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EDITORIAL

Tropical Animal Health and Production: a 55-year bibliographic analysis setting the course for a globalized international reference journal

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Abstract
In this paper, we carried out a bibliographic mapping analysis with data from Scopus on publications in Tropical Animal Health and Production (TAHP) from its creation. This analysis is important for the journal and its readership, as a self-evaluation in terms of the scope and impact of the journal and how it is changing as well as aiding the editors in shaping the future direction of the journal. A total of 6229 papers were found, with an average of 8.71 citations per paper. Article Influence, Percentage of papers in Open Access, Immediacy Index, and Journal Impact Factor have all risen in recent years, although improvements are still necessary. With a cited half-life of 7.2 years, the percentage of papers in international collaboration has stabilized since 2010 (around 40%), down from around a peak of 60% in 2006. The journal is a Q2 journal with 86.4% of its documents cited. Of all documents published, 2401 were classified in SDG3 (Good Health and Wellbeing) followed by SDG2 (Zero Hunger) with 136. We mapped citations, co-citations, and bibliographic coupling and identified major authors, sources, references, and countries publishing in TAHP. The journal continues to play a key role in advancing knowledge and understanding of animal health and production in tropical and sub-tropical regions and supporting the development of sustainable animal production and veterinary medicine in these vast regions of the globe.

Introduction

Tropical Animal Health and Production (TAHP) is a hybrid (transformative) scientific journal published by Springer Nature (Netherlands) that publishes original research articles and reviews on all aspects of animal health, disease, and production in tropical regions (ISSN Print 0049-4747 and Electronic 1573-7438). The journal was first published in 1969 under the auspices of the Centre for Tropical Veterinary Medicine, University of Edinburgh, Scotland, with abstracts in English, French, and Spanish. In such times, the majority of the manuscripts published originated in the British Empire and were then authored mostly by English-speaking scientists. Over the years, the journal grew in its international significance as the editorial board, authors, and reviewers from other countries became more frequent.

The journal covers a wide range of topics related to the health, nutrition, and management of various animal species including livestock, poultry, and aquatic animals, as well as wildlife when seen from a productive perspective. The scope of the journal includes the epidemiology, diagnosis, control, and prevention of infectious diseases, the development of sustainable and efficient animal production systems, and the improvement of animal welfare in tropical and sub-tropical regions. The journal provides a forum for the dissemination of scientific knowledge and research findings to support the development of animal agriculture in such regions and thus improving the livelihoods of communities that depend on animal production.

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Table 1 Bibliometric parameters for publications in Tropical Animal Health and Production (Data are in Supplementary file)

	Total[1]	Minimum documents[2]	Number met threshold[3]	With links[4]	Clusters[5]
Co-authors	18,300	5	743	581	29
Countries	182	5	105	105	11
Keywords	9775	10	337	337	7
Citation—documents	6229	20	919	112	14
Authors	18,300	10	136	121	11
Countries	182	5	105	105	9
Bibliographic coupling—documents	6229	30	425	338	20
Authors	18,330	10	136	136	18
Countries	182	5	105	105	10
Co-citation—references	159,233	5	231	169	16
Sources	44,906	30	517	512	7
Authors	203,377	50	789	789	9

[1] The total number from the Scopus database; [2] The minimum number of documents per author, country, etc.; [3] The number of documents that met the minimum in the previous column; [4] The number of documents with links to other documents; [5]Number of clusters formed

The objective of this study was to map the publications in the journal and identify how it is meeting its declared mission and vision as well as eventual means of improving the journal´s relevance for its audience. We analyse networks of co-authorships in papers published in the journal, as well as their citations and references. Thereby, we evaluate the two main components of citation networks in Tropical Animal Health and Production: (i) network actors (paper, keywords, citations) and (ii) network ties, which correspond to the inter-relationships among components (Su & Lee, 2010). This analysis is important for the journal as a self-evaluation in terms of the scope and impact of the journal and how it is changing as well as aiding the editorial board in shaping the future direction of the journal (Mas-Tur et al., 2021).

Material and methods

Information on publications from the journal Tropical Animal Health and Production was identified in Scopus (Elsevier data), whereby 6,229 documents were identified (Table 1). The information included the year of publication, title, author, affiliation, keywords, document type, abstract, and number of citations which were exported in the CSV format. The date of the retrieval was 31st January 2023. As Scopus only allows for the download of 2000 references at a time, the database of 6229 papers was downloaded and files then joined using Excel. This file was then used for cleaning the data, such as joining duplicate terms (zebu and *Bos indicus* for example), as were singular and plural.

Co-authorship, co-occurrence of keywords, citation, bibliographic coupling, and co-citation keywords were mapped in VosViewer (visualization of similarities) according to van Eck & Waltman (2010, 2017) and Waltman & Van Eck (2012, 2013).

The data viewed are as follows:

Co-authors—this includes an analysis of the number of co-authors from the papers found in Scopus, their country, and affiliations, with links between them.

Keyword C0-occurrence networks—author keywords specified by authors are listed in the same paper. Each keyword is represented as a node and each co-occurrence of a pair of words is represented as a link (Radhakrishnan et al., 2017).

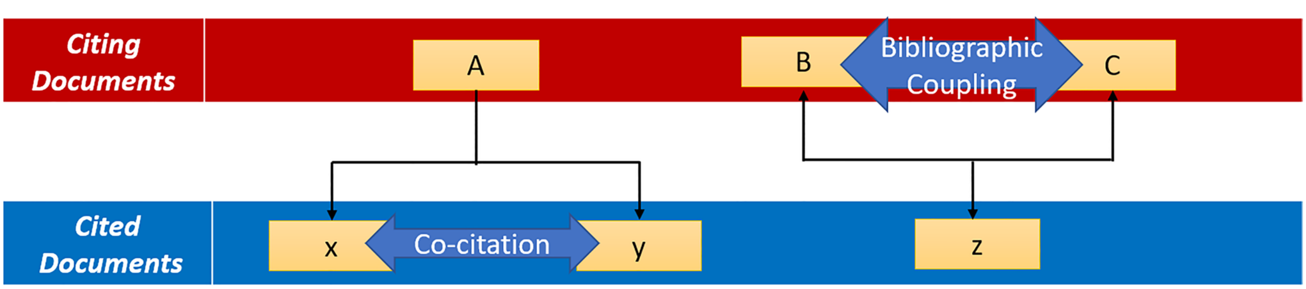

Fig. 1 Schematic for citation analyses in this paper

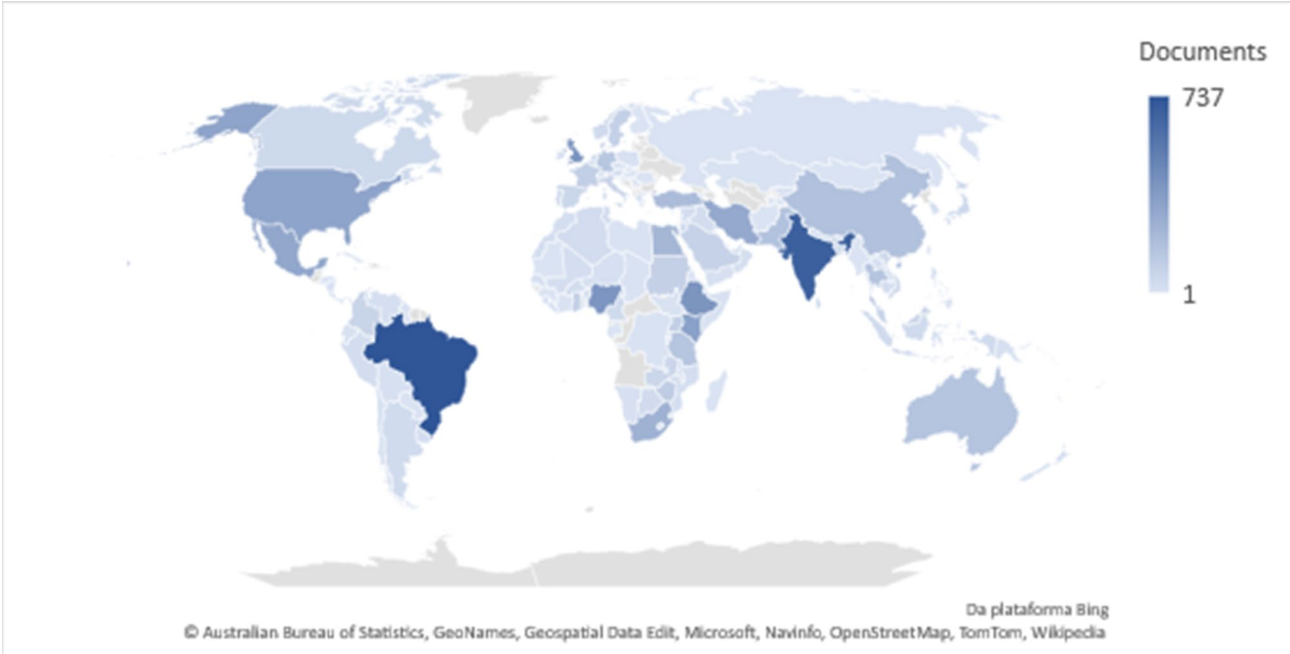

Fig. 2 Heat map for countries publishing in Tropical Animal Health and Production. A darker blue means more publications

Citations—is a link between two itemswhere one item cites the other

Bibliographic coupling—measures the similarity between two documents based on the number of references they have in common or the extent to which two documents are connected by their bibliographies or reference lists.

Co-citation—used to compare studies that have cited a particular pair of documents and helps to explain the similarity and dissimilarity among them, authors, and journals (Köseoglu et al., 2015). It assists researchers to identify the strength of the relationships and positions of selected articles and highlight clustering within the network (Wong et al., 2021).

Fractional counting was used (Table 1), whereby each paper is fractioned according to the number of co-authors (Cancino et al., 2017; Gaviria-Marín et al., 2018; Martínez-López et al., 2020). This means, for example, if a paper has three authors, then the weight for each author is 1/3 (Perianes-Rodriguez et al., 2016). Thereby, both the number of documents co-authored and the number of authors of each co-authored document determines the strength of a co-authorship link between two authors (McManus et al., 2023a). The units of analyses in the above analyses can be countries, (co)authors, documents, references, and publishing sources.

Co-citation measures the extent to which two or more documents are frequently cited together in other scientific articles and is useful for identifying influential articles and researchers in a given field, and for identifying

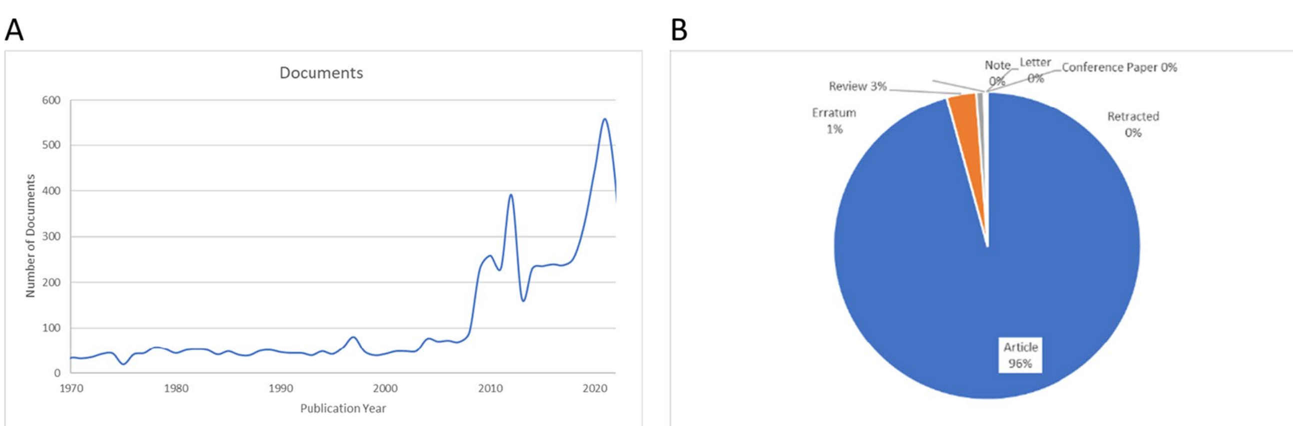

Fig. 3 Number of papers by year (**A**) and type of document (**B**) for publications in Tropical Animal Health and Production

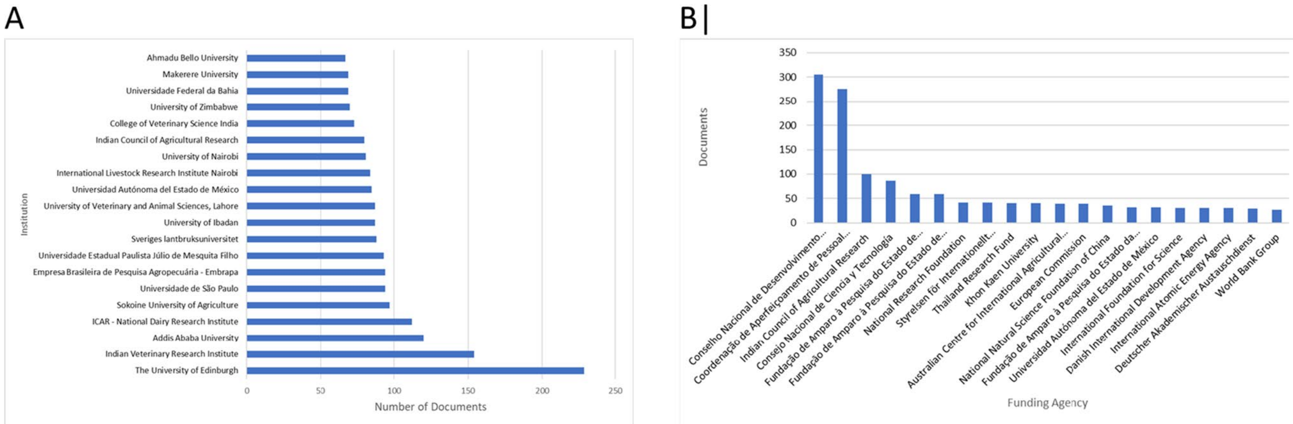

Fig. 4 Top institutions (**A**) and financing agencies (**B**) for publications in Tropical Animal Health and Production

potential sources of information and inspiration for future research. Co-citation analysis should not be confused with bibliographic coupling, which measures the similarity between two documents based on the number of references they have in common, rather than the number of times they are both cited in other documents.

Vosviewer produced linkage maps based on the data above and assigned authors, papers, keywords, and countries and citing sources to clusters, which are visually depicted, with different colours. Clusters were formed using association strength/proximity or probabilistic affinity index. Timelines were also constructed in Vosviewer to show mean years for publications of the same variables. These help in understanding the journal's progress over time and its future trends (Ding & Yang, 2020). In the VosViewer figures (Figs. 6, 7, 8, and 9), a larger circle indicates a higher occurrence of a keyword, countries, author, etc. in the authors, title, and abstract according to Scopus. If the colour of the connection between words is more vibrant, then the word/researcher/country is more commonly found in different documents. With small connections, the colour is more transparent. Cluster information was downloaded at each stage for further analyses.

Since its creation, TAHP has published 6,229 papers, from 182 countries and territories, 1289 organizations, and 18,300 co-authors (Table 1). These papers cited 159,233 references from 203,377 authors and 44,906 sources, as well as used 9,775 keywords. The country's publishing and citation diversity varies depending on economic, language, and political factors, among others (McManus et al., 2023b). Nevertheless, although the USA has the highest investment in R&D, it does not publish the most papers in this journal.

In bibliographic coupling, two works reference a common third work, while co-citation (Mas-Tur et al., 2021) is when two

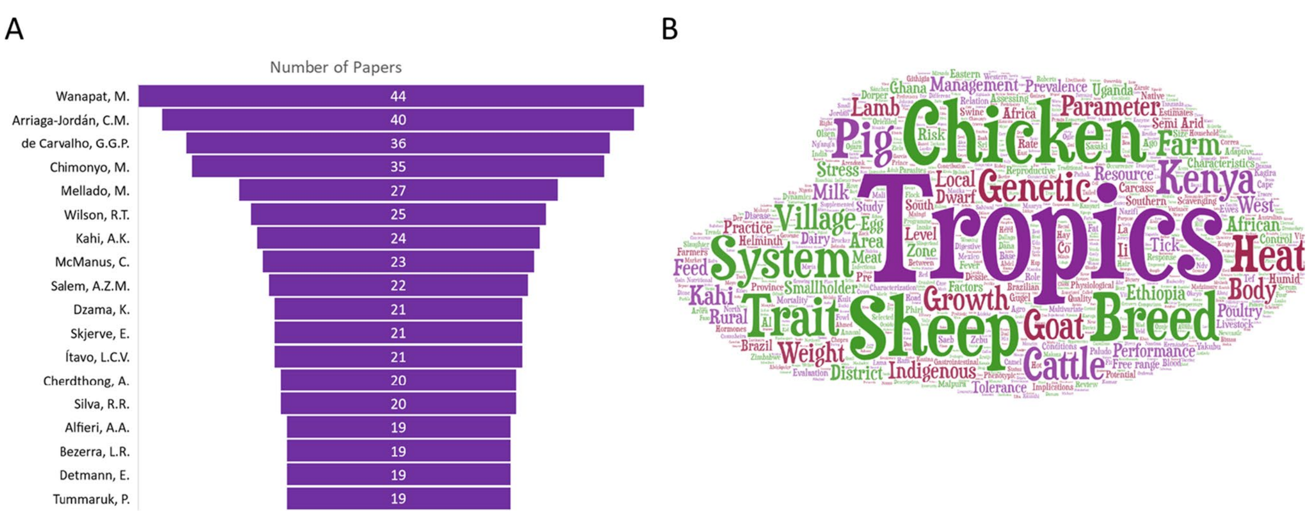

Fig. 5 Top authors (**A**) and word cloud for article titles (**B**) in publications in Tropical Animal Health and Production

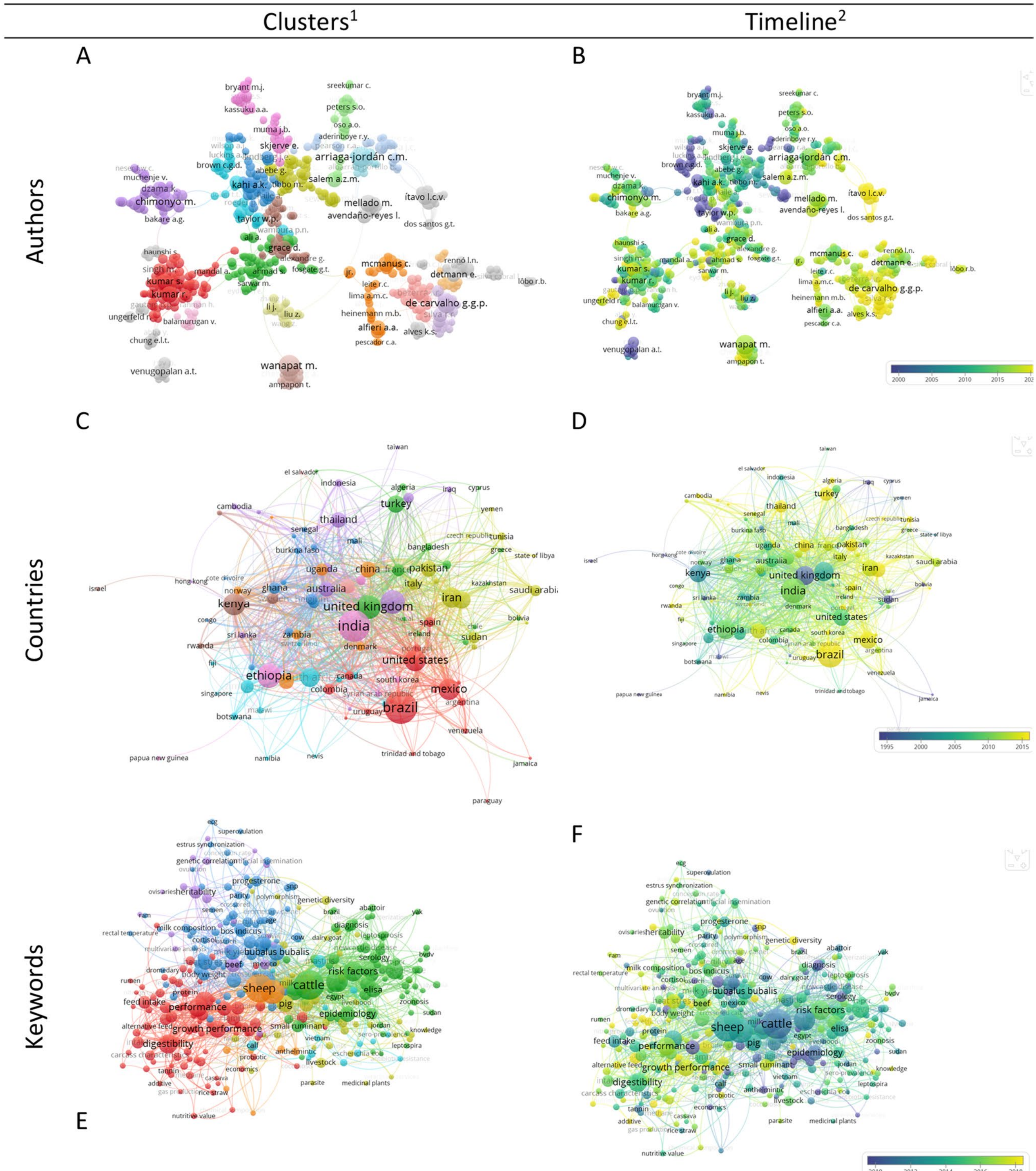

Fig. 6 Publication Parameters for co-authorship in publications in Tropical Animal Health and Production (nevis=St Kitts & Nevis). [1] Items are indicated by a label and a circle. The more important an item, the larger its label and circle (Van Eck & Waltman, 2010). [2] This reflects the development of the journal over time, which assists in understanding its evolution (Ding & Yang, 2020). The gradient colour from blue to yellow demonstrates the average publication year

Table 2 Top 20 authors by the number of papers for publications in Tropical Animal Health and Production

Authors	Cluster	Links	Total link strength	Documents	Citations	Norm. citations	Avg. pub. year	Avg. citations	Avg. norm. citations
Skjerve E.	9	18	64	21	588	32.76	2010	28.00	1.56
Wanapat M.	17	15	94	44	553	61.74	2017	12.57	1.40
Louvandini H.	7	7	31	16	522	33.45	2013	32.63	2.09
McManus C.	7	10	38	23	522	38.64	2015	22.70	1.68
Alfieri A.A.	7	7	26	21	471	39.16	2015	22.43	1.86
Arriaga-Jordán C.M.	15	12	68	40	466	47.68	2015	11.65	1.19
Chimonyo M.	5	15	49	37	413	29.88	2015	11.16	0.81
Kahi A.K.	3	8	31	24	409	24.59	2011	17.04	1.02
Paiva S.R.	7	6	22	11	405	23.51	2014	36.82	2.14
Alfieri A.F.	7	2	21	17	383	28.59	2015	22.53	1.68
Ogle B.	3	2	8	13	343	17.63	2006	26.38	1.36
Muma J.B.	9	7	28	12	338	17.99	2011	28.17	1.50
Abunna F.	4	7	33	12	334	18.35	2010	27.83	1.53
Detmann E.	20	17	44	19	334	23.26	2014	17.58	1.22
Megersa B.	4	13	39	12	332	18.46	2010	27.67	1.54
Regassa A.	4	7	32	12	323	17.96	2009	26.92	1.50
Taylor W.P.	6	7	10	18	322	28.49	1985	17.89	1.58
Oloya J.	9	6	24	9	308	15.19	2009	34.22	1.69
Dzama K.	5	8	31	21	307	21.75	2013	14.62	1.04
Paulino M.F.	20	11	56	18	303	22.45	2015	16.83	1.25

documents receive a citation from the same third document (Fig. 1).

The overall change in documents in all fields was compared with this specific field, from 2005 to 2021 (the last full year). Here, we calculated the ratio of the number of documents in this area over those published in all areas [Eq. 1] in 2005.

$$\text{RatioYear} = \frac{\sum \text{Number of papers in specific Area}}{\sum \text{Number of papers in all Areas}} \quad \text{(Eq. 1)}$$

This was recalculated in 2021. We then compared the two ratios, for 2005 and 2021 [Eq. 2].

$$\frac{\text{Ratio}_{2021}}{\text{Ratio}_{2005}} \quad \text{(Eq. 2)}$$

A ratio greater than one (1) means the area of knowledge is growing faster than the world mean, and less than one if it is growing at a slower rate.

Indicators were also downloaded from Incites® based on Web of Science from Clarivate Analytics (1980-2021). These included the % documents cited, % international collaborations, Article influence, % Open Access documents, Immediacy Index, and Journal Impact Factor. Papers were also classified according to the Sustainable Development Goals (SDGs) of the United Nations.

Results and discussion

The journal is classified in the sectors of Agriculture, Dairy & Animal Science as well as Veterinary Sciences in the Web of Science, where it ranks 55th in 169 journals (JCI[1] (67.75 percentile), JIF[2] (58.11percentile)) and 53rd in 145 JIF ranks (JIF 1.893). In terms of Cite Score rank, it is 156th in 448 in the category of Agricultural and Biological Sciences, Subcategory: Animal Science and Zoology, and 19th in 33 journals in the category of Agricultural and Biological Sciences, Subcategory: Food Animals. It is rated in the 2nd quartile in Animal Science and Zoology and Food Animals. It has an *h* index of 53 and an SJR[3] of 0.45. Papers normally undergo at least two rounds of evaluation, with 1 to 3 reviewers. Review duration is from 6 to 12 weeks. Acceptance to publication usually takes 21 days[4].

The growth of the number of documents in the Tropical Animal Health and Production Journal was 3.67 times the world average from the 2005 to 2021 period (as evaluated using Eqs, 1 and 2), indicating an increasing interest in this journal or

1 Journal Citation Indicator

2 Journal Impact Factor

3 Scimago Journal and Country Rank

4 https://academic-accelerator.com/Review-Speed/Tropical-Animal-Health-and-Production

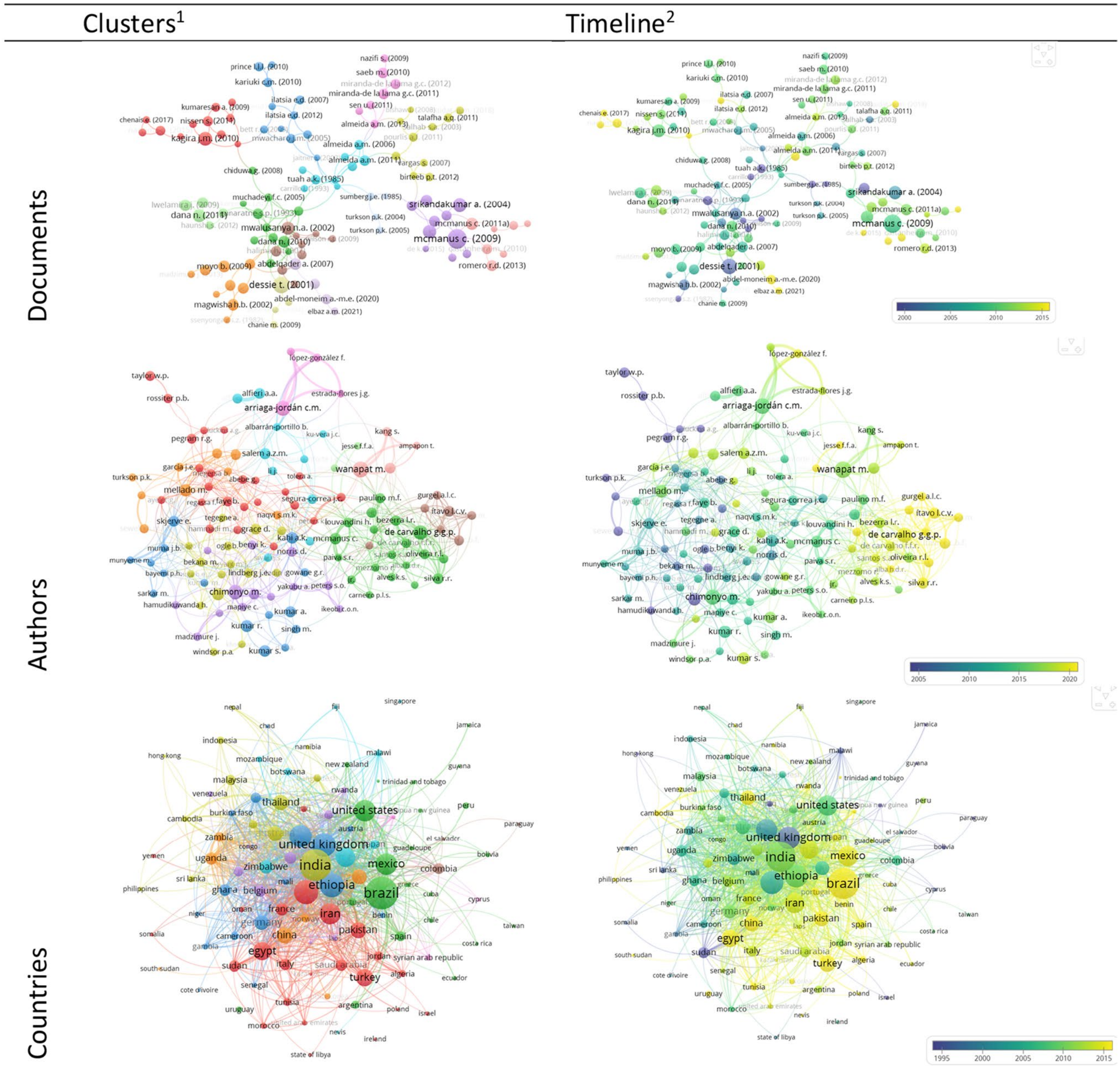

Fig. 7 Citation Analysis for publications in Tropical Animal Health and Production. [1] Items are indicated by a label and a circle. The more important an item, the larger its label and circle (Van Eck & Waltman, 2010). [2] This reflects the development of the journal over time, which assists in understanding its evolution (Ding & Yang, 2020). The gradient colour from blue to yellow demonstrates the average publication year

themes published therein. This may reflect the increase in publications from Global South countries such as China, India, and Brazil, among others. As can be seen in Fig. 2, the latter two countries are major contributors to the journal.

There has been a steady increase in the number of papers published in the journal since its inception in 1969, with a major fall in 2012–2013 (Fig. 3A) that coincided with several editorial board changes and the move to an international publishing company. The journal publishes mainly (96%) research papers (Fig. 3B), with some reviews (3%) as seen in Fig. 3B. In December 2020, Tropical Animal Health and Production changed its publication structure from paginated issues to a consecutive publishing model.

The University of Edinburgh is the major publishing institution (Fig. 4A), followed by the Indian Veterinary Research Institute. For a long time, the journal was based in Scotland

Table 3 Top 20 cited publications in Tropical Animal Health and Production

Article	URL	Cluster	Links	Citations	Norm.Cit
McManus C.; Paludo G.R.; Louvandini H.; Gugel R.; Sasaki L.C.B.; Paiva S.R. Heat tolerance in Brazilian sheep: physiological and blood parameters. TAHP[1], 41(1), 95-101. 2009.	https://doi.org/10.1007/s11250-008-9162-1	5	7	179	9.00
Dessie T.; Ogle B. Village poultry production systems in the central highlands of Ethiopia. TAHP, 33(6), 521-537. 2001.	https://doi.org/10.1023/a:1012740832558	13	5	129	6.64
Srikandakumar A.; Johnson E.H. Effect of heat stress on milk production, rectal temperature, respiratory rate and blood chemistry in Holstein, Jersey and Australian milking zebu cows. TAHP, 36(7), 685-692. 2004.	https://doi.org/10.1023/b:trop.0000042868.76914.a9	5	1	96	5.72
Kagira J.M.; Kanyari P.W.N.; Maingi N.; Githigia S.M.; Ng'ang'a J.C.; Karuga J.W. Characteristics of the smallholder free-range pig production system in western Kenya. TAHP, 42(5), 865-873. 2010.	https://doi.org/10.1007/s11250-009-9500-y	1	4	88	4.71
Sejian V.; Maurya V.P.; Naqvi S.M.K. Adaptability and growth of Malpura ewes subjected to thermal and nutritional stress. TAHP, 42(8), 1763-1770. 2010.	https://doi.org/10.1007/s11250-010-9633-z	5	5	81	4.33
Mwalusanya N.A.; Katule A.M.; Mutayoba S.K.; Mtambo M.M.A.; Olsen J.E.; Minga U.M. Productivity of local chickens under village management conditions. TAHP, 34(5), 405-416. 2002.	https://doi.org/10.1023/a:1020048327158	8	8	78	5.05
Magwisha H.B.; Kassuku A.A.; Kyvsgaard N.C.; Permin A. A comparison of the prevalence and burdens of helminth infections in growers and adult free-range chickens. TAHP, 34(3), 205-214. 2002.	https://doi.org/10.1023/a:1015278524559	7	3	65	4.21
Dana N.; van der Waaij L.H.; Dessie T.; van Arendonk J.A.M. Production objectives and trait preferences of village poultry producers of Ethiopia: implications for designing breeding schemes utilizing indigenous chicken genetic resources. TAHP, 42(7), 1519-1529. 2010.	https://doi.org/10.1007/s11250-010-9602-6	2	6	64	3.42
Moyo B.; Masika P.J. Tick control methods used by resource-limited farmers and the effect of ticks on cattle in rural areas of the Eastern Cape Province, South Africa. TAHP, 41(4), 517-523. 2009.	https://doi.org/10.1007/s11250-008-9216-4	7	2	64	3.22
Lwelamira J.; Kifaro G.C.; Gwakisa P.S. Genetic parameters for body weights, egg traits and antibody response against Newcastle Disease Virus (NDV) vaccine among two Tanzania chicken ecotypes. TAHP, 41(1), 51-59. 2009.	https://doi.org/10.1007/s11250-008-9153-2	11	2	62	3.12
Abdelqader A.; Wollny C.B.A.; Gauly M. Characterization of local chicken production systems and their potential under different levels of management practice in Jordan. TAHP, 39(3), 155-164. 2007.	https://doi.org/10.1007/s11250-007-9000-x	14	6	62	3.28
Phiri I.K.; Phiri A.M.; Ziela M.; Chota A.; Masuku M.; Monrad J. Prevalence and distribution of gastrointestinal helminths and their effects on weight gain in free-range chickens in Central Zambia. TAHP, 39(4), 309-315. 2007.	https://doi.org/10.1007/s11250-007-9021-5	7	2	57	3.01
Mungube E.O.; Bauni S.M.; Tenhagen B.-A.; Wamae L.W.; Nzioka S.M.; Muhammed L.; Nginyi J.M. Prevalence of parasites of the local scavenging chickens in a selected semi-arid zone of Eastern Kenya. TAHP, 40(2), 101-109. 2008.	https://doi.org/10.1007/s11250-007-9068-3	7	3	54	2.50
Saeb M.; Baghshani H.; Nazifi S.; Saeb S. Physiological response of dromedary camels to road transportation in relation to circulating levels of cortisol, thyroid hormones and some serum biochemical parameters. TAHP, 42(1), 55-63. 2010.	https://doi.org/10.1007/s11250-009-9385-9	9	2	51	2.73
Daramola J.O.; Adeloye A.A. Physiological adaptation to the humid tropics with special reference to the West African Dwarf (WAD) goat. TAHP, 41(7), 1005-1016. 2009.	https://doi.org/10.1007/s11250-008-9267-6	5	6	51	2.57
Gunaratne S.P.; Chandrasiri A.D.N.; Mangalika Hemalatha W.A.P.; Roberts J.A. feed resource base for scavenging village chickens in Sri Lanka. TAHP, 25(4), 249-257. 1993.	https://doi.org/10.1007/bf02250880	2	7	51	3.38
Halima H.; Neser F.W.C.; van Marle-Koster E.; DE kock A. Village-based indigenous chicken production system in north-west Ethiopia. TAHP, 39(3), 189-197. 2007.	https://doi.org/10.1007/s11250-007-9004-6	8	3	50	2.64
Mwale M.; Masika P.J. Ethno-veterinary control of parasites, management and role of village chickens in rural households of Centane district in the Eastern Cape, South Africa. TAHP, 41(8), 1685-1693. 2009.	https://doi.org/10.1007/s11250-009-9366-z	7	6	48	2.41
Castanheira M.; Paiva S.R.; Louvandini H.; Landim A.; Fiorvanti M.C.S.; Dallago B.S.; Correa P.S.; McManus C. Use of heat tolerance traits in discriminating between groups of sheep in central Brazil. TAHP, 42(8), 1821-1828. 2010.	https://doi.org/10.1007/s11250-010-9643-x	10	4	46	2.46

Table 3 (continued)

Article	URL	Cluster	Links	Citations	Norm.Cit
Tuah A.K.; Baah J. reproductive performance, pre-weaning growth rate and pre-weaning lamb mortality of Djallonké sheep in Ghana. TAHP, 17(2), 107-113. 1985.	https://doi.org/10.1007/bf02360783	6	4	45	3.46

[1] Tropical animal health and production

and published articles by British researchers working in UK colonies in Africa and South East Asia. Indian and Brazilian institutions are predominant, as well as institutions based in Africa such as ILRI and the University of Nairobi. Four of the six major funding agencies are Brazilian (Fig. 4B).

The major authors (Fig. 5A) were mainly from Global South (GS) countries such as Thailand (Wanapat, Cherdthong, Tummaruk), Mexico (Arriaga-Jordan, Mellado), South Africa (Chimoyo, Dzama), Sudan (Wilson), Kenya (Kahi), and Egypt (Salem), but mainly Brazil (de Carvalho, McManus, Silva, Alfieri, Detmann, Ítavo, Bezerra). Some were from Global North such as Skjerve (Norway), but mainly in collaboration with GS authors. Themes were based on the tropics (Fig. 5B), with the major species being chickens, sheep, and pigs, with goats and cattle to a lesser extent.

In co-authorship (Fig. 6 and Table 2), we see several distinct groups with little connections between them. In part, this may be a reflection of different scientific areas within animal (cattle, pig, small ruminant, poultry, nutrition, reproduction, etc.) and veterinary (theriogenology, physiology, health, epidemiology, parasitism, bacterial and viral diseases, etc.) sciences, but it is also noticeable that the groups are regionally separated. Brazilian groups are on the right and Indians on the left. These clusters reveal leading academic relations and researchers based on the average publication year in the network (Guleria & Kaur, 2021). Groups with an older mean date of publication (Fig. 6b) are European and younger groups Brazilian, Mexican, and Chinese. As previously stated, India and Brazil dominate the publications in this journal, along with the UK, USA, and Mexico. We can also see Ethiopia, Kenya, and Thailand to have important published manuscripts. The cluster analysis for keywords (Li et al., 2017) shows dominance for sheep and cattle, with studies on health (green), reproduction (blue), nutrition (red), and to a lesser extent genetics (purple), with subjects such as heat stress and molecular genetics being more recent. The timeline allows evaluating the longitudinal framework to follow the evolution of topics published in the journal as well as identify new groups or countries.

In the citation analysis (Fig. 7 and Table 3), the most cited manuscripts published in TAHP include McManus et al. (2009) on heat tolerance. This topic is seen in several other top cited papers such as Srikandakumar & Johnson (2004) and Sejian et al. (2010). A more recent group can be seen in the Federal University of Bahia (Carvalho GGP) working on ruminant nutrition and pasture, with older groups in Africa such as Chimonyo working with characterization of animal genetic resources and non-conventional feeds for livestock. Mexico, Brazil, and Pakistan are newer in the citations, while the UK and USA are older. In the published manuscripts, we see several village or indigenous chickens and smallholder pig production. This may reflect a niche for this journal and editorial policies, as these systems may have little space in the more specialized mainstream journals generally directed to animal production in temperate regions where such topics are of little relevance, contrarily to the tropics.

For bibliographic coupled (two documents cite the same third document) publications (Table 4 and Fig. 8), we see a similar pattern as in the citation analysis but an increase in papers on health and disease. Brazil anchors this analysis, along with India, Ethiopia, Mexico, and Kenya. The USA and UK also appear. Here, there are more recent coupled publications from countries such as Egypt, Pakistan, Turkey, and South Africa, as well as Thailand. This may reflect an increase in publications available on animals in these countries as well as improved access due to changes in internet access, among others. Bibliographic coupling uses citations to indicate similarities between two documents, authors, institutions, or countries, thereby forming clusters.

The bibliographic coupling and citation analysis here are different from McManus et al. (2023a) looking at heat tolerance in ruminants and horses, whereby the USA, Australia, and the UK played dominant roles, along with China, India, and Brazil. This reflects the different types of subjects published in TAHP, compared to other animal production journals such as the Journal of Dairy Science or Journal of Animal Science.

The manuscript that appeared most in co-citations (Fig. 9 and Table 5) is that of Van Soest et al. (1991), on *Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition*. This is expected given the pivotal role nature of this manuscript in the context of ruminant nutrition. Another manuscript is that of Duncan (1955) reference to his multiple-range statistical test. The preference for this test over others may be its lower probability of type II error (saying there is no significant difference between treatments when this, in fact, exists). This may indicate a desire to find non-existent significant differences (type I error) and

Table 4 Top 20 Bibliographic coupled publications in Tropical Animal Health and Production

Article	URL	cluster	Links	Total link strength	Citations	Norm. citations
McManus C.; Paludo G.R.; Louvandini H.; Gugel R.; Sasaki L.C.B.; Paiva S.R. Heat tolerance in Brazilian sheep: physiological and blood parameters. TAHP[1], 41(1), 95-101. 2009.	https://doi.org/10.1007/s11250-008-9162-1	11	14	28	179	9.00
Marai I.F.M.; Ayyat M.S.; Abd El-Monem U.M. Growth performance and reproductive traits at first parity of New Zealand white female rabbits as affected by heat stress and its alleviation under Egyptian conditions. TAHP, 33(6), 451-462. 2001.	https://doi.org/10.1023/a:1012772311177	9	3	4	174	8.96
Kivaria F.M. Estimated direct economic costs associated with tick-borne diseases on cattle in Tanzania. TAHP, 38(4), 291-299. 2006.	https://doi.org/10.1007/s11250-006-4181-2	5	8	8	134	5.69
Alfieri A.A.; Parazzi M.E.; Takiuchi E.; Médici K.C.; Alfieri A.F. Frequency of group a rotavirus in diarrhoeic calves in Brazilian cattle herds, 1998-2002. TAHP, 38(07/ago), 521-526. 2006.	https://doi.org/10.1007/s11250-006-4349-9	9	4	6	132	5.61
Dessie T.; Ogle B. Village poultry production systems in the central highlands of Ethiopia. TAHP, 33(6), 521-537. 2001.	https://doi.org/10.1023/a:1012740832558	2	10	14	129	6.64
Robinson P.M. *Theileriosis annulata* and its transmission-a review. TAHP, 14(1), 3-12. 1982.	https://doi.org/10.1007/bf02281092	5	12	20	104	9.58
Attia Y.A.; Hassan R.A.; Qota E.M.A. recovery from adverse effects of heat stress on slow-growing chicks in the tropics 1: effect of ascorbic acid and different levels of betaine. TAHP, 41(5), 807-818. 2009.	https://doi.org/10.1007/s11250-008-9256-9	12	3	9	100	5.03
Panda A.K.; Reddy M.R.; Rama Rao S.V.; Praharaj N.K. production performance, serum/yolk cholesterol and immune competence of white leghorn layers as influenced by dietary supplementation with probiotic. TAHP, 35(1), 85-94. 2003.	https://doi.org/10.1023/a:1022036023325	12	1	1	97	4.84
Srikandakumar A.; Johnson E.H. Effect of heat stress on milk production, rectal temperature, respiratory rate and blood chemistry in Holstein, Jersey and Australian milking zebu cows. TAHP, 36(7), 685-692. 2004.	https://doi.org/10.1023/b:trop.0000042868.76914.a9	9	2	2	96	5.72
Sampaio C.B.; Detmann E.; Paulino M.F.; Filho S.C.V.; de Souza M.A.; Lazzarini I.; Rodrigues Paulino P.V.; de Queiroz A.C. Intake and digestibility in cattle fed low-quality tropical forage and supplemented with nitrogenous compounds. TAHP, 42(7), 1471-1479. 2010.	https://doi.org/10.1007/s11250-010-9581-7	4	5	17	89	4.76
Kagira J.M.; Kanyari P.W.N.; Maingi N.; Githigia S.M.; Ng'ang'a J.C.; Karuga J.W. Characteristics of the smallholder free-range pig production system in Western Kenya. TAHP, 42(5), 865-873. 2010.	https://doi.org/10.1007/s11250-009-9500-y	3	3	4	88	4.71

Table 4 (continued)

Article	URL	cluster	Links	Total link strength	Citations	Norm. citations
Muma J.B.; Samui K.L.; Siamudaala V.M.; Oloya J.; Matope G.; Omer M.K.; Munyeme M.; Mubita C.; Skjerve E. prevalence of antibodies to Brucella spp. and individual risk factors of infection in traditional cattle, goats and sheep reared in livestock-wildlife interface areas of Zambia. TAHP, 38(3), 195-206. 2006.	https://doi.org/10.1007/s11250-006-4320-9	8	14	28	88	3.74
Roeder P.L.; Abraham G.; Kenfe G.; Barrett T. *Peste des petits* ruminants in Ethiopian goats. TAHP, 26(2), 69-73. 1994.	https://doi.org/10.1007/bf02239901	14	6	8	85	8.40
Kaiser M.N.; Sutherst R.W.; Bourne A.S. Relationship between ticks and zebu cattle in southern Uganda. TAHP, 14(2), 63-74. 1982.	https://doi.org/10.1007/bf02282583	16	2	3	82	7.56
Sejian V.; Maurya V.P.; Naqvi S.M.K. Adaptability and growth of Malpura ewes subjected to thermal and nutritional stress. TAHP, 42(8), 1763-1770. 2010.	https://doi.org/10.1007/s11250-010-9633-z	11	11	29	81	4.33
Wanapat M. Potential uses of local feed resources for ruminants. TAHP, 41(7), 1035-1049. 2009.	https://doi.org/10.1007/s11250-008-9270-y	16	3	3	80	4.02
Sowande O.S.; Sobola O.S. Body measurements of West African Dwarf sheep as parameters for estimation of live weight. TAHP, 40(6), 433-439. 2008.	https://doi.org/10.1007/s11250-007-9116-z	3	1	1	80	3.71
Rufael T.; Catley A.; Bogale A.; Sahle M.; Shiferaw Y. Foot and mouth disease in the Borana pastoral system, southern Ethiopia and implications for livelihoods and international trade. TAHP, 40(1), 29-38. 2008.	https://doi.org/10.1007/s11250-007-9049-6	8	11	15	79	3.66
Kerro Dego O.; Tareke F. Bovine mastitis in selected areas of southern Ethiopia. TAHP, 35(3), 197-205. 2003.	https://doi.org/10.1023/a:1023352811751	7	10	15	78	3.89
Mwalusanya N.A.; Katule A.M.; Mutayoba S.K.; Mtambo M.M.A.; Olsen J.E.; Minga U.M. Productivity of local chickens under village management conditions. TAHP, 34(5), 405-416. 2002.	https://doi.org/10.1023/a:1020048327158	2	17	24	78	5.05

[1] Tropical animal health and production

many statisticians advise against the use of this test in animal experiments (Lowry, 1992; Lehmann & Shaffer, 1977). One paper in the list is in Portuguese. The major journals include the Journal of Animal Science and Livestock Production Science (continued as Livestock Science in 2005), the Journal of Dairy Science, Poultry Science, Veterinary Microbiology and Veterinary Parasitology, in addition to Tropical Animal Health and Production itself. This is expectable as these journals were for a long time the reference journals in these particular fields, albeit novel journals have been created in recent years.

In terms of the % documents cited (Fig. 10) from Incites® based on Web of Science documents, recent years have shown a consistency of over 95%. The percentage of documents cited in the last 3 years shows a decrease, due to the time needed for citation. Article Influence[5] (world mean = 1), Percentage of papers in Open Access (OA), Immediacy Index[6], and Journal Impact Factor[7] have all risen in recent

[5] The average influence of a journal's articles over the first five years after publication.

[6] Average number of times an article is cited in the year it is published.

[7] Approximation of the mean citation rate per citable item. A Journal Impact Factor of 1.0 means that, on average, the articles published 1 or 2 years ago have been cited one time.

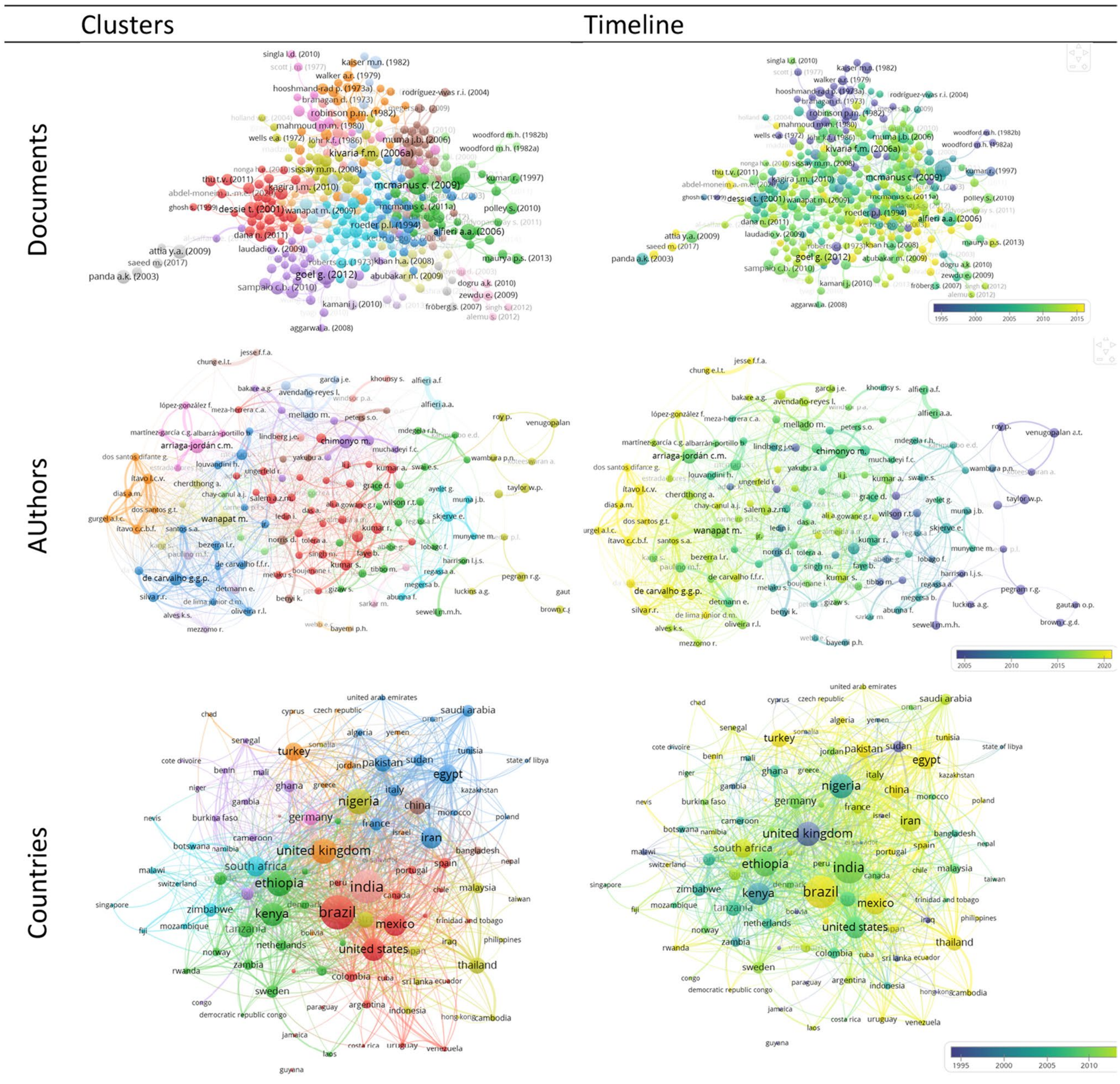

Fig. 8 Bibliographic Coupling Analysis for publications in Tropical Animal Health and Production

years, although improvements are still necessary. There was a sharp fall in Open Access papers between 2016 to 2020. This may be a reflection of budgetary cuts in some countries such as Brazil (McManus & Baeta Neves, 2021) for example, a major contributor to this journal. Indeed, and although they continued being published, the OA percentage decreased. For example, the Brazilian Universidade Estadual Paulista (UNESP) had 100% OA documents in 2017/2018, 0% in 2020, and 5.9% in 2021. Embrapa (Brazilian Agency for Agriculture Research) showed a similar trend, increasing the number of papers published but also the number in closed access. In addition, this date also coincided with the surge in numerous exclusively OA journals from major publishing companies. Cited half-life[8] is 7.2 years, while the percentage of papers in international collaboration has stabilized since 2010 (around 40%), down from around a peak of 60% in 2006. The journal is a Q2 journal with 86.4%

[8] Median age of the articles that were cited in the Journal Citation Report (JCR) year. Half of a journal's cited articles were published more recently than the cited half-life.

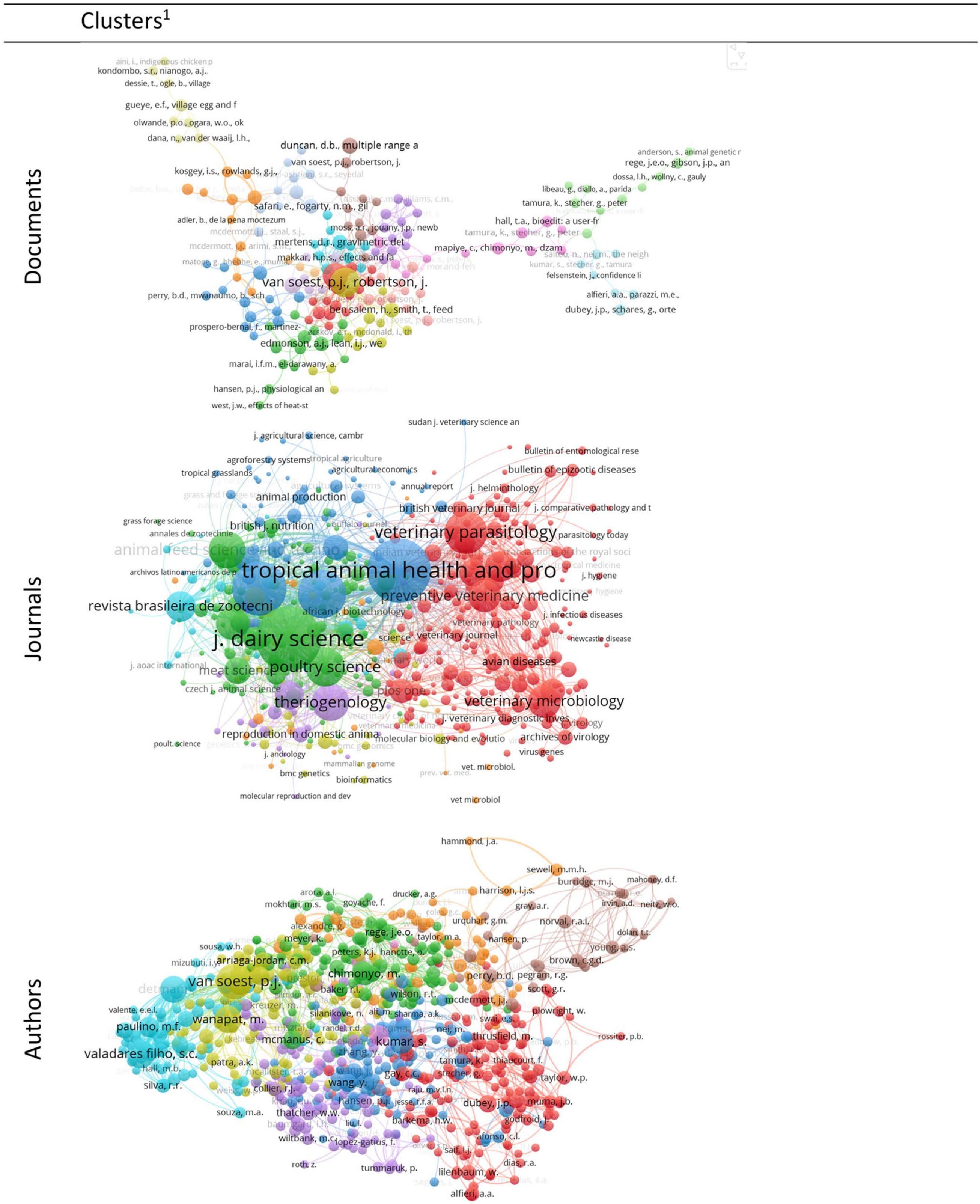

Fig. 9 Co-citation Analysis for publications in Tropical Animal Health and Production. [1] Items are indicated by a label and a circle. The more important an item, the larger its label and circle (Van Eck & Waltman, 2010)

Table 5 Top 20 co-cited for publications in Tropical Animal Health and Production

Article	Cluster	Links	Total link strength	Citations
van Soest, P.J., Robertson, J.B., Lewis, B.A., Methods for dietary fiber, neutral detergent fiber, and non-starch polysaccharides in relation to animal nutrition (1991) J. Dairy Science, 74, pp. 3583-3597	9	34	47	175
Licitra, G., Hernandez, T.M., van Soest, P.J., Standardization of procedures for nitrogen fractionation of ruminant feeds (1996) Animal Feed Science and Technology, 57, pp. 347-358	2	31	62	44
Mertens, D.R., Gravimetric determination of amylase-treated neutral detergent fiber in feeds with refluxing in beaker or crucibles: collaborative study (2002) J. AOAC International, 85, pp. 1217-1240.	2	10	13	34
Tamura, K., Stecher, G., Peterson, D., Filipski, A., kumar, S., Mega6: molecular evolutionary genetics analysis version 6.0 (2013) Molecular Biology and Evolution, 30, pp. 2725-2729.	3	2	3	23
Duncan, D.B., Multiple range and multiple f tests (1955) biometrics, 11, pp. 1-42	6	1	1	17
Detmann, E., Valente, E.E.L., Batista, E.D., Huhtanen, P., An evaluation of the performance and efficiency of nitrogen utilization in cattle fed tropical grass pastures with supplementation (2014) Livestock Science, 162, pp. 141-153	2	12	13	17
Safari, E., Fogarty, N.M., Gilmour, A.R., a review of genetic parameter estimates for wool, growth, meat and reproduction traits in sheep (2005) Livestock Production Science, 92, pp. 271-289	11	9	13	15
Meyer, K., Variance components due to direct and maternal effects for growth traits of Australian beef cattle (1992) Livestock Production Science, 31, pp. 179-204	11	5	10	15
Edmonson, A.J., Lean, I.J., Weaver, L.D., Farver, T., Webster, G., A body condition scoring chart for Holstein dairy cows (1989) J. Dairy Science, 72, pp. 68-78	1	6	6	15
Ben Salem, H., Smith, T., Feeding strategies to increase small ruminant production in dry environments (2008) small ruminant research, 77, pp. 174-194	9	12	12	15
Silanikove, N., Effects of heat stress on the welfare of extensively managed domestic ruminants (2000) Livestock Production Science, 67, pp. 1-18	1	10	14	13
Kosgey, I.S., Okeyo, A.M., Genetic improvement of small ruminants in low-input, smallholder production systems: technical and infrastructural issues (2007) Small Ruminant Research, 70, pp. 76-88	10	9	16	13
Espinoza-Ortega, A., Espinosa-Ayala, E., Bastida-Lopez, J., Castaneda-Martinez, T., Arriaga-Jordan, C.M., Small-scale dairy farming in the highlands of central mexico: technical, economic and social aspects and their impact on poverty (2007) Experimental Agriculture, 43, pp. 241-256	7	6	9	13
van Keulen, J., Young, B.A., evaluation of acid insoluble ash as a neutral marker in ruminant digestibility studies (1977) J. Animal Science, 44, pp. 282-287	14	10	15	12
Sniffen, C.J., Oæconnor, J.D., van Soest, P.J., Fox, D.G., Russell, J.B., A net carbohydrate and protein system for evaluating cattle diets: ii. carbohydrate and protein availability (1992) J. Animal Science, 70, pp. 3562-3577	2	4	5	12
Kadzere, C.T., Murphy, M.R., Silanikove, N., Maltz, E., Heat stress in lactating dairy cows: a review (2002) Livestock Production Science, 77, pp. 59-91	1	10	13	12
Wildman, E.E., Jones, G.M., Wagner, P.E., Boman, R.L., Troutt, H.F., JR., Lesch, T.N., a dairy cow body condition scoring system and its relationship to selected production characteristics (1982) J. Dairy Science, 65, pp. 495-501	7	7	7	11
Tamura, K., Peterson, D., Peterson, N., Stecher, G., Nei, M., Kumar, S., Mega5: molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods (2011) Molecular Biology and Evolution, 28, pp. 2731-2739	3	3	4	10
Mertens, D.R., Creating a system for meeting the fiber requirements of dairy cows (1997) J. Dairy Science, 80, pp. 1463-1481.	12	6	8	10
Mapiye, C., Chimonyo, M., Dzama, K., Raats, J.G., Mapekula, M., Opportunities for improving Nguni cattle production in the smallholder farming systems of South Africa (2009) Livestock science, 124, pp. 196-204	3	3	3	10
Kumar, S., Stecher, G., Tamura, K., mega7: molecular evolutionary genetics analysis version 7.0 for bigger datasets (2016) Molecular Biology and Evolution, 33, pp. 1870-1874.	3	1	1	10
Gueye, E.F., Village egg and fowl meat production in Africa (1998) World's Poultry Science Journal, 54, pp. 73-86	13	4	4	10
Casali, A.O., Detmann, E., Valadares FILHO, S.C., Pereira, J.C., Henriques, L.T., Freitas, S.G., Paulino, M.F., Influencia do tempo de incubacao e do tamanho de particulas sobre os teores de compostos indigestiveis em alimentos e fezes bovinas obtidos por procedimentos in situ (2008) Revista Brasileira de Zootecnia, 37, pp. 335-342	2	16	24	10

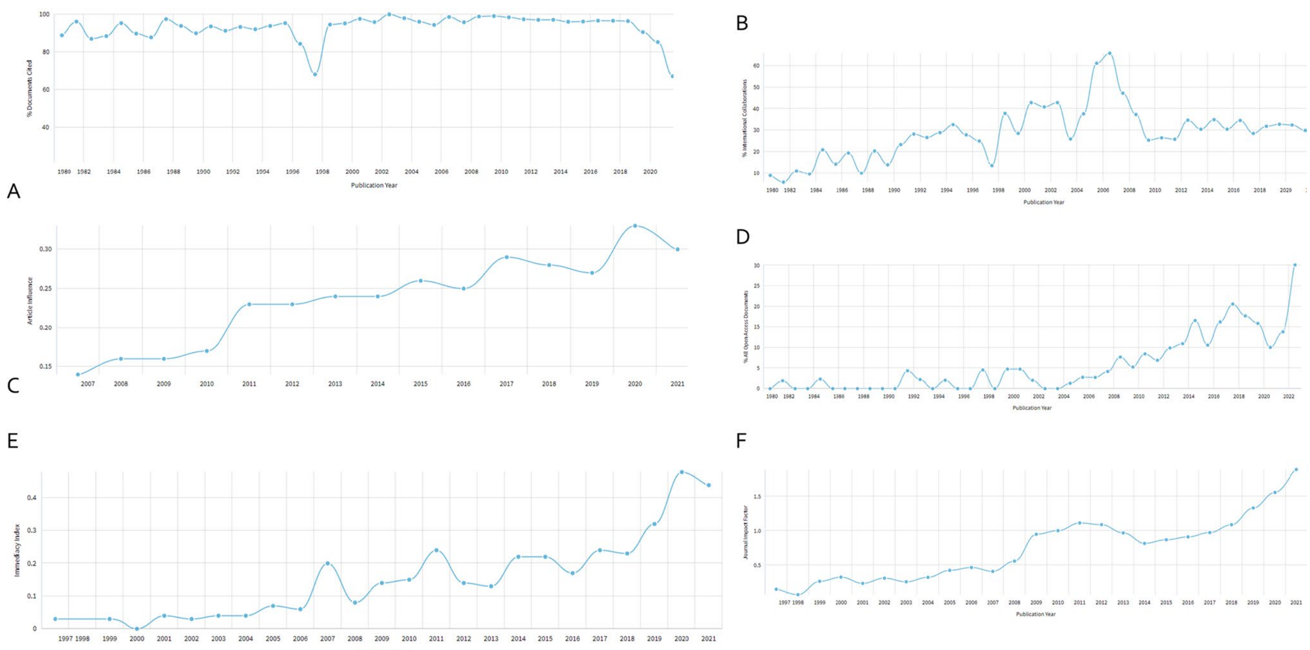

Fig. 10 Quality indicators for Tropical Animal Health and Production (Incites® based on Web of Science from Clarivate Analytics). **A** % documents cited, **B** % International collaborations, **C** Article Influence, **D** % Open Access documents, **E** Immediacy Index, and **F** Journal Impact Factor

of its documents cited, with an average of 8.71 citations per paper and an *h* index of 53.

Of all documents published, 2401 were classified in Sustainable Development Goal (SDG3 - Good Health and Well-being) followed by SDG2 (Zero Hunger) with 136 (Fig. 11). Publications in SDG3 possibly indicate a concentration on health rather than production issues in the journal. SDG3 also had 61 citations from patents. No Poverty (SDG1) had 40 documents and 2.5% industry collaborations which was the highest percentage. The highest international collaborations were for SDG8 (Decent Work and Economic Growth) and SDG16 (Peace and Justice, Strong Institutions) (although only 1 document each), followed by SDG4 (Quality Education) with 10 documents and SDG11 (Sustainable Cities and Communities) with 23 documents. SDG9 (Industry, Innovation, and Infrastructure) and SDG16 had the highest CNCI and SDG3 the highest number of citations per document (10.3). SDG11, SDG12 (Responsible Consumption and Production), and SDG 7 (Affordable and Clean Energy) had the highest Journal Normalized Citation Impact (JNCI).

The number of citations represents the popularity and influence of a scientific document (Merigó et al., 2017). From 1980 to date, TAHP has received 50,052 citations in the Web of Science from 33,870 documents. A total of 2996 sources cited papers from TAHP, with major sources of citation being TAHP itself (7.9%), Animals (2.4%), Veterinary Parasitology (2.2%), and Small Ruminant Research (1.9%). There has been a steady increase in the number of citations over the years (Fig. 12), with the journal receiving almost 4500 citations in 2021 (2022 has not yet been completed). Recent journals citing TAHP include Animals (550 citations in 2021 to 2022 compared with 510 from TAHP), Frontiers in Veterinary Science, and PloSOne.

As can be seen (Fig. 12b) the percentage of papers in higher normalized citation impact ranges has increased over the years, even taking into account that papers published in recent years may still receive more citations.

The advancements in science in the global south are helping to address some of the most pressing challenges facing these regions, and are helping to promote sustainable economic and social development. As can be seen here Tropical Animal Health and Production is helping this information reach a wider audience. In the present analysis, we examine publications and citations in TAHP over time, identifying the most influential countries, and institutions. This analysis has a risk of selection bias, citation bias, publication bias, and other forms of bias because the starting set of articles influences what is eventually retrieved (Belter, 2016; Sarol et al., 2018). As many of the publishing countries are Global South, citations of papers in TAHP by authors may not be captured in Scopus or Web of Science when occurring in local

Fig. 11 Tropical Animal Health and Production and Sustainable Development Goals by **A** the number of documents, **B** % industry collaborations, **C** % international collaborations, and **D** category normalized citation impact

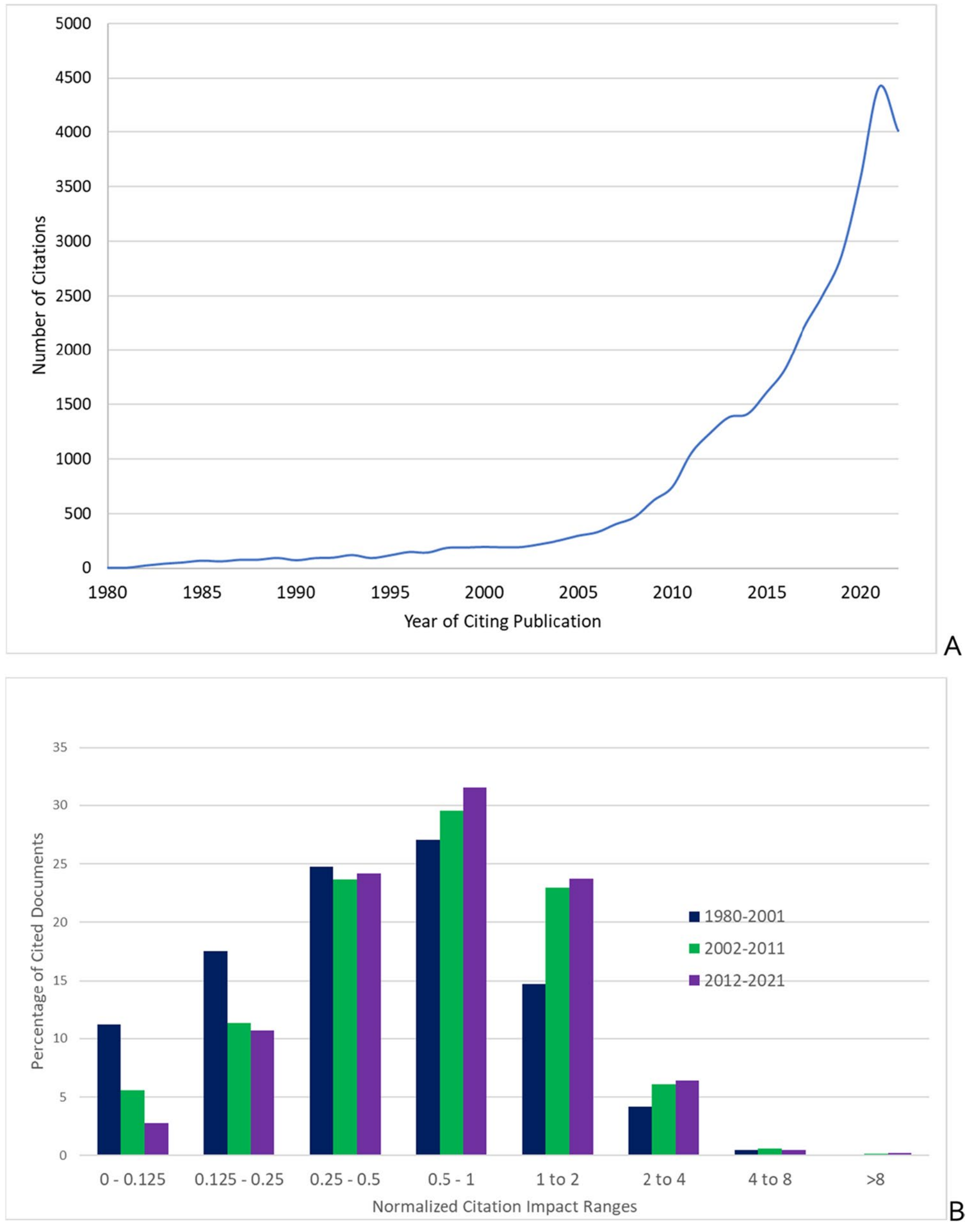

Fig. 12 Number of citations (**A**) received by papers by year and percentage of cited papers by normalized citation impact ranges (**B**) in Tropical Animal Health and Production

or regional journals and books. This is true in all areas of research, but may be especially relevant to a journal such as TAHP which focuses on animal production in tropical regions, thereby being affected by questions such as access (open or closed), field and study topics, and international cooperations, among others (Tahamtan et al., 2016).

Conclusions

The journal was established with the aim of providing a platform for the dissemination of research and knowledge on animal health and production in tropical regions. As can be seen from the results herein mentioned, over the years, the journal has evolved and expanded its scope to encompass a wide range of topics related to animal health, disease, and production in tropical regions, with increasing numbers of Global South authors. Today, it is recognized as the leading scientific journal in the field and has a strong reputation for publishing high-quality research articles and reviews. The journal continues to play a key role in advancing knowledge and understanding of animal health and production in tropical regions and supporting the development of sustainable animal agriculture in these areas, often facing challenges greater than those of temperate regions. Bias in the analysis should be noted, namely the low number of citations of recent papers or those that are not indexed in Scopus.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11250-023-03577-5.

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Declarations

Conflict of interest Authors Concepta McManus and André M. de Almeida are respectively Associate Editor and Editor in Chief for Tropical Animal Health and Production.

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Srikandakumar A.; Johnson E.H. Effect of heat stress on milk production, rectal temperature, respiratory rate and blood chemistry in Holstein, Jersey and Australian milking zebu cows. TAHP, 36(7), 685-692. 2004

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