the same technique is used, beginning with the small ruminants department, the analysis shows the following: The Journals of Animal Science received the highest citation of 90.

Half of the total cited journals accounted for over 72% of the departmental total citations, Fig.4 shows that the core journals for the department is fifteen (15), and subsequent zone can be formed thereafter.

A total of ninety nine (99) journals were cited in the cattle production department with the Netherland milk and Dairy Journal topping the citation list with 205 citations. Twelve (12) journals representing 12% of the total cited journals in the department is the "Core journals"for the department of cattle production (Fig.5).

For the department of Poultry and Swine, ninety two (92) journals were cited with half producting over 73% of the departmental citations. The "Core journals" for the department is twenty one (21) journals with a total citation of 1859 representing over 45%. The British Poultry Science Journal received the highest citation of 223 citations.

The Journal of Range Management is the highest cited journal for the Pasture Agronomy department, with 228 citations. Forty six (46) journals or 50% produced over 71% of the total departmental citation. The "Core journals" is eight.

In the Livestock Economics and Rural Sociology department, a total of eighty seven (87) journals were cited. 50% of these produced over 71% of the total citations, and the "Core journal" zone is the highest cited nineteen (19) journals. Journal of Animal Science received the highest citation 92.

The largest department in the industry as shown by the citation figures is the Animal Reproduction and Artificial Insemination department, with ninety six total cited journals. The Journal of Reproduction and Fertility received the highest citations of 225.

The highest cited five (5) journals represents the "Core journals" for the department.

Finally is the General Services department, where one hundred and six (106) journals were cited. Half of these journals accounted for over 76% of the total departmental citations. The "Core journals" zone is twelve (12) journals while the Canadian Journal of Animal Science is the highest cited journal in the department with 108 citations.

From the above analysis, it is found that a general pattern of journal requirement for the departments holds about half or 50% of the total departmental journal - collection have proved to be sufficient, having between 71%-75% of the total citations for the departments. For very small departmental libraries, the journals - contained in the first zone, i.e. the "Core journals" would suffice, while this can be increased to include journals listed in the second and subsequent zones with demand.

Comparative analysis of use and citation scores

Similarities

The pattern of use of journals by researchers in NAPRI is structured along the line of researchers' training, orientation and speciality. These factors affect the total use score obtained by some journals. The Veterinary Science researchers have more bias for journals in the Veterinary medicine and research, while the Animal scientists use mostly the abstract journals in livestock industry.

This pattern was observed as the same with researchers citations from the larger industry. Citations of Scientists with the D.V.M. prefix - after name are similar with the journals used by their NAPRI counterparts. Also citations of the animal scientists (B.Sc. M.Sc. etc) corresponds with those journals used by the NAPRI Animal Scientists. The veterinarian would cite or use such journals as: Veterinary Journal, Veterinary Records. Journal of Endocrinology, Theriogenology, etc. while the Animal Scientists would prefer the Journal of Animal Science, Journal of Animal production etc.

Journals mostly used or cited by authors are those that are readily available to the author. According to subramanyam (1) a high frequency of citation does not in itself reflect a high quality of journal. This is evidenced in the citation and use pattern of journals by researchers whose area of specialisation cut across disciplinary boundaries. The high quality of the Journal of Animal Science not withstanding, researchers from departments such as livestock Economics and rural sociology would naturally be expected to have inclination towards an extension periodical than a pure Animal Science journal. Such a journal as Journal of Wild Life Management with only one use score did not even get cited, because of its newness in the livestock industry, among other factors.

The Journal of Animal Science received the highest use scores of 36, followed by the Journal of Animal Production,31. Those two journals are equally the first and second highest cited journals with 889 and 839 citations respectively. The two journals under use and citation studies cut across departmental barriers.

The effect of size in any discipline is a force to be reckoned with. The use scores recorded by the Journal of reproduction and fertility, Theriogenology, etc. for instance, cannot be divorced from the size of researchers specialising in Animal reproduction and artificial insemination. Eight researchers from thirty six belong to this department in NAPRI.

Further analysis shows that specific journals, such as Journal of Range Management, Poultry Science Journal etc. have fairly low use and citation scores because of their restrictive nature. The Poultry Science Journal received ten (10) use scores, and 586 citations and the Range Management Journal was cited 602 times with 14 used seores.

Language of communication is also important in journal usage in livestock industry. All the journals in other languages but English remained unused in NAPRI. This situation is not any much better in the industrial set up. Such journals have citations as low as eighteen, none with citations up to one hundred. English language proved to be the language widely used in communication.

Journals published in Nigeria on livestock science were not among the most frequently cited, but were well used by NAPRI researchers. The Nigerian Journal of Animal Production is the highest used Nigerian journal with sixteen (16) use score. It ranked eighth (8th) after only four journals. This journal incidentally is the highest cited Nigerian journal in the industry with 446 citations, ranking twenty sixth (26th).

The following dissimilarities are observed from the use and citations:-

Seven journal received more than half (18) of the highest use score (36), while twenty six journals got over half (444) of the highest citations (889).

The reason for this is obvious, being the size of researchers scoring and citing respectively.

Finally, Nigerian journals received prominent use scores in NAPRI. Such journals as Samaru Miscellaneous paper, Research Bulletin, etc. received eight (8) scores each (or 25%) of the highest scored journal. These Samaru Publications were placed twenty third (23rd) on the use score board while the Samaru Agric. Newsletter (the first to be cited) was placed fifty eighth (58th) on the citation table.

However, the differences notwithstanding, the result obtained compare favourably similar, as these area of differences can be explained off.

Core Journals of NAPRI and of ciations in livestock industry

The Bradford distribution was the technique employed in this study. The distribution was applied to the data on journal use by NAPRI staff, and the result showed a non-conformity with the typical Bradford distribution as shown by the Fig. 2. The non-conformity was as a result of the small size of data involved (the highest score - 36, total score - 679). The same technique was applied to the various citation data gathered and it conformed with the typical Bradford distribution. (The data involved under citation has a highest citations of 889, total citations 34,308) inspite of this difference, attempt would be made to show the differences in the ranking of journals in the used score lists and that of the citations. Specifically, it will compare the core journals cited with the rankings in the use score lists.

Eighteen (18) journals have emerged as the core journals for the livestock industry. They are:- Journals of Animal Science -889, Journal of Animal Production - 830, Journal of Dairy Science - 822, Journal of reproduction and fertility - 618, Journal of Dairy research- 615, Veterinary record - 610, World Animal Review - 602, Journal of Range Management - 601, Tropical Animal Health Science - 601, Theriogenology - 598, Journal of Agric. Science - 590, World Poultry Science - 586, Poultry Science Journal - 508, British Veterinary Journal- 503, Indian Journal of Vet. Science and Animal Husbandry - 502, British Journal of Nutrition - 498 and Animal Breeding Abstract - 496. Thirteen of these eighteen journals were also identified among the eighteen journals with the highest use scores. The five core journals not in the use score first eighteen journals are:- World Animal Review- 34th, Poultry Science Journal - 20th, World Poultry Science Journal - 41st, British Vet. Journal - 24th and the Indian Journal of Vet. Science and Animal Husbandry which is not on NAPRI use - score list nor in the library holdings. The conformity of use score with the core journal in citation score is over 72% and thus a close conformity.

On departmental basis, the analyses revealed the following. More journals get cited on departmental basis at the livestock industry than was used in NAPRI library because of the simple reason of size of researchers citing. In the small ruminants departments for example, ninety one (91) journals were cited by livestock scientists, while only twenty-nine (29) is the corresponding figure of total journals used by researchers in the small ruminant department in NAPRI. The story is the same with the remaining six departments.

The core journals for the small ruminant department was determined as fifteen (i.e, the top 15 cited journals). They are: Journal of Animal Science - 90, Journal of Animal Production - 90, Journal of Dairy Science - 89, Journal of reproduction and fertility- 89, Journal of Dairy Research - 67, World Animal Review- 66, Tropical Agriculture - 64, Journal of Agric. Research - 63, Veterinary Record - 56, British Veterinary Journal -55, British Journal of Nutrition -54, Animal Breeding - 54, Indian Journal of Vet. Science and Animal Husbandry - 54, Eleven of these fifteen journals were among the top scored fifteen journals in the department in NAPRI. The four core journals not in the NAPRI 15 top scored journals of the same department are:-World Animal Review - 29th, while the remaining three journals: Isreael Journal of Agric. Research, Veterinary Record and British Vet. Journal were not even used in the department in NAPRI. However, the percentage of conformity of citation and use is 73.3% it shows relatedness in the top journals in both ranking.

In the aattle production department, twelve journals have been identified as the core journals. They are: Journal of Animal Science - 170, Journal of Animal Production - 165, Journal of Dairy Science - 203, Netherland milk and Dairy Journal - 209, Journal of reproduction and fertility - 143, Journal of Dairy Research - 137 Veterinary Record - 126, World Animal Review - 115, Tropical Agriculture- 113, Tropical Animal Health Science - 124, Journal of Agric. Science - 112, and British Journal of Nutrition - 112, Seven of the twelve core journals appeared among the top scored twelve journals of the departmental use score of NAPRI. The five missing journals are Journal of reproduction and fertility - 15th, Veterinary Record - 18th, World Animal review - 36th

Journal of Agric. Science - 26th, and the Netherland Milk and Dairy Journal which was not scored by the NAPRI cattle producers. One salient point worth mentioning here is that the highest cited journals in the industry with 209 citation was not used by NAPRI researchers of the same department, because it is not stocked by the library. The department and the NAPRI library in particular should endeavour to acquire this journal.

The poultry and swine department has the largest number of core journals 21. They are;- Journal of Animal Science - 56, Journal of production - 80, Journal of Dairy Science - 68, Journal of reproduction and fertility - 67, Journal of Dairy Research - 56, World Animal Review- 64, Journal of Range Management - 63, Tropical Agriculture - 64, Tropical Animal Health Science - 63, Journal of Agric. Science - 65. World Poultry Science Journal - 194, Poultry Science Journal - 223, British Poultry Science Journal - 182, Animal Production - 60, Livestock Production Science - 61, Ghana Journal of Agric. - 62, Poultry Digest - 155, Indian Journal of Vet.Saience - 63, Australian Vet. Journal - 61 Journal of Endocrinology - 60, and Journal of Food Protection - 60. Only twenty five journal were used by the NAPRI Poultry and Swine Scientists. Apart from the poultry science journals that were used by the NAPRI scientist, all the remaining core journals were not only missing from the high score twenty one list, but were not on the departmental journal list entirely. The reason for this marked departure is because of the small data of used journals (25) in the department in NAPRI, and of course, the small size of the researchers in the department. There is only 42.8% conformity in this department.

The core journals for the department of Livestock Economics and Rural Sociology is nineteen (19), these journals are: Journal of Animal Science - 92, Journal of Animal Production - 80, Journal of Dairy Science - 81, Journal of Reproduction.- 79, Journal of Dairy Research - 65, World Animal Review - 64, Tropical Agriculture - 63, Tropical Animal Health Science - 62, Theriogenology - 63, Journal of Agric. Science - 63, World Poultry Science Journal - 63, Poultry Science Journal - 64, British Vet. Journal - 56, Animal Breeding Abstract - 56, Indian Journal of Animal Science - 57. Animal production Science - 56, British Poultry Science Journal - 56, Ghana Journal of Agric - 56 and Journal of Food Protection - 59. Only six of these nineteen core journals can be traced among the high scored nineteen journals of NAPRI. The conforming journals are: Journal of Animal Science, Journal of Animal Production. Tropical Agriculture, Journal of Dairy Research, Poultry Science Journal. Most of the journals used in this department in NAPRI are African and Nigerian Journals. And the percentage of conformity is very low (31.6%). Because of the peculiar nature of the department, researchers tend to "Borrow" from all the other departments in term of conducted researches. It is more of Socio-Economics than livestock science.

The Animal Reproduction and Artificial Insemination department recorded the highest number of cited journals and of use. In spite of this, the number of core journals for the department is the lowest, being five (5). They are Journal of Animal Science (195), Journal of reproduction and fertility - 225, Veterinary Record - 190, Theriogenology 189, and Journal of Fertility and Sterility (189). Four of these five core journals are among the high scored five journals of the same department in NAPRI.

The only one that did not get into the first five of NAPRI is the the Journal of fertility and sterility which is placed fiftennth (15th(with three scores. This is a conformity with 80%.

Finally, the department of general services had - twelve (12) core journals, six of which were among the highly scored twelve journals of the NAPRI's department. The small size of the researchers and of available journals made it difficult to compare the two journal rankings.

In conclusion however, the analyses have shown that except with the department of Livestock Economics and Rural Sociology, the level of conformity in terms of comparing the cited core of journals with the used journals has been appreciably acceptable. The similarities between use: and citation analyses are more than otherwise.

REFERENCES

1. MARTYN, JOHN (1975). Progress in Documentation: Citation analysis: Journal of Documentation Vol.31. (4) 1976. p. 290-7.

2. BRADFORD, S.C. (1978). Documentation. London, England; Crosby lockwood R Son; 1948.

3. BROOKES, B.C. (1969). Bradford's law and the Bibliography of Science. Nature 1969 December 6: 223 (5223); p. 953-6.

4. DONOHUE, J.C. (1972). Understanding Scientific literatures: A bibliometric approach Cambridge. The M.T. Press, 1973.

FOOTNOTES

1. K.Subramanyam, Criteria for journal Selection. Special libraries Vol.66 (1975) P.369.

2. B.C. Brookes, Bradford's law and the bibliography of Science. Nature Vol.224(6) (1969) P.953.

CHAPTER FIVE

SUMMARY OF FINDING, CONCLUSION AND RECOMMENDATION

This study is an attempt to determine the most important journals in the livestock industry, with a view to limit acquisition to only those journals considered as pertinent to the field. A lot of waste has been going on from the erratic manner that many research libraries in particular go about their periodical selection and acquisition. Several efforts have been devised to stop this trend. This study is therefore a continuation of such efforts.

Libraries like other organisations are experiencing harder financial time because of the lean budgets and the ever increasing cuts in their annual book votes. This lean budget should therefore be properly planned, to meet the ever increasing demand for more periodicals, to satisfy a greater percentage of the clienteless than ever before. The study investigated the following:-

1. Which livestock periodicals are most frequently used and thus constitute the central journals for the scientists of the National Animal Production Research Institute (NAPRI) library?

2. Which livestock periodicals are most frequently cited by livestock scientists generally?

3. Are the most frequently cited journals also the most used journals?

In an attempt to find suitable answers to these research questions, the study went about using a use study and citation study analyses, to examine the following:-

(a) What is the number of the periodicals used by researchers in the NAPRI Library, and what percentage of this constitutes the "core journals" of their journals used.

(b) What are the cited journals in the industry in general, and what percentage of these cited journals constitute the "core journals" cited in the industry?

(c) Finally, do the two core journals in (a) and (b) above correspond?

Summary of findings

The Bradford-Zipf distribution was applied to the data gathered for this research, and was used to determine the 'core journals' for the citation data. This principle guided the ranking of the journals used by researchers at the institute in a diminishing order of importance through their identified use scores. It was found that as a guide to bibliographic coverage and control, a medium sized library of NAPRI's size, with fairly sufficient budget should limit itself to the acquisition of the first listed fifty nine (59) journals representing 51.75% of the total library journal collection. This accounted for 87.22% of the total journals need of the NAPRI researchers. The remaining fifty five journals, almost half of the total library collection produced as small as 12.78% of the use score of the researchers.

Applying the principle further, it was discovered that in a period of extreme budget cut, NAPRI library would still satisfy over 76% of the researchers journal need by acquiring only the first thirty four journals listed in the ranked list.

From the questionnaire data, it was discovered that fourteen journals which the library has continued to subscribe to were unnecessary addition to the researchers journal need. All the thirty six researchers involved in this study unanimously rejected the fourteen journals as contributing nothing to their research needs. The subscription cost of the journals cost six hundred and forty four naira per annum, an amount that cannot be considered as negligible particularly in these days of austerity.

It was also discovered that the journals published in languages other than English are not likely to be read by NAPRI scientists. There is no translation facilities in the institute's library.

The Journal of Animal Science received the highest use score of thirty six (36), that is to say that all the NAPRI scientists irrespective of their area of interest make use of the journal.

That about half (55 journals) of the total NAPRI library's collection might be considered for remote storage, possible weeding and cancellation.

It was also found that there is a general unique pattern of use among researchers of the same department. The departmental structure of the institute is reflected in the journal use pattern. Pasture agronomists for example, tended to be the dominant users of such journal as Journal of Range Management, Grass and Forage Science Journal, etc. The poultry specialist would likewise be the dominant users of journals like Poultry Science Journal, Poultry Digest, etc.

It was also found that on departmental basis, about half (50%) of the journals specified for each department contributed more than 75% of the use score of the department.

Finally, that the livestock scientists preference for certain journals is related to their subject field.

Veterinary scientists of NAPRI have peculiar flair for certain journals from their animal science conterparts. The former would often use Journals like Veterinary Record, Theriogenology, etc. before considering using other journals like the Journal of Animal Science; while the latter group would use the abstract journals in livestock industry like Journal of Animal Production etc. All these findings are represented in Chapter 3 of the study.

The second part is represented by the fourth chapter, and sought tof find out the use pattern in livestock science in general. This general use pattern in livestock was then compared to the use of periodicals by NAPRI scientists. Citation study as opposed to use study analysis was employed, and the following are the findings:-

1. That the Journal of Animal Science received the highest score of 889 citations from 114 journals.
2. That the cited core journals of the industry consist of the highly scored twelve journals, with a total of 7,977 citations, representing about 23% of the total citations for the industry. These twelve journals represent only 10.5% of the journal collections used in the industry.
3. That departmental boundaries affect the use of some particular journals as was the case with NAPRI.

The journals related to the department of Animal Reproduction and Artificial Insemination produced more than seventy percent of the citations received by the Journal of Reproduction and Fertility (618) Journal of Reproduction and Sterility (412), while those related to the department of pasture agronomy produced more than two third of the citations of the Journal. of Range Mnnagement (601) Grass and Forage Science Journal (394), etc.

4. From the rankings produced, it was found that about half or 50% of the journals of each department accounted for over 75% of the departmental use and citation scores. The core journals determined for each department in the livestock industry are as follows:

(a) Small Ruminants department - 15 Journals:

Journal of Animal Science Journal of Animal Production, Journal of Dairy Science, Journal of reproduction and fertility, Journal of Dairy research, world animal review, Tropical Agriculture, Tropical Animal Health Science, Journal of Agricultural Science, Israel Journal of Agric. research, Veterinary Recory, British Veterinary Journal of Nutrition, Animal breeding Abstract and the Indian Journal of Veterinary Science and Animal husbandry.

(b) Cattle Production department - 12. The Journals are:

Journal of Animal Science, Journal of Animal Production. Journal of Dairy Science, Netherland Milk and Dairy Journal, Journal of reproduction and fertility, Journal of Dairy research, Veterinary record. World Animal review, Tropical Agriculture, Tropical Animal Health Science, Journal of Agric. Science, and the British Journal of Nutrition.

(c) Poultry and Swine department - 21. The journals are:

Journal of Animal Science, Journal of Animal Production, Journal of Dairy Science, Journal of Reproduction and Fertility, Journal of Dairy research, World Animal Review, Journal of Range Management, Tropical Agriculture, Tropical Animal Health Science, Journal of Agric. Science, World Poultry Science Journal, Poultry Science Journal, British Poultry Science Journal, Animal Production, Livestock Production Science, Ghana Journal of Agric. Poultry digest, Indian Journal of Veterinary Science, Australian Vet. Journal, Journal of Endocrinology, and Journal of Food Production.

(d) Livestock Economics and Rural Sociology department - 19 core Journals; they are:

Journal of Animal Science, Journal of Animal Production, Journal of Dairy Science, Journal of reproduction and

fertility, Journal of Dairy research, World Animal review Tropical Agriculture, Tropical Animal Health Science, Theriogenology, Journal of Agric. Science, World Poultry Science Journal, Poultry Science Journal, British Vet. Journal, Animal Breeding abstract, Indian Journal of Animal Science, Animal Production Science, British Poultry Science Journal, Ghana Journal of Agriculture, and Journal of Food Production.

(e) Animal Reproduction and Artificial Insemination department has five (5) core journals only, they are:

Journal of Animal Science, Journal of Reproduction and Fertility, Veterinary record Theriogenology, and Journal of fertility and sterility.

(f) Pasture Agronomy department - 8. The eight journals are:

Journal of Animal Science, Journal of Range Management, Grass and Forage Science Journal, Journal of Animal Production, Journal of Reproduction and Fertility, Journal of British Grassland Society, Tropical Grassland, and Nigerian Journal of Plant Protection.

(g) General Service department - 12. The journals are:

Journal of Animal Science, Journal of Animal Production, Journal of Dairy Science, Journal of Dairy research, Theriogenology, Veterinary Review, Veterinary Record,

Nigerian Veterinary Journal, Journal of Reproduction and Fertility, Indian Journal of Veterinary Science, Canadian Journal of Animal Science, and Journal of Biological Chemistry.

5. Fourteen journals received extremely low citations. These journals are journals in languages other than English. They have citation scores ranging from 50-3 All these fourteen journals are the same journals that were not used by the NAPRI scientists.

6. The highest cited Nigerian Journal is the Nigerian Journal of Animal Production. It received a citation of 446. This is also the highest scored Nigerian journal in NAPRI library, with a use score of sixteen (16).

Conclusions

Based on the findings of this study, the following conclusions are made:-

1. The Journal of Animal Science is the most important journal to livestock industralists. This journal is thus a "sine qua non' to ary livestock research library for possible acquisition.

2. Based also on the findings, livestock industry libraries would find that less than half of the total periodicals stocked can be considered for remote storage or weeding, without much harm to researchers and other clienteless.

3. English was found to be the most widely used language in the field of livestock science.

4. From the ranked list of cited journals in the livestock industry, it is now possible for livestock librarians to select their journal requirements based on the size of their budgets.

5. Nigerian journals ranked low on the list of cited journals in the field of livestock science. Nigerian livestock journals should be given the necessary exposure by sending them to the indexing and abstracting agencies.

6. That citation study is a useful means of measuring the use of materials, and a useful means of utilizing scarce resources in a meaningful way since it enables materials that frequently get cited to be determined.

7. Finally, that the most used journals in National Animal Production Research Institute (NAPRI) were also the most cited journals in the industry, although it was not possible for the study to successfully apply the Bradford-Zipf bibliograph to the data on use of periodicals by researchers because of low scores, one was still able to compare the rankings on use and citation analyses. The degree of conformity of both is appreciably high. The principal hypothesis or research question of this study thus answered. There is no significant difference existing in the ranked list of core journals derived from citation analysis and the ranked list derived from the NAPRI researchers ranking.

Citation frequency has thus been proved as an indicator of an article's importance in the livestock industry.

Recommendations

Bearing in mind the findings and conclusion, the following recommendations are made:-

1. That livestock industry libraries should select their journals from the ranked lists of journals provided in this study. They should also cooperate among themselves for effective inter library loaning facility. Libraries that have not got all departments as shown in the study should use the departmental "Core journals" as identified and rankings to form their libraries' collection.

2. Journals emanating from Nigeria should be given the desired exposure by sending them to the indexing and abstracting services in the field for the purpose of getting their journal articles indexed and abstracted. Livestock industry has become very important in the development of the nation. The protein need of the nation has continued to be derived largely from the livestock sector. Government should therefore provide every needed assistance to aid the industry. Professional publications should therefore be encouraged and funded by the government.

3. Journals published in other languages but English may not befound useful by livestock libraries except there is a translation facility.

These periodicals have tended to increase the stock only, and when useful, they have increased the level of the library's expenditure through the payment for translation services.

4. Finally, that livestock libraries should be guided by the ranked list produced in this study in the selection of their journals to be considered for acquisition. This would lead to a more manageable size for the libraries, and increase the efficiency and performance of the libraries to their clienteles Users time will now be directed towards only journals of optimum utility.

In conclusion, citation analysis techniques should be employed to study other agricultural disciplines with a view to evolve standards in their methods of selection and acquisition, thereby reducing wastes generally.

BIBLIOGRAPHY

1. AFOLABI, Micheal .. (1975). The literature of librarianship in Nigeria, 1950-1973, a bibliometric and Documentation study. B.L.S. thesis, A.B.U., 1975.

2. AFOLABI, M.L. (1976). Citation patterns in Nigerian Journal of Economic and Social Studies, 1963-73.

3. BAUGHMAN, J.C. (1974). A structural analysis of the literature of Sociology. Library quarterly, Vol. 44 (4) pp. 243-308.

4. BRADFORD, S.C. (1934). Sources of Information on specific subjects. Engi neering Vol. 137 (1934) pp. 85-6.

5. BRADFORD, S.C. (1948). Documentation. Grossby-Lockwood, 1948.

6. BRADFORD, S.C. (1953). Documentation. 2nd. ed; London: Grossby Lockwood, 1953.

7. BRODUS, R.W. (1952). An analysis of literature cited in the American Sociological Review 17,) pp. 355-6.

8. BROOKERS, B.C. (1969). Bradford's law and the Bibliography of Science. Nature, Vol. 224 (6) Dec. 1969. p. 953.

9. BUCKLAND, M.C. and Hinole, A.J. (1969). Lower and upper limits of journals. Journal of Documentation, Vol. 25, (154) 1969

10. BUSH, et al. (1974). A quality Index for Economics Journal. Review of Economics and statistics. 1974 Feb., 56 (1) 123-125.

11. CHEN chin (1972). The use pattern of physics journals In a large academic Research library. J. American Soc. Info. Science, Vol. 23 (4), 1972-pp. 224-65.

12. COLE, JONATHAN (1970). Pattern of intellectual influence In scientific research. Sociology of Education. Vol. 43, full 1970-pp. 377-403.

13. COLE, JONATHAN and COLE, S. (1974). Citation analysis Science, 1974 January 11; 183 (4120): pp. 32-3.

14. DONOHUE, Joseph (1972). Understanding scientific literatures. A bibliometric approach. Cambridge: The M.I.T. Press, 1972.

15. EKERE, Felix C. (1980). A citation study of the journal of Documentation literature, as published in the year 1950, 1960 and 1970. M.L.S. Independent study, A.B.U., Zaria; 1980.

16. FAIIS in (1955). The use of citation analysis as a research technique and its implication for libraries. South Africa libraries; 23 (1955).

17. FROST, carolyn (1979). The use of citations in literary research: A preliminary classification of citation functions. Library quest. Vol. 49 (4) 1979 pp 399-414

18. FUSSLER, Herman H (1949). Characteristics of the research literature used by chemists and physicists in the United States. Library quarterly part 1; 1949 Jan. 19 (1) pp.19-35.

19. GARFIELD, E. (1972). Citation analysis as a tool in Journal evaluation. Science. 178471-79, 1972. (Reprinted in (3) and in: Essays of an information scientists vol.1. philadelphia: Island press; 1977.

20. GARFIELD, E (1973). What Scientific journals can tell us about Scientific Journals. IEEE Transactions on Professional communication. Pc 16(4) (1973).

21. GOFFMAN, W. and Morris, T. (1970). Bradford's law and library acquisitions. Nature, Vol. 226(6), 1970. pp. 922-3.

22. GROSS, P.C. and Gross, E.M. (1927). College libraries and chemical Education. Science, Vol. 66, 1927. pp. 385-9.

23. HIRST, Graeme (1978). Discipline impact factor: A method for determining core journal list. J. Am. Soc. Inf. Sci. Vol. 29 (4), 1978 pp. 171-2.

24. INHABER, and Przednowek, K. (1976). Quality of research and the noble prices. Social studies of science 1976 Feb; 6 (1) pp. 35-50.

25 KAPLAN, N. The norms of citation behaviour: Prolegomena to the footnote. American Documentation Vol. 16, (3) 1965. p. 179.

26. LAWANI, S.M. (1972). Periodical literature of tropical and subtropical Agriculture. UNESCO Bull. for libraries., Vol. 26(2) p. 88-93.

27. MARTINO, J.P. (1971). Citation indexing for research and development management, IEEE Transactions on engineering management. 1971 mors; E.M. 18(4). pp. 146-51.

28. MARTYN, John (1975). Progress in documentation: Citation analysis. Journal of Documentation, Vol. 31(4) 1975. pp. 29.

29. McANALY, A.M. (1951). Characteristics of materials used in research in U.S. history, P.hd. dissertation, univ. of Chicago.

30. MITRA, A.C. (1970). The bibliographical reference: A review of its role. Annals of library science doc. Vol. 17(3-4) 1970. pp. 117-20.

31. OKANLAWON,O. (1984). Characteristics and bibliographic control of the literature of veterinary medicine in Nigeria. M.L.S. thesis, A.B.U., 1984.

32. PRICE, Derek (1965). Network of scientific paper: The pattern of bibliographic references indicates the nature of the scientific research front. Science, Vol. 149, 1965. pp. 570-15.

33. PRICE, Derek (1963). Little Science big Science. New York, Columbia university press, 1963, pp. 64-5.

34. PRITCHARD, A (1969). Statistical bibliography of Bibliometric? Journal of Documentation vol. 25: pp. 358-9.

35. PUBLICATIONS UNIT, National Animal Production Research Institute Dec. 1983 Staff list.

36. PUBLICATIONS UNIT, National Animal Production Research Institute Dec. 1983 Newsletter.

37. RAISIG, L. (1960). Mathematical evaluation of the Scientific serial. Science, 1960 may, 131 (3411), pp. 1417-19.

38. SMALL, H. (1973). Co-citation in the scientific literature: a new measure of the relationship between two documents. J. Am. Soc. Inf. Science, July-Aug. 1973, pp. 265-9.

39. STEVEN, R.E.C. (1977). A statistical procedure for evaluating the importance of scientific papers. Lib. Quarterly, vol. 47 (4) 1977. pp 415-29.

40. SUBRAMANYAM, K. (1975). Criteria for journal selection special lib., vol. 66, Aug. 1975. pp. 367-71.

41. SUBRAMANYAM, K. (1976). "Core journals in computer science. IEEE Transactions on Professional Communication vol. 19(2) (1976) pp. 22-5.

42. VICKERY, B.C. (1949). Bradford's law of scattering. Journal of Documentation, vol 4, (1948-49), pp. 198-213.

43. VIRGO, Julie (1977). A statistical procedure for evaluating the importance of scientific papers. Lib. Quarterly, vol. 47 (4) 1977. pp. 415-29.

44. WEINSTOCK, Melvin (1971). Citation Indexes. In encyclopedia of library and information science. New York: Mercel Dekker Inc; vol. 5. pp. 16-40.

45. WESTBROOK, J.H. (1960). Identifying significant research. Science Vol. 132 (1960) pp. 1229-34.

46. WILLIAM, Gordon et al. (1968). Library cost models owning versus borrowing series publications National Science foundation, Nov. 1968.

47. YOUNG-JA, Cho. (1977). Citation characteristics of Periodical literature in Veterinary Science: America J. Vet. Research, vol. 38 (1) Jan. 1977.

48. ZLPF. George K (1965). Humen behaviour and the principle of least effort. New York, Hafner, 1965 (reprint).