

## Scientometric Portrait of Prof. Rudovick R. Kazwala: A Public Health Veterinarian

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**Abstract** - A scientometric analysis was conducted to assess the publication productivity of Professor Rudovick R. Kazwala. Data were extracted using the Publish or Perish software which uses Google Scholar to retrieve the number of publications, citation counts, indices and related metrics. The study findings indicate that Kazwala has produced 111 scholarly publications with three quarters (83; 74.77%) of these being journal articles. He has produced an average of four publications each year with the 4<sup>th</sup> (2005 – 2009) and 5<sup>th</sup> (2010 – 2014) quinquennial periods having 30 papers each. He attained the 50-percentile productivity life at the productivity age of 18 and he has a productivity coefficient of 0.69. Almost all (99.12%) his publications were multiple-authored and he has collaborated with 475 researchers. Kazwala is the first to third author in by-line in more than half (52.25%) of the publications. His scientific articles are published in 38 different journals; fitting the Bradford's law of scattering. Kazwala's publication density and publication concentration are 2.18 and 23.68 respectively. His publications have received 2057 citations although 26 publications remain uncited. The mean cites per year and mean cites per paper are 82.64 and 18.95 respectively. Kazwala has an h-index of 29, g-index of 43, hc-index of 20 and HI norm-index of 12. The highest frequency keyword is tuberculosis. These findings suggest, among other things, that his research efforts have concentrated largely on the problem of tuberculosis. He is eminently qualified to be taken as a role model for the younger generation to emulate. He is undoubtedly one of the most outstanding scientists in Tanzania.

**Keywords:** Scientometrics, Kazwala, veterinary, publication productivity, citations.

### Introduction

Evaluation of research productivity can be conducted at various levels and for different purposes. Governments and funding organizations conduct such evaluations for planning and implementing research policies, making budget allocations for research, and establishing

research accomplishments (Arora, David, and Gambardella). Companies use research productivity to identify expertise when hiring consultants or employees (Gonzalez-Brambila and Veloso). In universities, evaluation of research productivity is *sine qua non* in promotion, tenure, rewarding, allocation of research funds, and workload decisions (Read; Kotrlik and Bartlett). Evaluation of research productivity is also in ranking of universities and research institutions as well as in tracking advances in any scientific disciplines. Furthermore, measuring the research productivity of individual researchers is important because they form the basic foundations of any group or institution. Studying the research works of scholars who have reached top positions in research provides overview on the dynamics of research and creates role models for the younger generations to emulate (Kademani et al.).

One important approach used in evaluating research productivity is scientometric analysis. This is a technique that offers a set of measures for studying the structure and process of scholarly communication (Hess). It is concerned with the growth, structure, interrelationship and productivity of scientific disciplines (Hood and Wilson 2001). Scientometric analysis of individual scholars (also known as scientometric portrait) provides an estimate of scholar's research productivity over a given period of time and helps to understand individual's scientific calibre. Such studies deal with the biographical study of individual scholars and correlate this with the bibliographical analysis of their publications or academic and scientific achievements (Sangam and Savanur) in order to reveal the scientific image of an individual scholar. Generally, scientometrics offer a non-reactive way of measuring research productivity.

Indicators used in scientometric analysis include the number of publications, citation counts, partnership ability, subject dispersion, and channels of communication used. In recent years however, h-index has been developed to further characterize the importance, significance and impact of a researcher's cumulative research contributions. According to Hirsch (2005), a scientist has index  $h$  if  $h$  of his or her  $N_p$  papers have at least  $h$  citations each and the other  $(N_p - h)$  papers have  $\leq h$  citations each. Other variants of the h-index include the g-index which gives more weight to highly cited publications; the contemporary h-index (hc-index) which gives more weight to new publications; and the HI-norm index that normalizes the citation counts before the h-index is calculated (Harzing). There are also three laws that consider the productivity of scientists, dispersion of literature over journals and the occurrence of words in publications. The Lotka's Law describes the frequency of publications by authors in a given field. It shows that there is an inverse relation between the number of publications and the number of authors producing these publications (Lotka). Bradford's law deals with the scatter of relevant literature on a subject over journals. It points out that the major portion of literature of any discipline is concentrated in a small number of core journals (Drott). Zipf's law analyses the number of different words that appear in a body of text and then rank them by their number of occurrences (Wyllys).

Globally, there numerous scientometric portrait studies on individual scientists from diverse subject backgrounds (Hazarika and Sarma 2010; Kademani et al. 2002; Munnolli et al. 2011, 2011; Sangam and Savanur 2010). Such studies have analysed the scholars' publication productivity, collaborative patterns, authorship status, citations patterns, channels of communications used, core areas of research and the h-index. Unfortunately, there are no scientometric portrait studies on individual scientists in Tanzania. Therefore, the present study is

a scientometric portrait of Professor Rudovick R. Kazwala; a veterinary public health scientist at Sokoine University of Agriculture (SUA). Professor Kazwala is a prolific academician who has received many research grants from various agencies. In recent years, he has been consistently ranked the highest among SUA scholars in the Google scholar citations. Specifically, this study intended to find out year-wise growth of his publications; establish authorship patterns; determine his research impact; ascertain the preference of communication channels; and establish the main domain of his research.

## **Biographical sketch of Professor Rudovick R. Kazwala**

Rudovick R. Kazwala is a professor in the Department of Veterinary Medicine and Public Health at the Faculty of Veterinary Medicine at SUA. His teaching, research and consultancy activities centre in veterinary public health, epidemiology, bovine tuberculosis, bovine brucellosis, veterinary legislation, food borne diseases and zoonoses. Professor Kazwala completed bachelor of veterinary science at SUA in 1984, master degree in veterinary medicine from Dublin University in 1988, and doctorate degree at the University of Edinburgh in 1996. He also attained postdoctoral training in ecosystem health at the University of Illinois in 2007. Professor Kazwala served as Assistant Lecturer at SUA from 1988 to 1991. He was then promoted to Lecturer (1991 – 1994), Senior Lecturer (1994 – 1998), Associate Professor (1998 – 2001) and full Professor (2011). He has also served as Adjunct Professor at Ohio State University since 2001. Prior to his employment at SUA, he served as Livestock Field Assistant (1979 – 1980) and District Livestock Development Officer in 1985. Professor Kazwala has supervised more than 35 master and 12 doctoral students. He has received more than 17 research grants from international funding agencies.

Professor Kazwala has assumed several administrative responsibilities. He had served as Associate Director of the SUA Computer Centre (1997 - 2000), Head of Department (1999 – 2000), Director of SUA Computer Centre (2000 – 2006), Chairman of the Tanzania Veterinary Association (2005 – 2011) and Vice Chairman of the Veterinary Council of Tanzania (2011 - 2013). Currently, he is the Dean of the Faculty of Veterinary Medicine, Chairman of the Veterinary Council of Tanzania, Coordinator of the University Teaching and Learning Improvement Programme, Deputy Coordinator of the SUA Quality Assurance and Promotion Bureau, and Vice Chairman of the International Union against Tuberculosis and Lung Diseases. He is also a member in a number of professional associations and institutions.

## **Methods**

A complete bibliography of Kazwala's research publications from 1990 - 2015 was retrieved and compiled from the Web between 10<sup>th</sup> and 14<sup>th</sup> August 2015 using the Publish or Perish (PoP) software. This rather short period in retrieving his publications was necessary because citation counts keep on accumulating. PoP uses Google Scholar to retrieve various statistics and metrics for individual authors including the total number of publications and citations, years since first publication, average number of citations per year, total citations per paper, total citations per author, and total papers per author. PoP also calculates indices such the h-index, g-index, Hc-index, HI-norm index and other metrics (Harzing and van der Wal).

A search strategy was developed to include all possible variants in Kazwala’s names as an author. The retrieved publications were carefully refined to ensure that only works of Professor Kazwala were captured and duplicates were merged. In the context of this study, scholarly publications considered were journal articles, books, book chapters, conference papers and book reviews. A normal count procedure in which a full score is given for every occurrence of an author regardless of his position in the by-line was employed to obtain the total number of publications. His curriculum vitae was used to verify some of the retrieved data and obtain biographical information. The retrieved were compiled using MS Excel. The limitation of this study is that it only focused on publications that were retrieved by PoP through Google Scholar. This means that any publications and citations that were not available on the web could not be retrieved. This could, nonetheless, be considered as a strength in terms of wider reach and impact of the publications.

## Results and Discussion

### Publication productivity

The publication activity of Professor Kazwala which began in 1990 at the age of 32 continues to date. Extracted data from the web indicate that he has produced a total of 111 scholarly publications which include 83 (74.77%) journal articles, 26 (23.42%) articles in conference proceedings and 2 (1.80%) book chapters (Table 1). During his productivity age of 26 years (i.e. the count from the year in which his first paper was published until the latest year of publication), he produced scholarly publications each year except in 1991 and 2002. On average, he contributed four publications each year and the maximum number of 11 publications was produced in 2014 followed by 9 articles in 2015 and 8 articles each in the years 1997 and 2009. These four most productive years account for nearly a third (36; 32.4%) of all his publications. It should be noted however, that these publication data were retrieved in August 2015; hence the total productivity of the year 2015 might be incomplete. Chronological distribution of the publications along with collaborative patterns is presented in Table 2.

**Table 1: Types of publications produced**

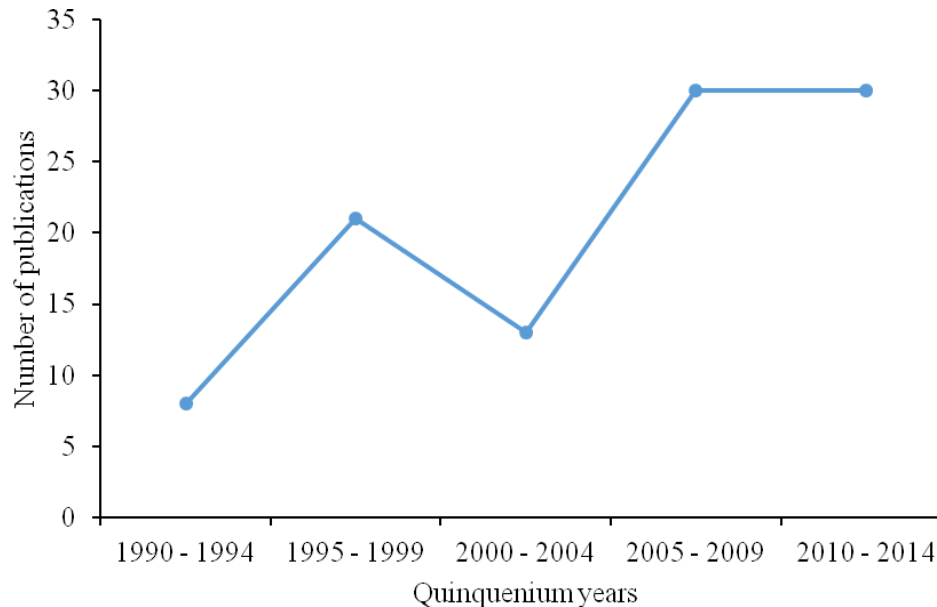
Type of publication	No of publication	Percent
Journal articles	83	74.77
Book chapters	2	1.80
Proceedings	26	23.42
<b>Total</b>	<b>111</b>	<b>100.00</b>

To-date, Kazwala’s total productivity life spans 26 years starting from the chorological age 32 years. He therefore attained the 50-percentile productivity life (i.e. the number of years during which 50% of the papers was published starting from the year of the first publication) in 2007 at the productivity age of 18 and chorological age of 49 and he was already holding the post of Associate Professor. His productivity coefficient computed as the ratio of 50-percentile age to the total productivity age is 0.69. This indicates that his high productivity period started after 50-percentile age of his scientific career. Although, there are concerns that scholars’ publication productivity tend to drop as they assume greater administrative responsibilities, this was not the case for professor Kazwala.

**Table 2: Chronological publication productivity and collaboration patterns**

Year	Papers with 1 author	Papers with 2 authors	Papers with 3 authors	Papers with 4 authors	Papers with 5 authors	Papers with 6 or more authors	Total
1990	0	0	0	0	1	0	1
1991	0	0	0	0	0	0	0
1992	0	0	2	1	0	0	3
1993	1	0	1	1	0	0	3
1994	0	0	1	0	0	0	1
1995	0	0	0	2	1	0	3
1996	0	0	1	0	0	1	2
1997	0	1	1	2	1	2	7
1998	0	0	1	2	1	2	6
1999	0	0	0	0	2	1	3
2000	0	0	0	0	0	2	2
2001	0	0	0	0	0	2	2
2002	0	0	0	0	0	0	0
2003	0	0	1	0	0	5	6
2004	0	0	0	0	1	2	3
2005	0	0	0	1	0	2	3
2006	0	0	0	3	2	1	6
2007	0	0	0	0	1	5	6
2008	0	0	1	1	2	3	7
2009	0	0	0	1	0	7	8
2010	0	0	0	0	0	4	4
2011	0	0	0	0	0	4	4
2012	0	0	0	0	0	5	5
2013	0	0	0	1	0	5	6
2014	0	0	1	1	0	9	11
2015	0	0	0	0	1	8	9
<b>Total</b>	<b>1</b>	<b>1</b>	<b>10</b>	<b>16</b>	<b>13</b>	<b>70</b>	<b>111</b>
<b>Percent</b>	<b>0.90</b>	<b>0.90</b>	<b>9.01</b>	<b>14.41</b>	<b>11.71</b>	<b>63.06</b>	<b>100.00</b>

Distribution of Kazwala’s papers was highest at the 4<sup>th</sup> and 5<sup>th</sup> quinquennial periods i.e. 2005 – 2009 and 2010 - 2014 with 30 papers each. This was preceded by 21 papers at the 2<sup>nd</sup> quinquennial period i.e. 1995 – 1999. As expected, the first quinquennial period (1990 – 1994) had the lowest (i.e. 8 papers) number of papers produced. Nearly half (54; 48.6%) of his publications were produced during the last eight years starting the year 2008 (Fig. 1). This supports the fact that Kazwala’s publication productivity increased after 50-percentile age of his scientific career.



**Fig. 1: Publication productivity of R.R. Kazwala**

### Collaboration

Collaboration among researchers is inevitable in order to share expertise and resources as well as to increase the visibility of research works. In this study, the degree of collaboration was computed as the ratio of the total number of collaborative publications to the total number of publications (Subramanyan). The findings indicate that during his career of 26 years, Kazwala had a maximum degree of collaboration (i.e. 1.00) in all years because almost all (99.12%) his publications were collaborative. Nearly two-thirds (70; 63.1%) of his publications were contributed by six or more authors (Table 1). The highest authorship in a single publication was 103 in the article titled “Capacity building efforts and perceptions for wildlife surveillance to detect zoonotic pathogens: comparing stakeholder perspectives” published in 2014 in BMC Public Health. These findings suggest that Kazwala prefers to work in teams perhaps because of the fact that veterinary research is multidisciplinary in nature and hence it calls for scientists to put in their diverse expertise collectively. Research teams could be in form of teacher-student collaboration, collaboration among colleagues, supervisor - assistant collaboration, researcher - consultant collaboration and collaboration among institutes (Subramanyan). Further analysis of the findings indicate that Kazwala is the primary author in 20 (18.02%) papers, second author in 17 (15.31%) papers and third author in 21 (18.92%) papers. The findings also indicate that he is being associated as mentor in his collaborative works as he is increasingly listed more frequently towards the end in the byline.

### Authorship status in collaborative publications

Professor Kazwala has produced his publications in collaboration with a total of 475 local and foreign researchers and the total number of authorships was 914. Prominent collaborators with 10 or more authorships (indicated in brackets) were D.M. Kambarage (25), S. Cleaveland (17), J.M. Sharp (16), L.J.M. Kusiluka (14), S.F.H. Jiwa (12), S.G. Mfinanga (11), G.M. Shirima (11),



C.J. Daborn (10), D. Clifford (10) and J. Mazet (10). Collaborators with first positions in the byline of five or more publications with Kazwala were Jiwa (7 papers), Kambarage (6 papers) and Mfinanga (5 papers) (Table 3). Traditionally, the first author is the person who contributed the most work to the study, including writing the manuscript (Bennett and Taylor; Smith and Williams-Jones)

**Table 3: Top co-authors**

Co-author name	No of co-authored publications	No of publications as 1 <sup>st</sup> author
D.M. Kambarage	25	6
S. Cleaveland	17	3
J.M. Sharp	16	0
L.J.M. Kusiluka	14	3
S.F.H. Jiwa	12	7
S.G. Mfinanga	11	5
G.M. Shirima	10	3
C.J. Daborn	10	2
D. Clifford	10	3
J. Mazet	10	2

### Channels of communication

Selection of communication channels in research is an important factor because of attracting the attention of scientists and other audience. As alluded to earlier, majority of Kazwala's publications were journal articles followed by articles in conference proceedings. His 83 scientific articles were spread over 38 different journals with the top ranking being the *Preventive Veterinary Medicine* (9 articles), *Tanzania Veterinary Journal* (9 articles) and the *Tropical Animal Health and Production* (6 articles). Most (86.75%) research articles are published in foreign journals whereas only 11 (13.25 %) articles are published in two local journals (i.e. *Tanzania Veterinary Journal* (9 articles) and the *Tanzania Journal of Health Research* (2 articles)) (Table 4). The publication density which is measured as the ratio of total number of papers published to the total number of channels in which the papers were published (Vinkler) in this case is 2.18. His publication concentration is 23.68 (i.e. the ratio in percentage of the number of channels accounting for half of the papers to the channels used (Kademani). Although Kazwala has published his research findings in a wide range of international journals; it can also be said that there is scarcity of relevant journals in the country. The findings also indicate that Kazwala managed to publish some of his articles in popular and high impact journals such as *Science* (impact factor of 33.611) and *PLOS Medicine* (impact factor of 14.429 (Table 4).

**Table 4: Channels of communication**

No	Journal title	Country	Impact factor	No of articles
1	Preventive Veterinary Medicine	Netherlands	2.167	9
2	Tanzania Veterinary Journal	Tanzania	-	9
3	Tropical Animal Health and Production	Netherlands	0.817	6
4	BMC Veterinary Research	UK		4
5	International Journal of Tuberculosis and Lung Diseases	France	2.756	4
6	Epidemiology and Infection	UK	2.54	3
7	PLoS Neglected Tropical Diseases	USA	4.569	3
8	PLOS ONE	USA	3.234	3
9	Veterinary Record	UK	1.50	3
10	Acta Veterinaria Scandinavica	UK	1.38	2
11	Applied and Environmental Microbiology	USA	3.67	2
12	BMC Infectious Diseases	UK	2.16	2
13	BMC Public Health	UK	2.26	2
14	Journal of Bacteriology	USA	2.808	2
15	Tanzania Journal of Health Research	Tanzania	-	2
16	Tuberculosis	USA	2.711	2
17	Veterinary Research Communications	Netherlands	1.236	2
18	Zimbabwe Veterinary Journal	Zimbabwe	-	2
25	East African Medical Journal	Kenya	-	2
19	American Journal of Tropical Medicine and Hygiene	USA	2.699	1
20	Annals of Tropical Medicine & Parasitology (Currently: Pathogens and Global Health)	USA	1.656	1
21	BMC Microbiology	UK	2.729	1
22	Bulletin of Animal Health and Production in Africa	Kenya	-	1
23	Cell Biology International	UK	1.747	1
24	Current Microbiology	USA	1.423	1
26	Foodborne Pathogens and Disease	USA	1.905	1
27	Infection, Genetics and Evolution	Netherlands	3.015	1
28	Journal of Wildlife Diseases	USA	1.355	1
29	Journal of Applied Bacteriology (Currently: Journal of Applied Microbiology)	USA	2.479	1
30	Small Ruminant Research	Netherlands	1.099	1
31	Journal of Veterinary Medicine	UK	2.815	1
32	Molecular and Cellular Probes	USA	1.869	1
33	Pastoralism: Research, Policy and Practice	UK	-	1
34	PLOS Medicine	USA	14.429	1
35	Science	USA	33.611	1
36	Tuberculosis Research and Treatment	Egypt	-	1
37	Veterinary Microbiology	Netherlands	2.511	1
38	Veterinary Medicine International	Egypt		1
<b>Total</b>				<b>83</b>



### Bradford's Law of Scattering

There are core journals in every discipline that are frequently referred to by researchers because they always contain relevant articles in the respective discipline. The concept of core journals is derived from Bradford's Law of Scattering, which states that if scientific journals are arranged in order of their decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject, and several 'groups' or 'zones' containing the same number of articles as the nucleus. The number of periodicals in the nucleus and succeeding zones will be 1: n: n<sup>2</sup>, where 'n' is a multiplier (Vickery). Bradford multiplier is the ratio of the number of periodical titles in any group to the number of periodical titles in any immediately preceding group. In this study, the total numbers of journal articles were divided into three equal zones in which 4 journals covered 28 articles, next 11 journals covered 28 articles and next 23 journals covered 27 articles. That means the ratio of journals in each zone was 4:11:23 (Table 5). The mean value of Bradford's multiplier was therefore computed as  $(11/4 + 23/11)/2 = 2.4$ . Hence, the expected ratio in three successive zones becomes 4:4 x 2.4:4 x 2.4 x 2.4 which is 4:9.6:23. The number of journals in the second zone is slightly higher than the expected value of 9.6. The percentage of error was only 3.68% which indicates adherence to the Bradford's law.

**Table 5: Bradford distribution**

Zone	No. of articles	No of journals
I	28	4
II	28	11
III	27	23
<b>Total</b>	<b>83</b>	<b>38</b>

### Citation counts

Distribution of citedness of articles on the basis of citations given in Table 6 indicates that 26 (23.4%) papers remained uncited. The total citation counts received in all papers is 2057 with the mean cites per year and the mean cites per paper being 82.64 and 18.95 respectively. Highly cited publications were identified as those which have received more than 50 citations each and only 10 (9.0%) publications met this criterion. The maximum number of citations is 130 for the paper titled "Revealing the history of sheep domestication using retrovirus integrations" published in *Science* in 2009 (jointly contributed by 33 authors) followed by 104 citations for the paper titled "The feasibility of canine rabies elimination in Africa: Dispelling doubts with data" published in *PLoS Neglected Tropical Diseases* in 2010 (jointly contributed by 8 authors). The 10 highly cited papers received over a third (795; 38.6%) of the total citations (Table 7). These findings confirm the fact that citation counts depend on many factors including the visibility and accessibility of journals where one publishes, the quality of the publication, age of publication, the size of the scientific community, the topic which ones publishes and the number of authors in a single publication (Bornmann and Daniel).

**Table 6: Distribution of papers on the basis of citations**

<b>Citedness of articles (No. of times)</b>	<b>No. of articles</b>	<b>No. of citations</b>
0	26	0
1	8	8
2	7	14
3	11	33
5	3	15
6	1	6
7	2	14
8	3	24
10	1	10
11	2	22
13	2	26
15	2	30
17	5	85
23	1	23
24	2	48
27	4	108
28	2	56
31	3	93
36	2	72
37	1	37
38	2	76
39	3	117
40	1	40
41	4	164
47	3	141
59	2	118
61	1	61
65	1	65
70	1	70
71	1	71
86	1	86
90	1	90
104	1	104
130	1	130
<b>Total</b>	<b>111</b>	<b>2057</b>

**Table 7: Citation profile of significant**

No.	Article	Journal	Year	Citations
1	Revealing the History of Sheep Domestication Using Retrovirus Integrations	Science	2009	130
4	The Feasibility of Canine Rabies Elimination in Africa: Dispelling Doubts with Data	PLoS Neglected Tropical Diseases	2010	104
2	Factors responsible for the introduction and spread of <i>Campylobacter jejuni</i> infection in commercial poultry production	Veterinary Record	1990	90
5	<i>Mycobacterium bovis</i> in rural Tanzania: Risk factors for infection in human and cattle populations	Tuberculosis	2007	86
3	Isolation of <i>Mycobacterium bovis</i> from human cases of cervical adenitis in Tanzania: a cause for concern?	The International Journal of Tuberculosis and Lung Disease	2001	71
6	Risk factors associated with the occurrence of bovine tuberculosis in cattle in the Southern Highlands of Tanzania.	Veterinary Research Communications	2001	70
7	Towards a standardized approach to DNA fingerprinting of <i>Mycobacterium bovis</i> .	International Journal of Tuberculosis and Lung Disease	1998	65
8	Tuberculosis in Tanzanian wildlife	Journal of Wildlife Diseases	2005	61
9	The bovine tuberculosis cycle - an African perspective	Journal of Applied Bacteriology	1992	59
10	Isolation of <i>Mycobacterium</i> species from raw milk of pastoral cattle of the Southern Highlands of Tanzania	Tropical Animal Health and Production	1998	59
<b>Total</b>				<b>795</b>

**H-index**

Professor Kazwala has an h-index of 29 which means that his 29 publications had been cited 29 or more times each, and the rest of the publications had fewer than 29 citations. When more weight is given to his highly cited publications, he has a g-index of 43 and when more weight is given to newly published works, he has an hc-index of 20. With regard to the HI norm-index which evaluates the effects of co-authorship and estimates the per author impact, he has an index of 12. These high values obtained after 26 years of scientific research indicate that Kazwala is a successful scientist in the field of veterinary science. According Hirsch (2005), an h-index of 20 after 20 years of scientific activity characterizes successful scientists; h-index of 40 after 20 years characterizes outstanding scientists and h-index of 60 after 20 years or 90 after 30 years characterizes truly unique individuals.

**Keyword tomography**

Keywords are good indicators of the thought content of the publications and they reflect the emphasis given by the author about the domain of his research (Angadi). The list of keywords

with frequencies in parenthesis appeared in the titles of Kazwala's publications is provided in descending order (Table 8). The high frequency keywords were tuberculosis (30), human (16), *Mycobacterium bovis* (16), cattle (13), bovine (12) and prevalence (11). It is clear that he his research efforts center mainly on the problem of tuberculosis although he has a relatively wide ranging interest in veterinary science.

**Table 8: Keyword tomography**

<b>Keywords</b>	<b>Frequency</b>
Tuberculosis	30
Human	16
<i>Mycobacterium bovis</i>	16
Cattle	13
Bovine	12
Prevalence	11
Factors	9
Infection	9
Zoonotic/Zoonosis	8
Rat	7
Health	7
Brucellosis	7
Risk	6
Livestock	6
Wildlife	5
Disease	5
Clonal	4
Goat	4
Chicken	4
Milk	4
Spread	4
<i>Campylobacter jejuni</i>	4
Epidemiology	4
Mycoplasma	3
Challenges	3
Control	3
Rodent	2
Comparison	2
<i>Campylobacter spp</i>	2

## Conclusion

The publication productivity of Professor Kazwala was found to be consistent and he made outstanding contribution to field of veterinary science in the last 26 years. He has increasingly been active in research despite his many administrative responsibilities. Kazwala prefers to work in teams and he has high degree of collaboration at institution, national and international levels. The high rate of citations to his papers proves the usefulness and impact of his scientific works in

the field of veterinary science. Consequently, Kazwala has attained an h-index of 29 after 26 years of scientific activity which characterizes him as a successful scientist in the field of veterinary science. His research efforts have concentrated largely on the problem of tuberculosis proving his strength in this field. Generally, Kazwala's research productivity portrays him as eminently qualified to be taken as a role model for the younger generation to emulate. He is undoubtedly one of the most outstanding scientists in Tanzania.

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## References

1. Angadi, M. "Nobel Laureate Anthony J Leggett: A Scientometric Portrait." *Annals of library and ...* (2006): n. pag. Web. 3 Dec. 2015.
2. Arora, A, PA David, and A Gambardella. *Reputation and Competence in Publicly Funded Science: Estimating the Effects on Research Group Productivity*. N.p., 2000. Web. 25 Oct. 2015.
3. Bennett, DM, and DMD Taylor. "Unethical Practices in Authorship of Scientific Papers." *Emergency Medicine* (2003): n. pag. Web. 3 Dec. 2015.
4. Bornmann, Lutz, and Hans-Dieter Daniel. "What Do Citation Counts Measure? A Review of Studies on Citing Behavior." *Journal of Documentation* 64.1 (2008): 45–80. Web.
5. Drott, MC. "Bradford's Law: Theory, Empiricism and the Gaps between." *Library trends* (1981): n. pag. Web. 3 Dec. 2015.
6. Gonzalez-Brambila, C, and FM Veloso. "The Determinants of Research Output and Impact: A Study of Mexican Researchers." *Research Policy* (2007): n. pag. Web. 3 Dec. 2015.
7. Harzing, AW. "Reflections on the H-Index." See [http://www.harzing.com/pop\\_hindex.htm](http://www.harzing.com/pop_hindex.htm) (2008): n. pag. Web. 3 Aug. 2015.
8. Harzing, Awk, and R van der Wal. "Google Scholar as a New Source for Citation Analysis." *Ethics in Science and Environmental Politics* 8 (2008): 61–73. Web.
9. Hazarika, Tilak, and Dipak Sarma. "Scientometric Portrait of Nayana Nanda Borthakur : A Biometeorologist." *Annals of Library and Information Studies* 57.March (2010): 21–32. Print.
10. Hess, DJ. *Science Studies: An Advanced Introduction*. N.p., 1997. Web. 25 Oct. 2015.
11. Hirsch, J E. "An Index to Quantify an Individual's Scientific Research Output." *PNAS* 102.46 (2005): 16569–16572. Web.
12. Hood, W.W. and Wilson, C.S. "The Literature of Bibliometrics , Scientometrics , and Informetrics." *Scientometrics* 52.2 (2001): 291–314. Print.
13. Kademani, B S et al. "Publication Productivity of The Bio-Organic Division at Bhabha Atomic Research Centre : A Scientometric Study." (2002): 1–14. Print.
14. Kademani, BS. "Scientometric Portrait of Sir KS Krishnan." *Indian Journal of ...* (1996): n. pag. Web. 3 Dec. 2015.
15. Kotrlík, JW, and JE Bartlett. "Factors Associated with Research Productivity of Agricultural Education Faculty." *Journal of Agricultural ...* (2002): n. pag. Web. 3 Dec. 2015.

16. Lotka, AJ. "The Frequency Distribution of Scientific Productivity." *Journal of Washington Academy Sciences* (1926): n. pag. Web. 3 Aug. 2015.
17. Munnolli, S S, S M Pujar, and B S Kademani. "Scientometric Portrait of Nobel Laureate Harald Zur Hausen." *Annals of Library and Information Studies* 58 (2011): 71–78. Print.
18. Read, WJ. "Are Publication Requirements for Accounting Faculty Promotions Still Increasing?" *Issues in Accounting ...* (1998): n. pag. Web. 3 Dec. 2015.
19. Sangam, S. L., and K. Savanur. "Eugene Garfield: A Scientometric Portrait." *Collnet Journal of Scientometrics and Information Management* 4.1 (2010): 41–51. Web. 3 June 2015.
20. Smith, E, and B Williams-Jones. "Authorship and Responsibility in Health Sciences Research: A Review of Procedures for Fairly Allocating Authorship in Multi-Author Studies." *Science and engineering ethics* (2012): n. pag. Web. 3 Dec. 2015.
21. Subramanyan, K. "Bibliometric Studies of Research Collaboration: A Review." *Journal of Information Science* 6.1 (1983): 33 – 38. Print.
22. Vickery, BC. "Bradford's Law of Scattering." *Journal of documentation* (1948): n. pag. Web. 14 Aug. 2015.
23. Vinkler, P. "Bibliometric Analysis of Publication Activity of a Scientific Research Institute." (1990): n. pag. Web. 3 Dec. 2015.
24. Wyllys, RE. "Empirical and Theoretical Bases of Zipf's Law." *Library Trends* (1981): n. pag. Web. 14 Aug. 2015.

