

Bibliometrics Analysis And An Husbandry Practice

Şenol Çelik

Bingöl University Faculty of Agriculture Department of Biometrics and Genetics,
Bingöl-Turkey e-mail: senolcelik@bingol.edu.tr

Abstract—The aim of the study is to examine the 500 studies published within SCI-Expanded with the headline keyword of "Sheep breeding" between 1992-2019 with bibliometrics analysis retrospectively and to reveal the trends of the recent years. A search was conducted in the Web of Science Core Collection database with "sheep" as the title, and bibliometric data were obtained. Current issues on the matter of "sheep breeding" have been revealed to help the academicians and researchers examining sheep breeding. The studies evaluated with publications per year, research types, citation analyses, international collaborations, and common citation indexes. Analysis results have presented that articles majorly published on the subject of "sheep breeding" are: Small Ruminant Research, Animal and Applied Animal Behavior Science, respectively.

Keywords—Bibliometry, publish, citation, sheep

I. INTRODUCTION (*Heading 1*)

Bibliometrics is the method used to evaluate published scientific studies in books and journals with mathematical and statistical technics [1]. Bibliometrics analysis is a technic to examine the literature macroscopically. In other words, bibliometric analysis is a method to examine academic research written on a certain subject for its properties and citation status [2].

The most effective publications and researchers, popular journals on specific subjects, and prominent countries and institutions can be determined with the Bibliometrics analysis. Therefore, researchers willing to keep track of changes in the academic literature of a specific subject and to be informed on the overall literature can use this analysis method [3].

Bibliometrics analysis is a prominent method used in the process of scientific decision-making, and it is also widely used to evaluate the performances of journals, countries, and institutions [4].

There are studies conducted on bibliometrics analysis in different fields. In one of those studies, Yıldız and Aykanat examined the developments of leadership studies in the field of management and organization. The researchers conducted the study on the papers between 1973-2015 on the Scopus database. It was found that the number of studies increased after 2005, and the USA had the highest

number of publications with 430 studies and Turkey took the 23rd place on the list with 7 studies. Turkey had 0.63% of the studies in total [5]. In other research, supply chains and logistics management were studied. In that context, a search was conducted on ULAKBIM social sciences database with 47 journals and 1776 issues included, and 34 research papers were revealed. It was concluded that in the aforementioned journals there had not been any publications made on the field of supply chains and logistics management before 2001, but most of the studies were conducted on logistic centers [6].

[7] evaluated over 400 academic studies on rural tourism both nationally and internationally. Researchers conducted their study on two main factors, the primary factors (thesis, articles, papers, books, statistics and research) and secondary factors (congress, symposium, academic periodicals and academic training programs). The study showed that studies on the subject of rural tourism began almost twenty years ago. The aim of the present study is to examine the studies published between 1992-2019 on the subject of sheep husbandry with bibliometrics analysis retrospectively and to determine the trends of the recent years.

II. MATERIAL AND METHOD

Data of the study comprised of 500 studies searched on the Web of Science database and published between 1992- January 2020. Web of Science (WOS) database provides citation statistics and bibliographic information of academic publications [8]. Publication types, topics, authors, countries of origin, citation statistics, citations on the papers listed on WOS and references of 500 studies conducted on "sheep breeding" were all collected via the Web of Science Core Collection database. Social network analysis was carried out about poultry with common citation databases. This analysis was performed following the R program.

Bibliometrics is a quantitative method of statistical measurement of the rates of production and dispersion of scientific knowledge. This method was introduced in the early twentieth century, due to the need for the production and evaluation of scientific communication [9].

Bibliometrics are related to the relations between 'cited' and 'citing' literature. [10] is greatly credited with pioneering the use of bibliometrics with his Science Citation Index (SCI), which makes the systematic quantitative analysis of scientific literature possible.

The range of bibliometric methods includes word frequency analysis, citation analysis, authorship analysis, co-citation analysis, coauthor analysis, co-word analysis and simple document counting, such as the number of publications by an author, research group or the country.

III. RESULTS AND DISCUSSION

Basic information about sheep breeding is presented in Table 1. There are a total of 500 studies published. 358 of those are articles, 36 are papers and 106 are compilations. The studies were performed by academicians, of which 37 have a single name and 1986 has multiple names, therefore a total of 2023 researchers were found.

Table 1. Main Information

Description	Results
Documents	500
Sources (Journals, Books, etc.)	203
Keywords Plus (ID)	2518
Author's Keywords (DE)	1631
Period	1992 - 2020
Average citations per documents	53.15
Authors	2023
Author Appearances	2460
Authors of single-authored documents	37
Authors of multi-authored documents	1986
Single-authored documents	44
Documents per Author	0.247
Authors per Document	4.05
Co-Authors per Documents	4.92
Collaboration Index	4.36
Document types	
Article	358
Article; proceedings paper	36
Review	106

500 records on the Web of Science database found in the search "Sheep Breeding" made on January 20, 2020, belong to the period 2002-2020 (January). The yearly distribution of publications is presented in Table 2.

Table 2. Annual production

Year	Articles
1992	3
1995	4
1996	2
1997	3
1998	2
1999	5
2000	9
2001	9
2002	9
2003	14
2004	7
2005	12
2006	6
2007	19
2008	14
2009	32
2010	19
2011	37
2012	52
2013	64
2014	70
2015	46
2016	36
2017	16
2018	6
2019	3
2020	1

Journals published articles directly related to the topic are listed in Table 3. The journal with the most publications about sheep breeding is Small Ruminant Research, with 37 articles. The second is Animal Research journal with 19 articles, and the third is Applied Animal Behavior Science journal. The graph can be found in Figure 1.

Table 3. Most relevant sources

Sources	Articles
Small Ruminant Research	37
Animal	19
Applied Animal Behaviour Science	17
Plos One	13
Journal Of Applied Ecology	12
Journal Of Animal Science	11
Animal Production Science	10
Journal Of Animal Ecology	10
Meat Science	10
Agriculture Ecosystems & Environment	8
Animal Genetics	8
Molecular Ecology	7
Animal Reproduction Science	6
Biological Conservation	6
Crop & Pasture Science	6
Journal Of Dairy Science	6
Veterinary Microbiology	6
Behavioral Ecology And Sociobiology	5
Bird Study	5
Ecology	5

2012 was the busiest year with 4 publications out of a total of 17 articles.

Table 4. Distribution of journals with the highest number of publications by years

Year	Journal of Applied Ecology	Animal	Applied Animal Behaviour Science	Small Ruminant Research	Plos One
1992	0	0	1	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	1	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	1	0	0	0	0
2000	0	0	0	0	0
2001	2	0	2	0	0
2002	0	0	1	0	0
2003	0	0	0	1	0
2004	2	0	0	0	0
2005	0	0	1	1	0
2006	0	0	1	0	0
2007	1	2	1	6	0
2008	1	0	0	2	0
2009	0	0	0	2	1
2010	0	1	0	2	0
2011	1	2	3	5	0
2012	0	3	4	2	0
2013	1	6	0	6	2
2014	2	1	0	4	9
2015	0	3	2	2	0
2016	0	1	0	4	0
2017	0	0	0	0	1
2018	1	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0

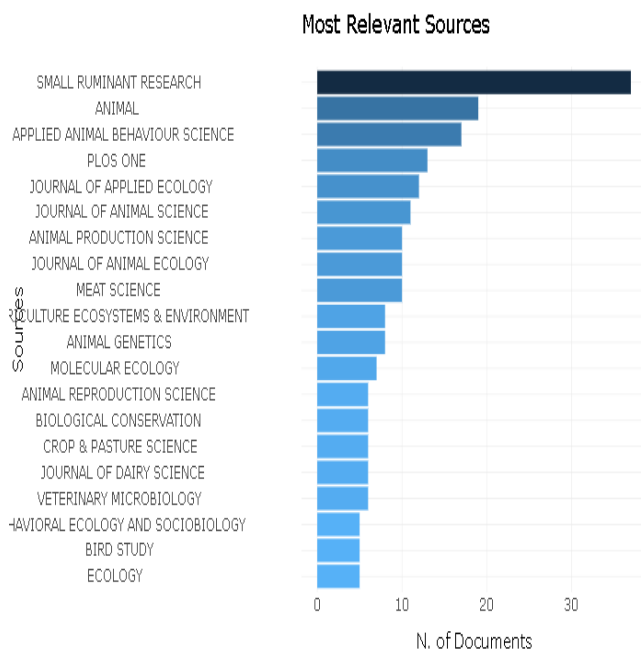


Figure 1. Most relevant sources

The yearly distribution of articles of journals with most publications can be found in Table 4 and Figure 2. In Small Ruminant Research, the journal with the highest publications, 2007 and 2013 both seen 6 publications. A total of 37 publications were made in this journal between 2002- 2019. In animal journal publishing a total of 19 articles, most publications were made in 2013. In the Applied Animal Behavior Science journal,

Source Growth

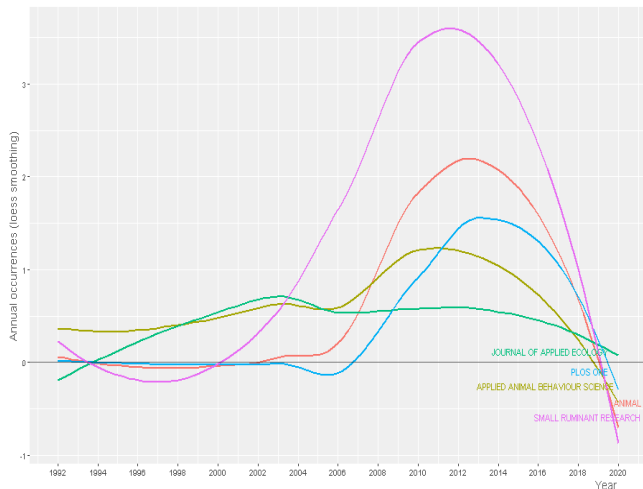


Figure 2. Journals with the highest number of publications on sheep breeding by years

The best authors were Festa Bianchet M, Pemperton JM, and Coltman DW respectively. Information about other authors is presented in Figure 3.

Top-Authors' Production over the Time

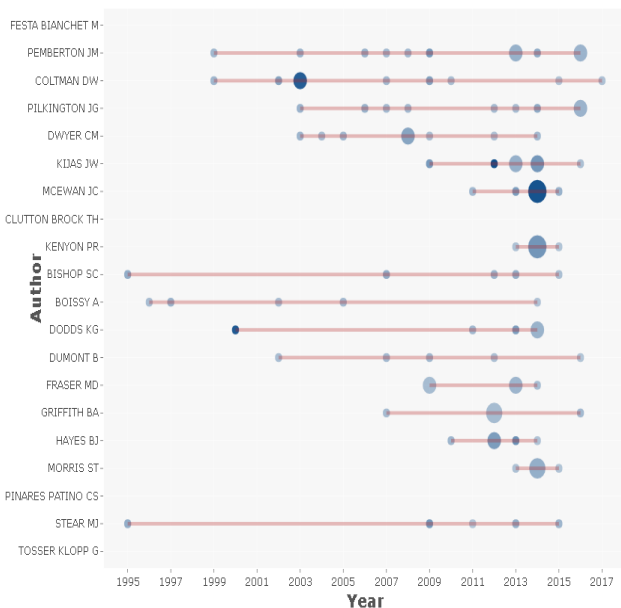


Figure 3. Author information

The most cited countries in these articles are the United Kingdom (8093), France (3176), and Australia (2689). In mean citation numbers, the leaders are Israel, Nigeria and Austria. Mean citation numbers for these countries are 204.3, 126 and 92, respectively (Table 5 and Figure 4).

Table 5. Most cited countries number of citations

Country	Total Citations	Average Article Citations
United Kingdom	8093	72.9
France	3176	59.9
Australia	2689	48.9
USA	2426	56.4
New Zealand	1536	56.9
Canada	1168	73
Italy	969	34.6
Spain	724	27.8
Norway	640	49.2
Israel	613	204.3
Portugal	586	73.2
Germany	571	38.1
Ireland	517	86.2
China	442	18.4
Austria	368	92
Denmark	341	68.2
Belgium	206	51.5
Mexico	201	40.2
Greece	180	25.7
Egypt	177	88.5
Netherlands	163	81.5
Switzerland	150	25
Nigeria	126	126
Czech Republic	93	15.5
South Africa	67	16.8
Finland	56	28
Poland	37	37
Sweden	36	18
Brazil	30	15
Slovakia	28	14
Tunisia	20	20
Kenya	19	19
Iran	18	9
Turkey	16	16
Armenia	10	10
Chile	9	9
India	9	4.5
Uruguay	6	6
Korea	5	5
Colombia	3	3
Hungary	1	0.5
Saudi Arabia	1	1
Russia	0	0

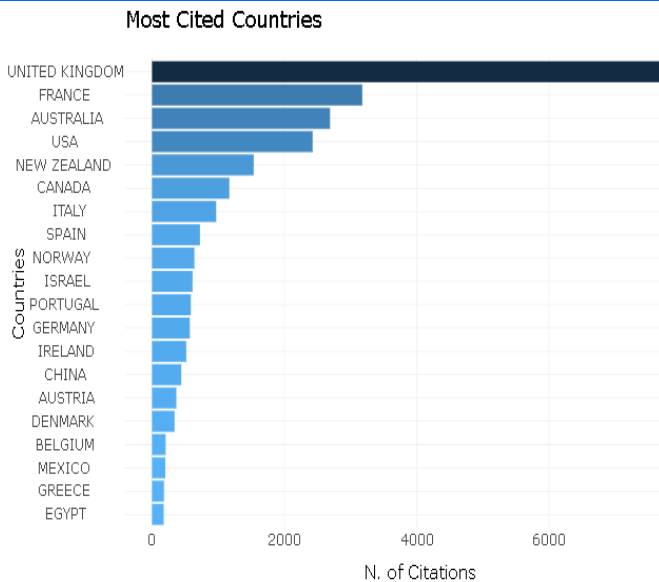


Figure 4. Most cited countries number of citations

The most cited publications are presented in Table 6 and Figure 5. The most cited source on the field of sheep breeding is the article of Galloway SM, published in Nat Genet journal (n=695). The mean citation number for this publication is 33.095 per year. The second most effective study is the article of Vickery JA, which was published in J Appl. Ecol journal in 2001 (n=484). Another important research was carried out by Coltman DW and published in 2003 in Nature journal (n=472).

Table 6. Most cited documents of total citations

Paper	Total Citations	TC Per Year
Galloway SM, 2000, Nat Genet	695	33.095
Vickery JA, 2001, J Appl. Ecol.	484	24.Şub
Coltman DW, 2003, Nature	472	26.222
Silanikove N, 2000, Livest Prod Sci.	469	22.333
Hanrahan Jp, 2004, Biol. Reprod	457	26.882
Mosher Ds, 2007, Plos Genet	448	32
Newton I, 2004, Ibis	418	24.588
Kijas JW, 2012, Plos Biol.	330	36.667
Safari E, 2005, Livest Prod Sci.	322	20.125
Santos-Silva J, 2002, Livest Prod Sci.	304	16
Reale D, 2000, Anim Behav	300	14.286
Waiblinger S, 2006, Appl. Anim. Behav Sci.	287	19.133
Luikart G, 2001, P Natl Acad. Sci. Usa	284	14.Şub
Thompson DBA, 1995, Biol. Conserv	277	10.654
Joost S, 2007, Mol Ecol	267	19.071
Maclachlan NJ, 2009, J Comp Pathol	252	21

Ruckstuhl KE, 2002, Biol. Rev	234	12.316
Francisco-Ortega J, 2000, Am J Bot	229	10.905
Hanon EA, 2008, Curr Biol.	221	17
Hegarty RS, 2007, J Anim. Sci.	220	15.714
Hadfield JD, 2010, Am Nat	216	19.636
Groeneveld LF, 2010, Anim. Genet	212	19.273
Wilkins PW, 2003, J Agr Sci-Cambridge	212	11.778
Stear MJ, 1995, Parasite Immunol	203	7.808
Coltman DW, 2002, P Roy Soc B-Biol Sci.	200	10.526
Forchhammer MC, 2001, J Anim. Ecol.	195	Eyl.75
Berube CH, 1999, Ecology	176	8
Fuller RJ, 1999, Biol Conserv	176	8
Chessa B, 2009, Science	169	14.083
Kijas JW, 2009, Plos One	163	13.583
Durant JM, 2005, Ecol. Lett	161	10.062
Ruckstuhl KE, 2000, Behaviour	160	7.619
Besier RB, 2003, Aust J Exp. Agr	158	8.778
Lincoln GA, 2003, J Endocrinol	156	8.667
Cote SD, 2001, Oecologia	153	Tem.65
Gill M, 2010, Animal	152	13.818
Barker ZE, 2010, J Dairy Sci.	152	13.818
Romeyer A, 1992, Appl. Anim. Behav Sci.	150	5.172
Hamel S, 2009, J Anim. Ecol.	149	12.417
Boissy A, 1997, Physiol. Behav	147	6.125
Cluttonbrock TH, 1996, J Anim. Ecol.	139	May.56
Silanikove N, 1992, Livest Prod Sci.	137	4.724
Hayes BJ, 2013, Trends Genet	135	16.875
Chemineau P, 1992, Anim. Reprod Sci.	135	4.655
Reale D, 2009, J Evolution Biol.	133	11.083
El-Agamy EI, 2007, Small Ruminant Res	133	9.May
Singh BB, 2003, Field Crop Res	129	7.167
Van Der Most PJ, 2011, Funct Ecol.	129	12.Eyl
Mysterud A, 2002, J Anim. Ecol.	128	6.737

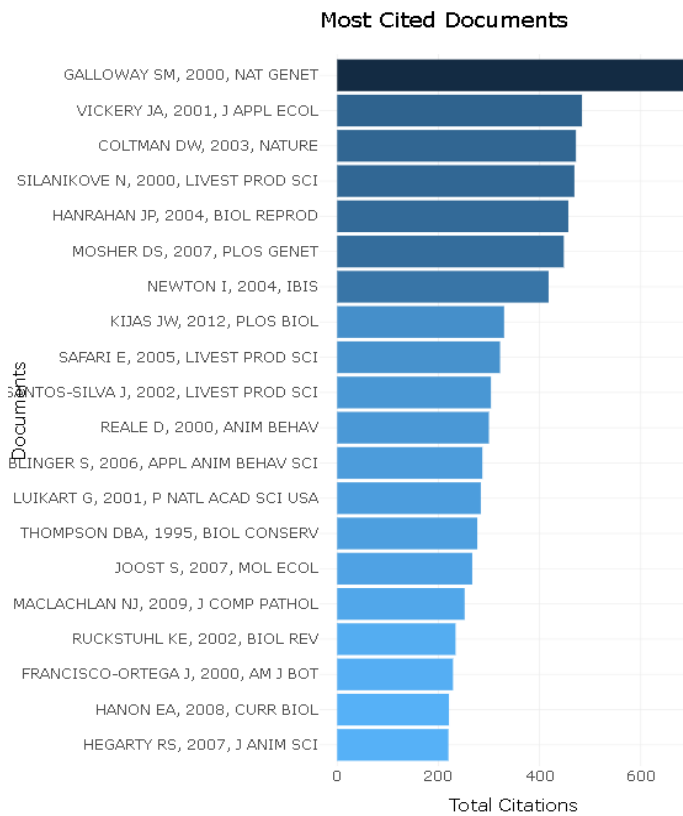


Figure 5. Most cited documents of total citations

The number of articles belonging to the countries where the responsible authors are the most contributing authors to the number of publications on "sheep" in the Web of Science database are as follows: United Kingdom (111) is the first, Australia (55) is the second, and France (53) is the third. Other countries are listed as USA (43), Italy (28), New Zealand (27) and Spain (26), respectively. It is presented in detail and clearly in Table 7 and Figure 6.

Table 7. Number of corresponding author's country documents

Country	Articles	Frequency	SCP	MCP	MCP Ratio
United Kingdom	111	0.222	81	30	0.27
Australia	55	0.110	42	13	0.236
France	53	0.106	33	20	0.377
USA	43	0.086	32	11	0.256
Italy	28	0.056	22	6	0.214
New Zealand	27	0.054	17	10	0.37
Spain	26	0.052	14	12	0.462
China	24	0.048	17	7	0.292
Canada	16	0.032	13	3	0.188
Germany	15	0.030	9	6	0.4
Norway	13	0.026	7	6	0.462
Portugal	8	0.016	5	3	0.375
Greece	7	0.014	6	1	0.143
Czech Republic	6	0.012	6	0	0
Ireland	6	0.012	2	4	0.667
Switzerland	6	0.012	3	3	0.5
Denmark	5	0.010	3	2	0.4
Mexico	5	0.010	2	3	0.6
Austria	4	0.008	2	2	0.5
Belgium	4	0.008	4	0	0
South Africa	4	0.008	4	0	0
Israel	3	0.006	2	1	0.333
Brazil	2	0.004	1	1	0.5
Egypt	2	0.004	2	0	0
Finland	2	0.004	2	0	0
Hungary	2	0.004	2	0	0
India	2	0.004	2	0	0
Iran	2	0.004	2	0	0
Netherlands	2	0.004	2	0	0
Slovakia	2	0.004	2	0	0
Sweden	2	0.004	1	1	0.5
Armenia	1	0.002	0	1	1
Chile	1	0.002	1	0	0
Colombia	1	0.002	1	0	0
Kenya	1	0.002	0	1	1
Korea	1	0.002	1	0	0
Nigeria	1	0.002	1	0	0
Poland	1	0.002	1	0	0
Russia	1	0.002	0	1	1
Saudi Arabia	1	0.002	1	0	0
Tunisia	1	0.002	0	1	1
Turkey	1	0.002	1	0	0
Uruguay	1	0.002	0	1	1

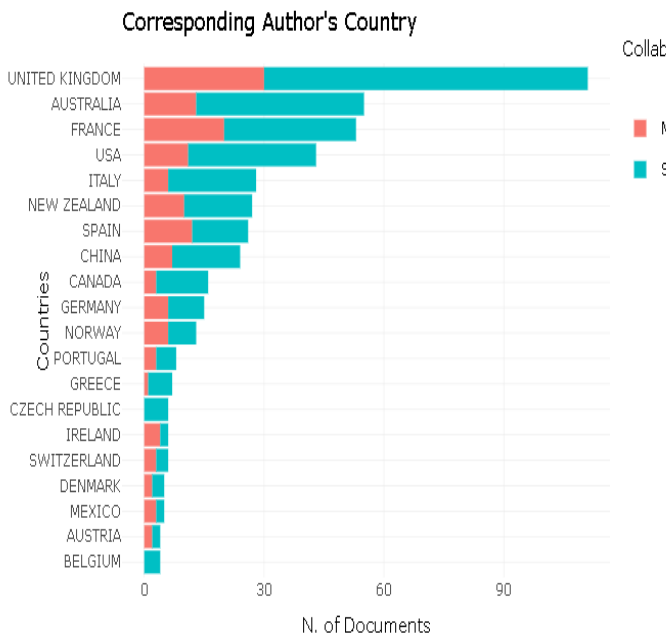


Figure 6. Number of corresponding author's country documents

The most studied fields related to "sheep" found in the Web of Science database are sheep (91), cattle (47), management (28), bighorn sheep (27) and red deer (25). The data is presented in Table 8 and Figure 7. Yearly trends of research topics are presented in Figure 8.

Table 8. Most relevant words occurrences and trend topics

Item	Frequently	Year
Sheep	91	2013
Cattle	47	2013
Management	28	2012
Bighorn Sheep	27	2009
Red Deer	25	2009
Conservation	23	2012
Selection	20	2013
Dairy-Cows	18	2012
Performance	18	2014
Behavior	18	2010
Breeding Success	17	2005
Soay Sheep	16	2008
Growth	15	2013
Population	15	2012
Evolution	14	2012
Fatty-Acid-Composition	14	2012
In-Vitro	14	2014
Haemonchus-Contortus	13	2009
Genetic-Parameters	13	2013
Quality	13	2014
Beef-Cattle	12	2014

Breed	12	2011
Reproductive Success	11	2003
White-Tailed Deer	11	2004
Gene	11	2014
Litter Size	10	2010
Population-Dynamics	9	2003
Climate-Change	9	2011
Predation	8	2009
Habitat	8	2011
Luteinizing-Hormone	8	2011
Density	8	2003
Body-Weight	8	2008
Trichostrongylus-Colubriformis	8	2011
Cows	7	2015
New-Zealand	7	2009
Grasslands	7	2007
Age	7	2000
Heather Moorland	6	2008
England	6	2005
Phenotypic Plasticity	6	2010
Sexual Selection	6	2010
Temperament	6	2007
Britain	6	2010
Life-History	6	2015
Photoperiodic Control	6	2008
Protein	5	2016
Epidemiology	5	2015
Natural-Populations	5	2008
Individual-Differences	5	2006

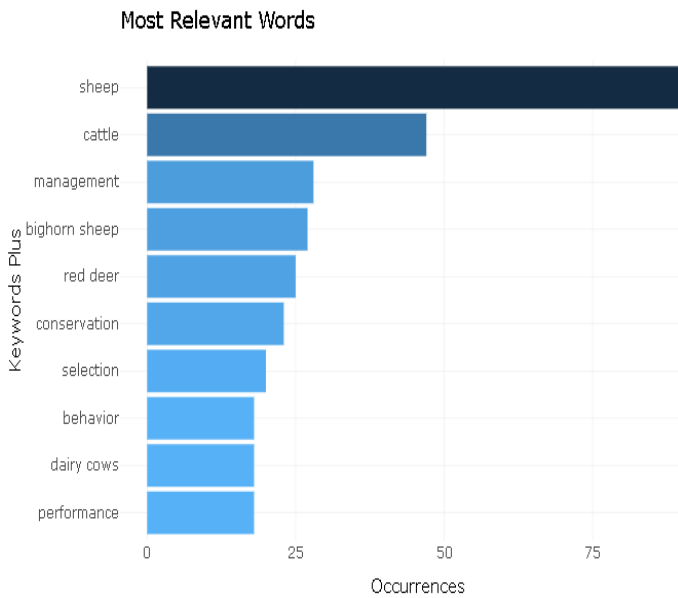


Figure 7. Most relevant words occurrences

2003	1	0	1	2	0
2004	0	0	1	1	0
2005	0	0	1	2	0
2006	0	0	1	1	0
2007	5	2	0	1	1
2008	0	0	0	0	0
2009	2	0	2	4	4
2010	3	2	1	0	1
2011	7	3	2	1	1
2012	18	6	4	1	2
2013	18	9	2	0	1
2014	7	7	3	3	2
2015	10	8	3	1	1
2016	10	2	4	1	1
2017	2	2	1	3	2
2018	2	1	0	0	1
2019	0	0	1	0	0
2020	0	0	0	0	0

Table 9. Word Dynamics (1992-2020) (continued)

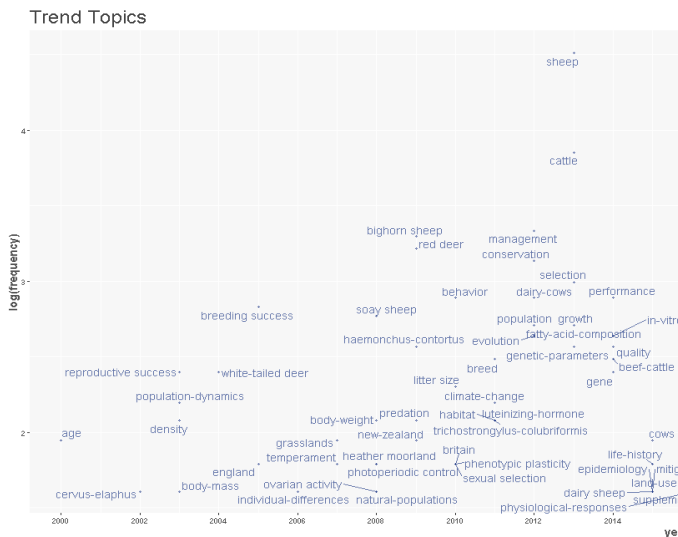


Figure 8. Trend topics

Research fields in which the sheep breeding was studied and the yearly distribution of these fields are presented in Table 9 and Figure 9.

Table 9. Word Dynamics (1992-2020)

Year	Sheep	Cattle	Management	Bighorn sheep	Red deer
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	1	1	0	0	1
1997	1	0	0	0	0
1998	0	0	0	0	0
1999	1	0	0	1	2
2000	0	1	0	2	3
2001	1	1	0	1	2
2002	2	2	1	2	0

Year	Conservation	Selection	Behavior	Dairy-cows	Performance
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	1	0	0	0	0
1996	0	0	1	0	0
1997	0	0	0	0	0
1998	1	0	0	0	0
1999	0	1	0	0	0
2000	0	0	0	0	0
2001	2	0	0	0	0
2002	1	0	0	0	0
2003	1	3	2	0	0
2004	0	0	0	0	0
2005	0	0	1	0	0
2006	0	0	0	1	0
2007	0	0	1	1	1
2008	1	0	0	1	0
2009	1	1	2	2	0
2010	1	1	2	0	0
2011	1	0	1	3	2
2012	2	3	2	2	2
2013	2	3	1	5	4
2014	6	2	1	1	4
2015	0	3	2	0	2
2016	1	2	1	1	2
2017	1	0	0	1	0
2018	1	0	1	0	1
2019	0	1	0	0	0
2020	0	0	0	0	0

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