

Business and management research trends of sustainability assessment in the food sector

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Abstract

Purpose – This study aimed to identify research trends and topics in sustainability assessment in the food sector within the scope of economics, business and management research.

Design/methodology/approach – The authors conducted a bibliometric analysis by applying a rigid and systematic research protocol, employing bibliometric techniques and a keyword co-occurrence network. Further, the Visualization of Similarities viewer software was used to analyse publications between 1994 and 2021.

Findings – The knowledge trends regarding “sustainability assessment” in the research area of business economics demonstrated a notable evolution of the topics analysed, ranging from indicators and policy analyses in agriculture and fishery sectors, to the topic of sustainability life cycle assessment (LCA) and management systems. In business and management research areas, the main theoretical frameworks used for sustainability assessment in the food sector included the triple-bottom line (TBL) and the LCA, and the main research topics were food chain logistics, bio-based products, retailers, consumption patterns and crop-based biodiesel options.

Research limitations/implications – This study employed only the WoS database and future studies could incorporate other scientific databases. Regarding future research, more emphasis could be laid on food retailers given their prevalence as demonstrated by the study and past research.

Practical implications – The findings can help all participants in the food global value chain to make better decisions to guide their sustainability efforts and assessment. Moreover, this research reveals that companies need to be actively engaged with their stakeholders and pay special attention to consumer patterns and perceptions.

Originality/value – The bibliometric research focus on business and management research areas using the Web of Sciences categories, starting from the research area of business economics to the analysis of the food sector’s sustainability assessment.

Keywords Sustainability assessment, Food, Business, Management, Bibliometric, Keyword analysis

Paper type Research paper

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Introduction

The role of businesses in the transition from a linear to a circular economy is highlighted by the [United Nations Environment Programme \(2021a,b\)](#) and is specifically related to the need for greater business and supply chain resilience, noting that there is thus a real opportunity for businesses to reduce costs, build supply chain resilience, comply with emerging policies and meet investor and customer requirements by moving toward a more circular approach. This work focuses on publications and research about sustainability assessment in the food sector in the areas of business and management within the Web of Sciences (WoS) database.

Sustainability assessment is emerging worldwide as a key decision-making tool, which coincides with the establishment of national sustainable development strategies ([Bond et al., 2012](#)). [Hacking and Guthrie \(2008\)](#) argue that sustainability assessment is best viewed as an umbrella term containing a variety of impact assessment practices. However, these authors state that international practice varies considerably depending on the legal and governance structures in place and the form of decision-making, as well as the conceptualisation of sustainability that is incorporated into the process. A growing body of literature recognises the importance of “Sustainability Assessment” ([Bond et al., 2012](#); [Bravo et al., 2021](#)), which has been an object of research since 1994. The definition is sufficiently broad: “Any process that aims to direct decision-making towards sustainability” ([Hacking and Guthrie, 2008](#)), placing emphasis on delivering positive net sustainability gains now and into the future ([Bond et al., 2012](#)).

Research to date has not yet determined research bibliometric trends in sustainability assessment in the food sector from the standpoint of business and management research categories. Our study aims to cover this gap by identifying the research trends and topics that take precedence in sustainability assessment in the food sector, with a focus on understanding the knowledge components and structure within this sector. The research questions are as follows.

- RQ1.* What is the structure of and prevalent knowledge trends on sustainability assessment in the research area of “Business Economics” and which topics are more relevant to the food sector?
- RQ2.* Which topics take precedence in the research area of “Business Economics” within the business and management categories pertaining to food’s sustainability assessment?

This study makes theoretical contributions to business and management literature by identifying the main theoretical frameworks used for sustainability assessment in the food sector, which includes the triple-bottom line (TBL) and the life cycle assessment (LCA). We contribute to the literature by identifying that food chain logistics, development of innovative bio-based products involving stakeholders, sustainability of retailers together with consumer perceptions, sustainability and food consumption patterns and the ecological footprints of crop-based biodiesel options, are the main business and management research topics in sustainability assessment in the food sector.

The rest of the paper is organised as follows: The conceptual background involves a literature review. Then, the research methodology is described, and the results, findings and discussion are presented. Finally, the conclusions, limitations and prospective future research are outlined.

Literature review

Sustainability assessment

The main papers to date, under the topic “sustainability assessment,” were identified in order to enable an investigation of the topic’s meaning, implications and the journal category (JCR) it was published under. Given the objective of the study, the conceptualisation

of “sustainability assessment” was derived from papers that had been published in the JCR categories of operations research, economics, management and education. Under these, the studies identified were by authors: [Ness et al. \(2007\)](#), [Lambrechts \(2015\)](#), and [Eslami et al. \(2021\)](#). [Ness et al. \(2007\)](#) defined sustainability assessment as “a tool that can help decision-makers and policy-makers decide which actions they should or should not take in an attempt to make society more sustainable.” [Lambrechts \(2015\)](#) also emphasises on decision-making, noting that “sustainability assessment is seen as an important tool for decision-making in a variety of contexts, as an assessment contributes to understanding the sustainability challenge in a given context, provides information on sustainability impacts, and fosters the defining of objectives.” [Eslami et al. \(2021\)](#) went beyond decision makers by including policy-makers, pointing out that sustainability assessment was a methodology that could help decision makers and policy-makers decide what actions they should and should not take in an attempt to make society more sustainable. All definitions commonly established that “sustainability assessment” is a tool and methodology for decision-making in the private and public spheres, which depends on the context and objectives of each organisation, including all stakeholders, as responsible for a more sustainable society.

A definition of sustainability assessment that can be interpolated is “a process that directs decision-making towards sustainability” ([Bond and Morrison-Saunders, 2011](#), p. 4). This definition derived from [Hacking and Guthrie \(2008\)](#), is sufficiently broad to encompass a vast range of decision-making—ranging from choices of individuals in everyday life through to projects, plans, programmes, or policies more familiarly addressed in the fields of impact assessment ([Pope et al., 2017](#)).

Food value chain

The United Nations Environment Programme ([UNEP, 2021a](#)) confirmed that businesses are key actors at most stages of the food value chain, including from farms, food processing companies, restaurants, food companies, retail, food service and consumers, the latter being amongst the most influential actors along the food value chain. Further, UNEP highlighted the business necessity to work towards accelerating the transformation to a circular economy. They proposed, amongst other actions, the necessity of involving consumers and other businesses in a bid to reduce food loss and waste; to reframe food waste and by-products as valuable resources; to facilitate secondary market development; and to increase information accessibility and data utilisation ([United Nations Environment Programme, 2021b](#)).

Methodology

While there are several thematic review methods in the literature ([Paul and Feliciano-Cestero, 2021](#)), this research used a bibliometric analysis ([Martínez-López et al., 2018](#); [Secinaro et al., 2022](#)) by applying a rigid and systematic research protocol.

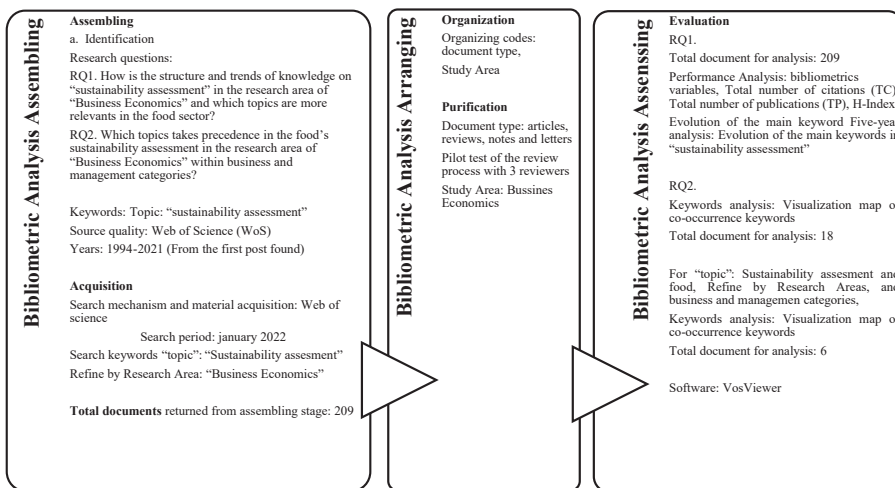
Employing bibliometric techniques and a keyword co-occurrence network, we analysed the most influential journals, papers, authors and countries, published between 1994 and 2021. We used the Web of Science (WoS) database and the Visualization of Similarities (VOS) viewer software, in the research area of “Business Economics,” focusing on “Business” and “Management” categories in the food sector.

We selected the bibliometric method due to its nature as a set of methodological knowledge for the application of quantitative techniques ([Chipp et al., 2016](#)). This analysis consists of a compiled list of articles selected from the Web of Science database, with topics related to “Sustainability assessment” and “food.” Owned by Clarivate Analytics, the WoS is a database that contains bibliographic citations and high-impact journal summaries,

and provides information analysis through Incites Benchmarking and Analytics and JCR. Hence, the WoS is a highly suitable database for this current investigation.

This study followed and applied a bibliometric map, using the “research areas” defined by WoS; in this case, we began searching under the broad area of “Social Sciences.” Research areas constitute a subject categorisation scheme that is shared by all WoS product databases, in which one can identify, retrieve and analyse documents from multiple databases that pertain to the same subject. In the research area of social sciences, we selected the subsection of “Business Economics” to conduct the first search using the keyword “sustainability assessment” for the period 1994–2021. The result of this process was refined using the WoS category of “Business” and “Management,” and at the same time, employing the keyword “food” (See Figure 1). Then, a visualisation map of co-occurring keywords was created using all the articles in the query, and the database was then processed using VosViewer Software (Van Eck and Waltman, 2010) in order to construct and visualise bibliometric networks (Small, 1973). The size of the nodes in the keywords co-occurrence analysis represents the normalised number of citations received for each item, and the thickness of the lines represents the strength of the links. The link and the proximity between the two items help identify the relationship of the citation, or co-occurrence in this case, between two units of analysis. The random colour of the nodes indicates the group with which each item is associated.

To answer RQ1, the following areas were analysed in this research: the structure of knowledge in the research area of “Business Economics” over time, relation to the WoS publications, ranking of the most influential journals, ranking of the most influential publications and authors, the most relevant countries and their respective authors and a five-year analysis of the evolution of the main keywords. The following indicators were selected to create the ranking of the most influential journals for the selected research period: H-index (Hirsch, 2005), total number of citations and the total number of publications (Martinez-Lopez et al., 2018). Next, the ranking of the most influential publications and authors was created using Total Cites index. The five-year evolution of the main keywords was studied by conducting a thematic analysis of the main keywords in sustainability assessment, in the research area of “Business Economics.” To answer which topic/s take precedence, the initial



Source(s): Author’s elaboration based on Paul and Feliciano-Cestero (2021)

Figure 1. Procedure systematic literature reviews

base of the 209 publications created was refined using the keyword “food.” The results were read and selected by two analysts, were analysed and found to meet the objectives, thereby helping derive the most cited publications. Then, using VosViewer software, a visualisation map of co-occurrence keywords was created, finally demonstrating a co-occurrence of three keywords.

To answer RQ2, using information from the previous query, the WoS categories of “management” and “business” were used as filters to identify the main journals, publications and authors. Additionally, a visualisation map of co-occurrence keywords was created.

Results

The first stage of the study involved creating the database and search criteria, which was based on the objectives of the study. The papers related to “sustainability assessment” between 1994 and 2021 were selected, yielding 4,236 results with a search date of January 18th, 2022. In continuation, a refined search was carried out by applying “Business Economics” as a filter, which yielded 218 results. This search was further refined by the type of document, be it articles, reviews, notes, or letters, finally yielding 209 results.

The structure and trends of knowledge and topics in the food sector

The evolution of WoS publications on “sustainability assessment” in the research area of “Business Economics” over time, was analysed taking into account all publications in WoS on the subject; it was found that publications referring to sustainability assessment in the research area of “Business Economics” began only in 1994, with two publications that year. Between 1995 and 2003, they did not exceed more than one publication a year. Years such as 1995, 1997, 1998, 1999 and 2002 had no related publications. However, from 2004 onwards, more publications were found, reaching some 14 studies in 2011, after which they decreased once again until 2016. From 2017 onwards, the subject under study grew more popular, achieving a boom in 2019, in which 30 publications were published. In 2021, 24 additional publications were found, leading to a total of 209 publications to date (considering January 18, 2022 as the date of elaboration of the bibliometric research).

The most influential journals of the 209 papers were identified, and the first 20 journals were selected (see Table 1). To elaborate on the most influential journals’ rankings, the following indicators were selected: H-index (Hirsch, 2005), Total number of citations and the Total number of publications (TP) (Valenzuela *et al.*, 2017). Also included was the H index (TH) for each journal, which indicates the combinations between publications and times cited and can be understood as a measure that integrates productivity and influence in the singular global indicator (Herrera *et al.*, 2009). The first journal found with the greatest relevance under the classification was “Ecological Economics,” which had a total of 42 publications, was cited 3,577 times and had an H index of 26, implying that the publications had been cited at least 26 times. This was followed by the “Energy Policy” journal with 37 publications, cited 1,504 times, with an H index of 23, implying that the publications had been cited at least 23 times. The other results can be seen in Table 1 below.

Based on the ranking of the most influential publications and authors, created by using the Total Cites index, the most influential publication on sustainability assessment in the research area of Business Economics was “Categorising tools for sustainability assessment” cited 750 times and conducted by Ness *et al.* (2007) (see Table 2). It is followed by the articles “An adaptive learning process for developing and applying sustainability indicators with local communities” by Reed *et al.* (2006) with a total of 387 citations, “A systemic framework

Ranking	Journal	TP	TC	TH	TC/TP
1	Ecological Economics	42	3,577	26	85
2	Energy Policy	37	1,504	23	41
3	Technological Forecasting And Social Change	7	203	5	29
4	Corporate Social Responsibility And Environmental Management	5	59	4	12
5	Benchmarking An International Journal	4	40	4	10
6	Business Strategy And The Environment	4	125	3	31
7	Engineering Construction And Architectural Management	4	47	4	12
8	International Journal Of Construction Management	4	32	2	8
9	International Journal Of Strategic Property Management	4	20	3	5
10	Socio Economic Planning Sciences	4	20	3	5
11	Transformations In Business Economics	4	27	2	7
12	Construction Management And Economics	3	15	2	5
13	European Journal Of Operational Research	3	193	3	64
14	Facilities	3	17	3	6
15	Inzinerine Ekonomika Engineering Economics	3	140	3	47
16	Journal Of Modelling In Management	3	2	1	1
17	Systems Research And Behavioral Science	3	81	3	27
18	Technological And Economic Development Of Economy	3	72	3	24
19	Accounting Auditing Accountability Journal	2	48	2	24
20	E M Ekonomie A Management	2	8	2	4

Source(s): Authors. Note: TP: Total Publications, TC: Total Cites, TH: H Index

Table 1.
Ranking of most influential journals in sustainability assessment, in the research area of “business economics”

for sustainability assessment” by [Sala et al. \(2015\)](#) with 266 citations and “Sustainability: an ill-defined concept and its assessment using fuzzy logic” by [Phillis and Andriantiatsaholiniaina \(2001\)](#) with 221 citations. The other results can be seen in [Table 2](#) below.

The most cited authors (360 citations in total) were [Phillis and Andriantiatsaholiniaina \(2001\)](#) from England, who had published 3 publications to date (see [Table 3](#)). Also relevant in terms of each of their publications being cited at least 3 times were Antunes P., with 3 publications and 96 citations, and Bebbington J. and Graymore M.L.M. who had 3 publications and had been cited 233 times, among others (see [Table 3](#)). The most relevant countries of publications were England (28), U.S.A. (24) and Australia (24).

The main keywords in sustainability assessment, in the research area of “Business Economics,” have evolved remarkably over time, with trends from 1994 to 2021 (see [Table 4](#)).

The initial base of 209 publications created was refined using the keyword “food.” The results were read and selected by two analysts and were found to meet the objectives while providing relevant information, thereby helping to identify the 18 papers most cited in publications under our research area (see [Table 5](#)).

Analysing the keywords of the 18 most influential publications using VosViewer software, the minimum number of occurrences of a keyword was found to be 3. The map highlights the central term “Sustainability assessment” and identified 4 clusters ([Figure 2](#)). The most relevant terms in each cluster were as follows.

Cluster 1: Sustainability assessment, Performance, Framework, Design, Strategy.

Cluster 2: Indicators, Barriers, Ranking

Cluster 3: Management, Model, TOPSIS, Systems, Supply chain, Decision-making, Quality

Cluster 4: Sustainability, Green, Perspective, Life cycle assessment, Impact, Market, Ecological footprint, China

Ranking	Source title	Title	Author	TC	Year	C/Y
1	Ecological Economics	Categorising tools for sustainability assessment	Ness, B; Urbel-Piirsalu, E; Anderberg, S; Olsson, L	750	2007	53.6
2	Ecological Economics	An adaptive learning process for developing and applying sustainability indicators with local communities	Reed, MS; Fraser, EDG; Dougill, AJ	387	2006	25.8
3	Ecological Economics	A systemic framework for sustainability assessment	Sala, S; Ciuffo, B; Nijkamp, P	266	2015	44.3
4	Ecological Economics	Sustainability: an ill-defined concept and its assessment using fuzzy logic	Phillis, YA; Andriantiatsaholiniaina, LA	221	2001	11.1
5	Tourism Management	Development of a tourism sustainability assessment procedure: a conceptual approach	Ko, TG	178	2005	11.1
6	Supply Chain Management- International Journal	Framing sustainability performance of supply chains with multidimensional indicators	Varsei, M; Soosay, C; Fahimnia, B; Sarkis, J	173	2014	24.7
7	Ecological Economics	Accounting technologies and sustainability assessment models	Bebbington, J; Brown, J; Frame, B	169	2007	12.1
8	Ecological Economics	How to compare companies on relevant dimensions of sustainability	Krajnc, D; Glavic, P	161	2005	10.1
9	Omega- International Journal Of Management Science	The state-of-the-art survey on integrations and applications of the best worst method in decision making: Why, what, what for and what's next?	Mi, XM; Tang, M; Liao, HC; Shen, WJ; Lev, B	135	2019	67.5
10	European Journal Of Operational Research	Data envelopment analysis application in sustainability: The origins, development and future directions	Zhou, HB; Yang, Y; Chen, Y; Zhu, J	129	2018	43.0
11	Energy Policy	Sustainability assessment of electricity generation technologies using weighted multi-criteria decision analysis	Maxim, A	129	2014	18.4

Table 2. Ranking of the most influential publications and authors in “sustainability assessment”, in the research area of “business economics”

(continued)

Ranking	Source title	Title	Author	TC	Year	C/Y
12	Energy Policy	Sustainability assessment of energy technologies via social indicators: Results of a survey among European energy experts	Carrera, DG; Mack, A	128	2010	11.6
13	Ecological Economics	Evaluating strategies for sustainable development: fuzzy logic reasoning and sensitivity analysis	Andriantiatsaholiniaina, LA; Kouikoglou, VS; Phillis, YA	127	2004	7.5
14	Ecological Economics	Measuring farm sustainability and explaining differences in sustainable efficiency	Van Passel, S; Nevens, F; Mathijs, E; Van Huylenbroeck, G	121	2007	8.6
15	Technological Forecasting And Social Change	Urban sewage sludge, sustainability, and transition for Eco-City: Multi-criteria sustainability assessment of technologies based on best-worst method	Ren, JZ; Liang, HW; Chan, FTS	116	2017	29.0
16	Energy Policy	An integrated life cycle sustainability assessment of electricity generation in Turkey	Atilgan, B; Azapagic, A	116	2016	23.2
17	Ecological Economics	Regional sustainability: How useful are current tools of sustainability assessment at the regional scale?	Graymore, MLM; Sipe, NG; Rickson, RE	114	2008	8.8
18	Energy Policy	Sustainability assessment of bio-ethanol production in Brazil considering land use change, GHG emissions and socio-economic aspects	Walter, A; Dolzan, P; Quilodran, O; de Oliveira, JG; da Silva, C; Piacente, F; Segerstedt, A	107	2011	10.7
19	Ecological Economics	Conceptualizing sustainable development An assessment methodology connecting values, knowledge, worldviews and scenarios	de Vries, BJM; Petersen, AC	102	2009	8.5

*(continued)***Table 2.**

Ranking	Source title	Title	Author	TC	Year	C/Y
20	Ecological Economics	Asymmetric outcomes: assessing central aspects of the biological, economic and social sustainability of a mangrove crab fishery, <i>Ucides cordatus</i> (Ocypodidae), in North Brazil	Glaser, M; Diele, K	99	2004	5.8

Table 2. Source(s): Authors. Note: TC: Total Cites, C/Y: Total Cites/Year

Country	TP	Author	Author TP	TC	TH	TC/TP
England	28	Phillis YA	3	360	3	120
USA	24	Andriantiatsaholiniaina LA	2	349	2	175
Australia	21	Bebbington J	3	233	3	78
China	19	Graymore MLM	3	233	3	78
Spain	19	Dale VH	2	108	2	54
Netherlands	15	Antunes P	3	96	3	32
India	14	Santos R	3	96	3	32
Lithuania	14	Videira N	3	96	3	32
Germany	12	Ciegis R	2	69	2	35
Italy	11	Ahmad S	2	37	2	19
Sweden	11	Bhakar V	2	24	2	12
Iran	10	Digalwar AK	2	24	2	12
Switzerland	8	Kumar A	3	23	3	8
Belgium	7	Brook BW	2	22	2	11
Canada	7	French S	2	20	1	10
Brazil	6	Cheiro S	2	18	2	9
New Zealand	6	Diaz-sarachaga JM	2	6	2	3

Table 3. Classification of main countries and main authors

Note(s): TP: Total Publications, TC: Total Cites, TH: H Index, TC/TP: total cities/total paper
Source(s): Authors

Table 4. Evolution of the main keyword five-year analysis: thematic analysis of the main keywords in sustainability assessment, in the research area of "business economics"

1994–1998	1999–2003	2004–2008	2009–2013	2014–2018	2019–2021
-Agriculture	-Fuzzy	-Indicators	-Sustainability	-Sustainability	-Sustainability
-Fishery	Assessment of	-Sustainability	Assessment	Assessment	Assessment
-Indicators	sustainability	Assessment	-Framework	-Indicators	-Performance
-Policy	-Indicators of	-Sustainability	-Indicators	-Framework	Indicators
Analysis	Sustainability	indicators	-Sustainable	-Sustainability	-Management
-Sustainability	-Sustainable	-Sustainable	development	Life-cycle	Systems
	development	development	energy	assessment	
	-Decentralised	- Sustainability			
	policy				
	-Energy policy				
	analysis				

Source(s): Authors

Ranking	Source title	Title	Author	TC	Year	C/Y
1	Ecological Economics	Measuring farm sustainability and explaining differences in sustainable efficiency	Van Passel, S; Nevens, F; Mathijs, E; Van Huylbroeck, G	121	2007	8.1
2	Energy Policy	Sustainability assessment of bio-ethanol production in Brazil considering land use change, GHG emissions and socio-economic aspects	Walter, A; Dolzan, P; Quilodran, O; de Oliveira, JG; da Silva, C; Piacente, F; Segerstedt, A	107	2011	9.7
3	Ecological Economics	Conceptualizing sustainable development An assessment methodology connecting values, knowledge, worldviews and scenarios	de Vries, BJM; Petersen, AC	102	2009	7.8
4	Ecological economics	Understanding the complementary linkages between environmental footprints and planetary boundaries in a footprint-boundary environmental sustainability assessment framework	Fang, K; Heijungs, R; De Snoo, GR	81	2015	11.6
5	Ecological Economics	Normalization in sustainability assessment: Methods and implications	Pollescha, NL; Dale, VH	64	2016	10.7
6	Ecological Economics	Opening the black box of energy throughputs in farm systems: A decomposition analysis between the energy returns to external inputs, internal biomass reuses and total inputs consumed (the Valles County, Catalonia, c.1860 and 1999)	Tello, E; Galan, E; Sacristan, V; Cunfer, G; Guzman, GI; de Molina, MG; Krausmann, F; Gingrich, S; Padro, R; Marco, I; Moreno-Delgado, D	60	2016	10.0
7	Energy Policy	Beyond commonplace biofuels: Social aspects of ethanol	Ribeiro, BE	49	2013	5.4
8	Energy Policy	Environmental sustainability of biodiesel in Brazil	Castanheira, EG; Grisoli, R; Freire, F; Pecora, V; Coelho, ST	47	2014	5.9
9	International Journal of Logistics-Research And Applications	Sustainability assessment of food chain logistics	Bloemhof, JM; van der Vorst, JGAJ; Bastl, M; Allaoui, H	39	2015	5.6
10	World Development	National Consumption and Global Trade Impacts on Biodiversity	Chaudhary, A; Brooks, TM	29	2019	9.7

(continued)

Table 5. Ranking of the most influential publications and authors in sustainability assessment, in the research area of “business economics adding the keyword “food” according to total cited

Ranking	Source title	Title	Author	TC	Year	C/Y
11	Journal of Manufacturing Technology Management	Sustainability indicators for manufacturing sectors A literature survey and maturity analysis from the triple-bottom line perspective	Ahmad, S; Wong, KY; Rajoo, S	25	2019	8.3
12	Corporate Social Responsibility And Environmental Management	Transitioning towards the bio-economy: Assessing the social dimension through a stakeholder lens	Falcone, PM; Garcia, SG; Imbert, E; Lijo, L; Moreira, MT; Tani, A; Tartiu, VE; Morone, P	24	2019	8.0
13	Ecological Economics	Weak and strong sustainability assessment in fisheries	Garmendia, E; Prelezo, R; Murillas, A; Escapa, M; Gallastegui, M	22	2010	1.8
14	Ecological Economics	An aggregate resource efficiency perspective on sustainability: A Sustainable Value application to the EU-15 countries	Ang, F; Van Passel, S; Mathijs, E	14	2011	1.3
15	Business Strategy and the Environment	Measuring Retailers' Sustainable Development	Youn, C; Kim, SY; Lee, Y; Choo, HJ; Jang, S; Jang, JI	13	2017	2.6
16	International Journal of Consumer Studies	Sustainability and dietary change: the implications of Swedish food consumption patterns 1960–2006	Geeraert, F	8	2013	0.9
17	Ecological Economics	Tradeoffs between resistance to antimicrobials in public health and their use in agriculture: Moving towards sustainability assessment	Lhernie, G; Wernli, D; Jorgensen, PS; Kenkel, D; Lawell, CYCL; Tauer, LW; Grohn, YT	6	2019	2.0
18	Technological Forecasting and Social Change	Sustainability of crop-based biodiesel for transportation in China: Barrier analysis and life cycle ecological footprint calculations	Zhang, L; Bai, WLYS	2	2021	2.0

Note(s): TC: Total Cites, C/Y: Total Cites/Year
Source(s): Authors

Table 5.

Food's sustainability assessment and business and management categories

When the search was refined and the results of food sustainability assessment were filtered using business and management categories, only six publications were obtained. The ranking of these publications is provided in [Table 6](#).

Given the objective of the study, that is to identify research trends and topics that take precedence in food sustainability assessment, the JCR categories were identified. These six publications were mainly under management and business categories, with other categories having much less representation. Using the visualisation map of co-occurring keywords

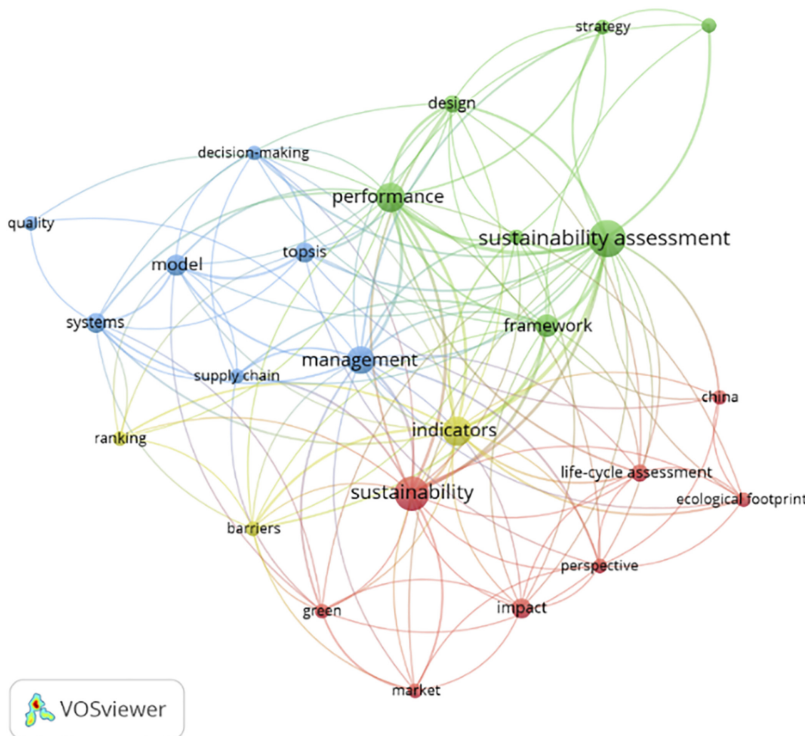


Figure 2. Visualization map of co-occurrence keywords. Bibliometric keyword analysis: “Sustainability assessment” and “Food”, filtered by research area “Business Economics”, 1994–2021 period, defining a co-occurrence of 3 keywords. Elaboration using VosViewer

under the categories of “Business” or “Management,” we found seven items, with two clusters (See [Figure 3](#)). The most relevant terms in each cluster were as follows.

Cluster 1: Sustainability assessment (Total Link Strength: 5), indicators (Total Link Strength: 5), life cycle assessment (Total Link Strength: 5) and barriers (Total Link Strength: 4).

Cluster 2: Social impacts (Total Link Strength: 4), sustainability (Total Link Strength: 3) and performance indicator (Total Link Strength: 2)

Thus, aside from the pivotal theme of “Sustainability assessment,” the map displays other related topics, with indicators and life cycle assessment demonstrating the highest Total Link Strength.

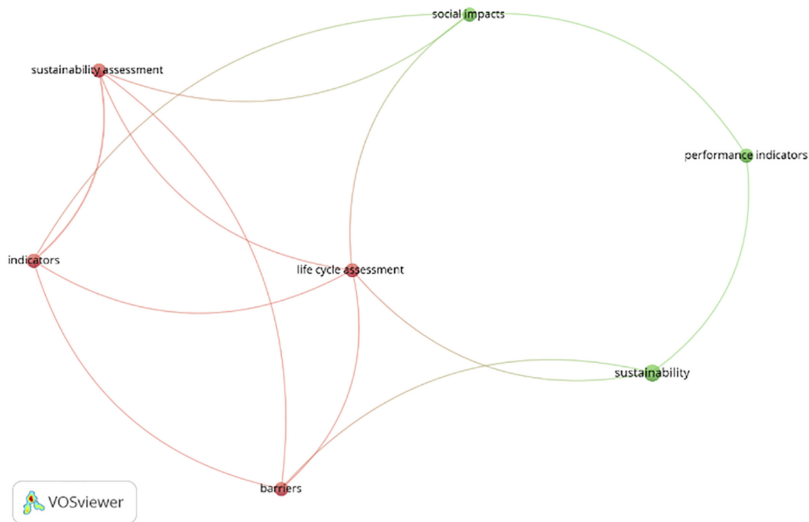
Based on [Table 6](#), a brief summary of each article was provided, beginning with a paper by [Bloemhof et al. \(2015\)](#), which explained how food chain logistics played an important role in the sustainability performance of the food sector. The authors stated that it was necessary to assess TBL performance, ideally covering the entire life of a product, to help decision-makers take the right steps toward sustainability improvement. This study aims to present and empirically apply a sustainability framework for food chain logistics to propose a structured and rational method for assessing sustainability. The framework included drivers, strategies, performance indicators, metrics and improvement opportunities to measure and potentially enhance sustainability performance. The authors concluded that Logistics Service Providers seemed to have a wait-and-see attitude towards sustainability, wherein food companies were

R	Source title	Title	Author	TC	Year	C/Y
1	International Journal of Logistics-Research And Applications	Sustainability assessment of food chain logistics	Bloemhof, JM; van der Vorst, JGAJ; Bastl, M; Allaoui, H	39	2015	5.6
2	Journal of Manufacturing Technology Management	Sustainability indicators for manufacturing sectors A literature survey and maturity analysis from the triple-bottom line perspective	Ahmad, S; Wong, KY; Rajoo, S	25	2019	8.3
3	Corporate Social Responsibility and Environmental Management	Transitioning towards the bio-economy: Assessing the social dimension through a stakeholder lens	Falcone, PM; Garcia, SG; Imbert, E; Lijo, L; Moreira, MT; Tani, A; Tartiu, VE; Morone, P	24	2019	8.0
4	Business Strategy and the Environment	Measuring Retailers' Sustainable Development	Youn, C; Kim, SY; Lee, Y; Choo, HJ; Jang, S; Jang, JI	13	2017	2.6
5	International Journal of Consumer Studies	Sustainability and dietary change: the implications of Swedish food consumption patterns 1960–2006	Geeraert, F	8	2013	0.9
6	Technological Forecasting and Social Change	Sustainability of crop-based biodiesel for transportation in China: Barrier analysis and life cycle ecological footprint calculations	Zhang, L; Bai, WLYS	2	2021	2.0

Table 6. Ranking of publications and authors on food's sustainability assessment in the research area of "business economics", within "business" and "management" categories

Source(s): Authors, Note: R: ranking, TC: Total Cites, C/Y: Total Cites/Year

Figure 3. Visualization map of co-occurrence keywords. Bibliometric keyword analysis: "Sustainability assessment" and "Food", filtered by research area "Business Economics", and filtered by WOS categories "Business" or "Management, 1994–2021 period, defining a co-occurrence of 2 keywords. Elaboration using VosViewer



more proactive at following market demands for more sustainable products. Additionally, the authors opined that collaboration regarding sustainability involvement in the food sector would be a significant topic for further research.

The second article by [Ahmad *et al.* \(2019\)](#) aims to review the indicators for the three aspects of sustainability (environment, economy, and society), using the TBL perspective for manufacturing sectors. In addition, this paper aimed to document the sustainability indicators for manufacturing sectors; perform an analysis of these indicators to show their evolutionary progress and maturity in terms of their consistent, repeated and standardised usage; and highlight the further work needed to make them more refined and standardised.

Additionally, the article titled “Transitioning towards the bio-economy: Assessing the social dimension through a stakeholder lens” ([Falcone *et al.*, 2019](#)) focused on the Social Life Cycle Assessment (SLCA) as part of the Life Cycle Sustainability Assessment (LCSA) framework. This research aimed to identify and understand the most relevant social impact categories, subcategories and indicators that should be included in the SLCA of bio-based products. The authors paid attention to the production of innovative bio-based products, which are products that are wholly or partly derived from biological materials or innovative production processes and/or innovative biomass such as food waste or forest residuals. According to participatory stakeholder involvement, a validation exercise enabled the consideration of a restricted number of social indicators so as to reduce the amount of data needed for assessment and decrease related costs.

The fourth article titled “Measuring Retailers’ Sustainable Development” ([Youn *et al.*, 2017](#)) aimed to develop a Sustainable Retailing Assessment that combined top-down and bottom-up approaches and reflected consumer perceptions of sustainable retailing. Sustainable retailing and the retailer’s role as a gatekeeper to sustainable retailing has emerged in response to an increasing demand for organic and wellness-related products. The authors stated that sustainable retailing does not relate only to the sale of sustainable products but could also include selling products, managing the retail supply chain and developing customer-facing initiatives and facilities. They created an initial sustainable retailing assessment framework and its measurement items by drawing on the existing assessments developed and verified this framework and its constituent items based on consumer perceptions.

The fifth article by [Geeraert \(2013\)](#) focuses on the environmental impact of past choices. The study aimed to report changes in food consumption patterns and analyse the consequences of these changes from a sustainability point of view. For the sustainability assessment the authors used: land requirements, greenhouse gas emissions and energy use parameters. They concluded that food production, processing and distribution had changed significantly during the period under assessment due to the increase in the consumption of animal products.

Finally, the sixth article by authors [Zhang and Bai \(2021\)](#) focused on the Life Cycle Perspective, using the ecological footprint to evaluate the sustainability of biodiesel production of five different crop-based biodiesel options. The objective of this study was to identify and prioritise the barriers and challenges that hindered the adoption and development of crop-based biodiesel as alternative vehicle fuels. It was found that biodiesel had encountered a number of barriers and challenges related to investments, feedstock supplies, transportation, refining, processing and production that blocked the adoption and promotion of biodiesel as a mature alternative vehicle fuel for low-carbon transportation. They concluded that life cycle sustainability assessment may be conducted by involving feedstock by using various biodiesel technologies, such as edible oils, non-edible oils, waste oils, algae and even transgenic oil crops.

Conclusion

Within the specific research area of Business Economics in the WoS database, sustainability assessment appeared to be an area of interest mainly since 2017, presenting a total of 209 publications between 1994 and 2021. Discourse on this subject was observed in a growing number of published articles, but it is a fairly recent issue, with the UK and USA being where most of the publications originate from.

Only two journals stood out with respect to their indicators, wherein one is associated with ecology (Ecological Economics) and the other with energy (Energy Policy). The journals that included “sustainability assessment” in the chosen research area were often multidisciplinary in nature, mainly covering economics, business, management, energy, engineering and accountability. Additionally, the journals belonged to different JCR categories. The above finding indicates that scientific research on “sustainability assessment” is a cross-cutting issue throughout the food value chain. The most outstanding publication on this subject is “Categorising tools for sustainability assessment” by the authors [Ness et al. \(2007\)](#) from the journal Ecological Economics, a publication that far outperforms the other articles identified. The myriad of knowledge trends in our area of research has seen a notable evolution in terms of the topics analysed, going from the indicators and policy analysis in agriculture and fishery sectors (1994–1998), to the topic of Sustainability Life Cycle assessment (2014–2018) and Management Systems (2019–2021).

Grouping all the information from the cluster, a trend map was developed to understand the main topics of the cluster related to food “sustainability assessment” in business economics research. Then, the components of knowledge and knowledge structure in the area were identified by visualising the citation context data as networks. The analyses uncovered an important trend in research related to “performance”, wherein the concern for processes is evident in terms of sustainable efficiency and to enhance sustainability performances. Moreover, current trends that analyse sustainability from the perspective of ecological footprint and life cycle assessment were also uncovered.

When the analysis focuses on the categories of business and management, only six articles emerged in our search, which sheds light on how this is an area in evolution, warranting further studies in order to develop sustainable food chain value. This study also highlights the importance for scientists and editors in the areas of management and business to focus their attention on the sustainability assessment of foods since both climate change and the COVID-19 crisis have revealed food as a strategic area of significance in society and global value chains.

In business and management research about sustainability assessment in the food sector, the main research topics identified are food chain logistics ([Bloemhof et al., 2015](#)); development of innovative bio-based products involving stakeholders ([Falcone et al., 2019](#)); sustainable retailing assessment based on consumer perceptions ([Youn et al., 2017](#)); environmental impact and changes in food consumption patterns ([Geeraert, 2013](#)); and ecological footprint to evaluate the sustainability of biodiesel production of crop-based biodiesel options ([Zhang and Bai, 2021](#)). The main theoretical framework used in the food’s sustainability assessment in business and management research areas are the Life Cycle Assessment (LCA) approach ([Bloemhof et al., 2015](#); [Falcone et al., 2019](#); [Zhang and Bai, 2021](#)) and TBL perspective ([Bloemhof et al., 2015](#); [Ahmad et al., 2019](#); [Falcone et al., 2019](#)).

Given the small number of publications with a focus on food sustainability assessment, deepening studies in this area—since it is mainly the companies and organisations that make the decisions when incorporating sustainability into their management—would not only satisfy consumers and stakeholders, but also contribute to a better world for future generations.

Limitations and future research

The main limitation of this research is the use of the WoS database only; future studies could incorporate other scientific databases. Sustainability assessment in the food sector from the business and management domains is an underdeveloped area that could be further explored in future research. First, future studies on sustainability assessment should focus on the middle stages of the food value chain, comprising food companies, retail and food services ([UNEP, 2021a](#)). Second, in the case of food retailers, research should analyse how to adopt this

assessment according to retailer characteristics such as online/offline, local/global and size (Youn *et al.*, 2017). Third, research on sustainability assessment should incorporate consumer perceptions, since consumers are the end-users of the food supply chain (Youn *et al.*, 2017). Fourth, more research is required on how the food value chain is adapting to the reshaping of the food environment to reduce food loss and waste (UNEP, 2021a). Finally, studies comparing different products, sectors, regions and countries would enable more effective sustainability assessments (Geeraert, 2013).

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