Drivers and barriers towards circular economy in agri-food supply chain: A review

Amina Mehmood, Shehzad Ahmed, Evi Viza, Anna Bogush, and Rana Muhammad Ayyub

Original citation & hyperlink:
Mehmood, A., Ahmed, S., Viza, E., Bogush, A. and Ayyub, R.M., 2021. Drivers and barriers towards circular economy in agri-food supply chain: A review. *Business Strategy & Development*. (In Press)
https://doi.org/10.1002/bsd2.171

DOI 10.1002/bsd2.171
ISSN 2572-3170

Publisher: Wiley

Received: 14 February 2021 | Revised: 30 April 2021 | Accepted: 30 April 2021

DOI: 10.1002/bsd2.171

RESEARCH ARTICLE

Business Strategy and Development

WILEY

Drivers and barriers towards circular economy in agri-food supply chain: A review

Amina Mehmood[1] | Shehzad Ahmed[1] | Evi Viza[2] | Anna Bogush[3] | Rana Muhammad Ayyub[4]

[1]School of Business and Creative Industries, University of the West of Scotland, Paisley, UK

[2]School of Computing, Engineering and Physical Sciences, University of the West of Scotland, Paisley, UK

[3]Centre for Agroecology, Water and Resilience (CAWR), Coventry University, Coventry, UK

[4]Department of Economics and Business Management, University of Veterinary & Animal Sciences, Lahore, Pakistan

Correspondence
Shehzad Ahmed, School of Business and Creative Industries, University of the West of Scotland, Room G326, Gardner Building, Paisley Campus, High Street, Paisley, PA1 2BE, UK.
Email: shehzad.ahmed@uws.ac.uk

Abstract

Over the past few years, the circular economy (CE) concept has captured considerable attention from researchers and practitioners as a potential solution for social, economic, and environmental challenges. But in literature, limited engagement has been given to explore the CE initiatives, particularly in the agri-food supply chain (AFSC). This paper aims to address this gap by critically reviewing the existing literature and identify the drivers and barriers for implementing the CE in the AFSC. This study uses a systematic literature review approach to critically analyse the current literature to develop future empirical research areas. The popularity of the CE drivers and barriers in the AFSC following the number of times they appeared in the research studies is examined. It shows that environmental (67%), policy and economy (47%), and financial benefits (43%) are the three top drivers. However, institutional (64%), financial (48%), and technological risks (40%) are the top three barriers in implementing CE practices in the AFSC. It is observed that there is an utmost need for international communities to introduce internationally accepted standards and frameworks for CE practices to be used globally to eliminate waste, particularly in the agriculture sector. Moreover, government intervention to stimulate CE initiatives plays a critical role in the transition process.

KEYWORDS

agri-food supply chain, barriers, circular economy, closed-loop supply chain, drivers

1 | INTRODUCTION

The concept of circular economy (CE) has captured considerable attention from academia, practitioners, and policymakers as a potential solution for social, environmental, and economic challenges of the current competitive scenario (Govindan & Hasanagic, 2018; Jawahir & Bradley, 2016; Kirchherr et al., 2017; Sassanelli et al., 2019). The changing socio-economic and regulatory landscape, resource price instability, burgeoning regulatory pressure on waste, greenhouse gas emissions, and climate change pose significant questions for the traditional linear economic business model's approach (Kalmykova et al., 2018; Nattassha et al., 2020). In contrast, CE keeps the resources in a closed-loop supply chain. It replaces the traditional linear economy of 'take-make-consume- dispose of' into a circular system including reduction, maintenances, repair, reusing, refurbishing, remanufacturing, and recycling to ensure little or zero generation of waste (Esposito et al., 2020; Gustavsson et al., 2013; Parfitt et al., 2010). This principle is operating at each level of an economy, micro (product, companies, consumers), meso level (eco-industrial parks) and at macro level (city, state, country) (Bernon et al., 2018)

with the primary objective of resource-saving and recycling. It aims to accomplish sustainable development by creating environmental and social quality and economic prosperity. This makes it an indispensable choice for the countries that want to change their economic growth pattern from extensive to an intensive one.

The CE concept and its implementation to reduce and manage waste effectively and efficiently have become critical among emerging economies. Global actors like the United Nations Environment Programme (UNEP), the Organisation for Economic Co-operation and Development (OECD), and the World Wide Fund for Nature (WWF) are actively promoting the urgency of close loop material through numerous reports and events (OECD, 2011). In Asia, China and Japan are the leading economic players who have started introducing CE policies at the national level. In Europe: Germany, Denmark, Netherlands, and the UK are taking the lead in implementing the CE policies and pilot programmes (European Commission, 2014). It has been estimated that waste reduction and reuse can bring a net saving of up to 600 billion EUR for businesses in the EU (Kalmykova et al., 2018). In contrast, CE can help in generating 50,000 jobs and €12 billion investment in the UK (European Commission, 2014). In the Netherlands, the estimated potential benefits of CE are €7.3 billion per year with the generation of 54,000 new jobs (Bastein et al., 2013).

In CE, the agri-food sector has significant potential in the transition to low carbon and climate-friendly economy. Food loss and waste (FLW) within the food supply chain's different steps are considered important contributors to overall waste production (Borrello et al., 2016). According to the Food and Agriculture Organisation, about one-third (approximately 1.3 billion tons) of all food produced in the world is lost or wasted globally (FAO, 2014). FLW is happening throughout the entire food supply chain, from farm production to final household consumption (Gustavsson et al., 2013; Kummu et al., 2012; Parfitt et al., 2010). It is estimated that at the production phase, 24–30%, while at post-harvest and consumption stages, 20% and 30–35% of global FLW happen respectively (FAO, 2014). Additionally, the growing population and increasing urbanisation also contribute to organic waste generation. Therefore, this overall waste has a significant impact on the environment, economy, and society.

Therefore, the agri-food supply chain (AFSC), which includes all the stages starting from growing, harvesting, packing, processing, transporting, marketing, and distribution, to its final consumption not only has its general risks, including social, political, cultural, and economic; but is also facing its unique vulnerability due to perishability, seasonality, weather effect, quality and safety requirements (Esposito et al., 2020; Yanes-Estévez et al., 2010). The outcomes of all these activities came in terms of food security (nutrition), socio-economic status (income and employment), and environmental factors (climate and biodiversity; van Berkum et al., 2018). These characteristics make the AFSC more complex and distinctive from the ordinary supply chain. When we come to the application of the CE framework in the agri-food sector, it also shows some unique features that can be taken as an advantage for its application (Nattassha et al., 2020). The AFSC has a natural circulation system in which biological material in a symbiotic relationship moves within the ecosystem and creates a continuous flow of matter and energy (Tseng et al., 2019). In CE, waste is considered input for the following cycle/process, which is the core idea on the biological input side and easily attainable and proven. However, it is difficult but not impossible to maintain the quality and toxicity of the waste; this process is called upcycling (Lasaridi & Stentiford, 2011). This concept of using such inputs, which are more straightforward and possible to reintroduce into the process after obtaining the valuable feedstock, covers the core principles of a restorative CE (Morseletto, 2020).

Ellen MacArthur Foundation, across various reports, has emphasised the possible advancement to a renewing food system using circular development. This system needs a systematic transformation to be regenerative, ensure negligible nutrients leakage, and sustainable local supply chains with a zero-waste goal (Macarthur, 2013). The basis of the CE revolves around using those agricultural practices which would elevate yields without deteriorating the quality of water, soil, and air. The best chance to have an ever-lasting performance is to ensure the long-term health of agricultural systems (Macarthur, 2013). The advocators of the CE have linked these ideas to AFSC to predict the future of the sustainable agri-food sector.

Despite the surge in interest from academics and practitioners to the CE, there is scarcity in the research related to circular systems in AFSCs. Before setting the stage for implementing CE initiatives in AFSC, it is crucial to identify the indicators that could ensure the successful transition from linear AFSC towards circular AFCS. Considering the lack of knowledge, this study attempts to offer detailed state-of-the-art literature to identify the drivers and barriers of circular AFSCs and provide guidelines for future research on this topic. The basic notion behind a systematic review is to systematically collect available evidence from a larger pool of publications to rationalise the problem and identify new lines of inquiry. Three research questions have guided this research process:

- *RQ1*: What is the current status of research in the agri-food sector towards CE, and why CE is essential for AFSC?
- *RQ2*: What are the drivers for CE in AFSC?
- *RQ3*: What are the barriers to CE in AFSC?

To answer the above research questions, the study is divided into five sections and is structured as follows: Section 2 justifies the need for the research; Section 3 covers the adopted literature review methodology; in Section 4, the results of the investigation are presented, first through descriptive analysis that highlights the trends in the existing literature and then by inductive qualitative content analysis approach showing the different drivers and barriers related to CE in AFSC under different themes in the examined literature; the detailed discussion on identified drivers and barriers is presented in Section 5; conclusion, limitations, and future research directions are dealt with in Section 6.

2 | LITERATURE REVIEW

In this section, the research and framework development need will be justified by summarising the existing literature on implementing CE

initiatives in AFSC. Due to the growing interest in the subject area, a rising trend is seen from 2015, and most of the literature has been published over these years. An overview of the research studies published after 2014 on CE in AFSC is given in Table 1 below, including the title, author, year of publication, and a summary of the research.

On the contrary, none of the other studies has conducted state-of-the-art literature on different drivers and barriers towards CE from the AFSC perspective. Most of the studies focus on CE in general, and only a few highlight the challenges that could hinder the CE initiatives in AFSC paradigms. These publications enabled us to bridge the gap by reviewing the currently available literature about this issue and providing guidelines for future research. Hence, the idea of this research remains novel.

3 | MATERIAL AND METHODS

This paper employs the systematic literature review approach to critically evaluate the extensive existing literature on the topic. According to Fink (2005), 'a systematic literature review (SLR) is a systematic, comprehensive and reproducible technique for identifying, evaluating, and interpreting all the available research produced by researchers and scholars relevant to a particular research question or area of interest'. The systematic literature review is an evidence-based approach that summarises and provides a deep understanding of existing literature, identifies the gap in the current research, and suggests frameworks for future research (Oguntoye & Quartey, 2020; Petticrew & Roberts, 2008; Rafi-Ul-Shan et al., 2018). Its fundamental principles such as inclusivity, transparency, exploratory and explanatory reduce business issues and provide a comprehensive overview of a search result (Denyer & Tranfield, 2009). To answer the research questions, the study adopted a modified version of the five-step approach drafted by (Denyer & Tranfield, 2009) and eight steps theorised by (de Oliveira et al., 2018; Figure 1).

In the first phase of SLR, the scope of the study and objectives were defined. The primary domain of our research was to identify the drivers and barriers of CE in AFSC. To accomplish the aim of the study, three objectives were formulated. First, identify the current CE practices in the agri-food sector and find the gaps in current research. Second, identify the opportunities in terms of drivers of CE in AFSC. Third, identify the threats in terms of barriers that could impede the process of CE in AFSC.

TABLE 1 Summary of the previous literature on the circular economy in the agri-food supply chain

Title	Author	Year	Summary of the research
Building sustainable circular agriculture in China: economic viability and entrepreneurship (Zhu et al., 2019b)	Zhu et al.	2019	This study examines the economic viability of the circular economy in the agriculture business
Barriers to circular food supply chains in China	Farooque et al.	2019	This study analyses the cause-and-effect relationships among the barriers to circular food supply chains
When challenges impede the process for circular economy-driven sustainability practices in the food supply chain	Sharma et al.	2019	This study proposed a model to tackle the challenges for the implementation of the circular economy led sustainability in food supply chains
A research challenge vision regarding the management of agricultural waste in a circular bio-based economy	Gontard et al.	2018	This study indicates key challenges to ensure sustainable agriculture by managing agricultural waste in a circular bio-based economy. Also proposed innovative holistic approaches for smart agricultural residue management strategies
Economic sustainability of biogas production from animal manure: a regional circular economy model	Yazan et al.	2018	This study examines the implementation of a circular economic business model on manure-based biogas supply chains
Food security across the enterprise: a puzzle, problem, or mess for a circular economy?	Irani & Sharif,	2018	This study investigates strategic planning as a process and tool to explore the food security challenges based on the current research on food security and waste in the food supply chain
The circular economy and agriculture: new opportunities for re-using phosphorus as fertiliser	Vollaro et al.	2016	This study illustrates an impact analysis of recycled phosphorous as fertiliser, a substitute for chemical phosphorus.
Boosting the circular economy and closing the loop in agriculture: A case study of a small-scale pyrolysis-biochar based system integrated into an olive farm in symbiosis with an olive mil	A. Zabaniotou et al.	2015	This study examines the application of the pyrolysis-biochar system to an olive farm in symbiosis with an olive mill
Sustainable Supply Chain Management and the transition towards a Circular Economy: Evidence and some Applications	Aminoff & Kettunen	2011	This study compares the performances of linear traditional and circular production system covering a range of indicators

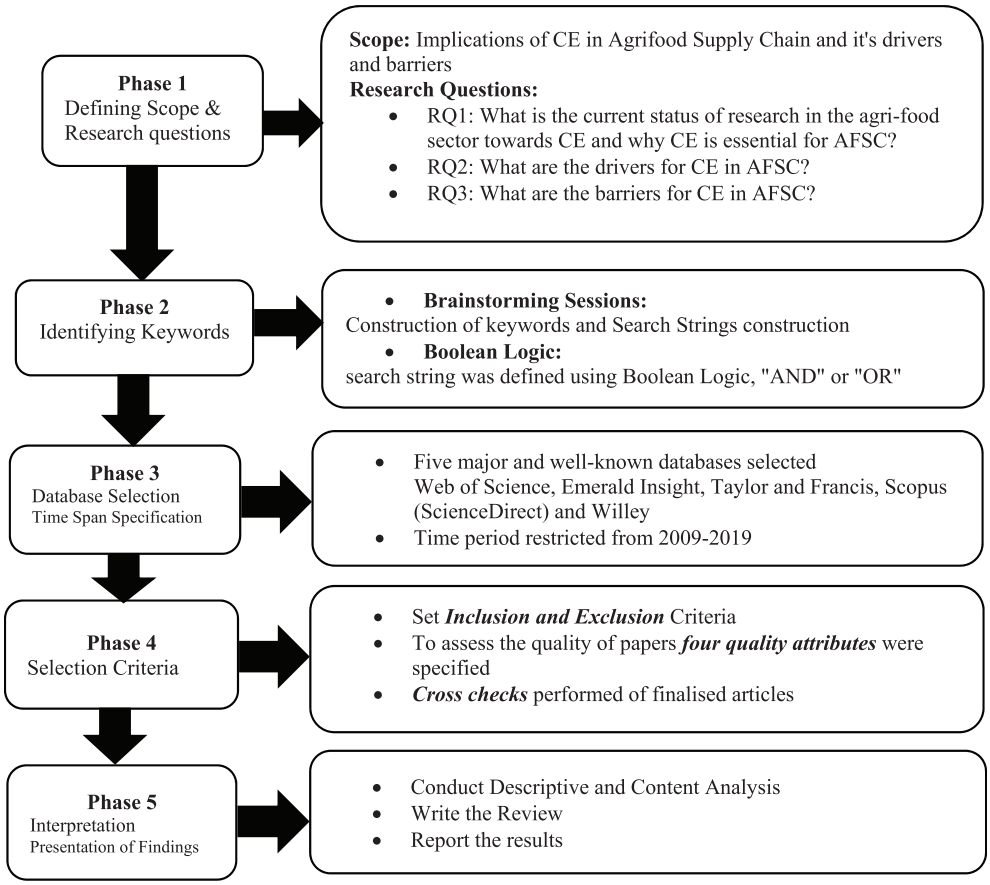


FIGURE 1 Five-step approach for conducting a systematic review

The second phase comprises the identification of the keywords relevant to the objectives and subject area. To scrutinise the literature, the structured search was carried out after multiple brainstorming sessions among the authors. Initial keywords were refined, and search string was constructed by using Boolean logic, such as 'drivers', 'enablers', 'opportunities' and 'barriers', 'obstacles', 'inhibitors', 'challenges' with terms such as CE, closed-loop supply chain, supply chain, AFSC. The search strings were continuously redefined using Boolean Logic 'AND' 'OR' with all possible combinations between the two sets of keywords in various databases.

In the third phase, selecting the most relevant online libraries for article search and publication period was included. To ensure the quality and reliability of the study, five major and well-known publisher databases were selected; *Web of Science (WoS)*, *Emerald Insight*, *Science Direct*, *Tylor and Francis*, and *Willey*. Most of the data was taken from the WoS as many studies (Aghaei Chadegani et al., 2013; Bar-Ilan, 2010; Mongeon & Paul-Hus, 2016) argue that WoS is the most extensively used database. Moreover, Oliveira et al. (2018) indicated that WoS covers 95% of the researched articles. However, the period is restricted from 2009 to 2019 (Table 2).

The fourth phase of this research consisted of inclusion and exclusion criteria. A robust funnelling process was carried out to select the articles. After an initial full-text screening of the raw researched articles, inclusion and exclusion criteria was developed. Inclusion criteria specified which article would be taken forward in the final review process. The set inclusion and exclusion criteria with their rationale are shown in Table 3.

TABLE 2 List of publisher databases

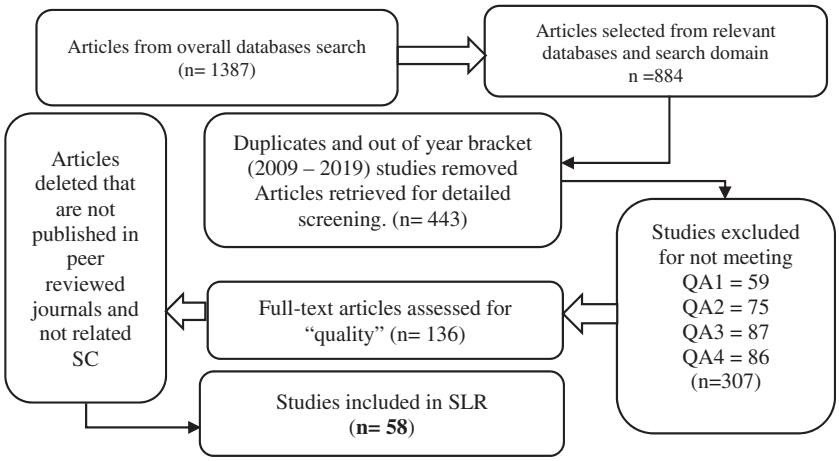
Database	No. of publications	%
Emerald	13	22
Web of Science	29	50
Science Direct	8	14
Tylor and Francis	5	9
Willey	3	5

Also, quality attributes (QA), a checklist of questions, applied to our finalised research papers. In each potential study, answers to the following questions were searched: (QA1) Does the potential research paper discuss drivers and barriers of the circular economy? (QA2) Does the selected article relate to the agri-food supply chain or supply chain? (QA3) Does the potential research study provide an overview of CE in the agri-food supply chain? (QA4) Does the research study lucidly show the study results, and are the results helpful in addressing the research questions? The contribution of all the authors in cross-checking the quality attributes of the selected publications enabled us to eliminate any potential subjective biases. It ensured the validity and reliability of the data (Figure 2).

TABLE 3 Inclusion and exclusion criteria

	Criteria	Inclusion	Exclusion	Rationale
A	Quality	Peer-reviewed journal	Books, non-peer-reviewed articles, Unpublished/grey material, Opinion articles, and Dissertations	Peer-reviewed articles were selected
B	Language	English	All other languages	English is recognised worldwide for academic publications
C	Length	Fully accessed articles	Articles not accessible with full- text	For detailed content analysis, full-text articles are essential
D	Publication date	2009–2019	Before 2009	Selection of articles that are referring to the trends over the last decade from linear to a circular economy
E	Publication type	Empirical and conceptual Studies	General articles from the newspaper, working paper or magazines	Selection of articles that provides realistic pieces of evidence, acknowledged by the academic fraternity
F	Publication focus	Articles whose research addresses the drivers and barriers of CE in the supply chain in general and AFSC in particular	Articles whose research did not consider the CE as the main topic	Selection of papers that focuses on the specific area of research interest
G	Publication scope	Articles whose research addresses closed-loop, reserve logistic, sustainability perspectives	Articles whose research addresses other organisational aspects	Selection of papers that considered one or more factors of the main subject area

FIGURE 2 Shortlisting of papers based on inclusion and exclusion criteria



The last phase is devoted to the analysis and interpretation of the key findings. Data analysis included the collection of the data and summarising the results of the chosen studies. Finally, papers were analysed for both descriptive and thematic content before discussing their key findings. Descriptive analysis majorly focused on the classification of articles by the year and the main topic of every paper. Thematic analysis identified different themes in the literature in a systematic way (Ikhlayel, 2018; Oguntoye & Quartey, 2020). According to Elo and Kyngäs (2008), content analysis provides in-depth insights into knowledge found in the existing literature.

To reach our final papers for review, initially, 884 articles were found using the keywords designed through brainstorming sessions among the authors from five databases. This number was further reduced to 443 using Boolean logic by refining the keywords. Finally, 58 articles were selected for the review by using inclusion and exclusion criteria and quality attributes. These chosen 58 articles were read in their entirety to ensure empirical relevance. The above figure concludes the whole search process to identify the most relevant articles for the analysis.

4 | DATA ANALYSIS

4.1 | Descriptive analysis

4.1.1 | Distribution of papers by year of publication

To investigate the development of the research on the CE field in the context of the AFSC and to comprehend the trends, 58 articles were finalised. These papers were distributed yearly (Figure 3). Although 2009 was the earliest year of publication, however, the number of

publications increased considerably between 2015 and 2019, but still, it was significantly higher than in the early years. This trend shows rising concern about CE with its practicalities in supply chains.

It is evident from Figure 3 that CE gained the interest of scholars and authors in 2009. This can be linked to an emerging interest in CE by China as both of these papers were published by Chinese authors about China. Chinese economic crisis was supplemented by their mounting population and the diminution in natural resources. Therefore, to cope with this alarming situation, China started working on CE to meet these challenges (Zhu et al., 2019a). In the same year, China proposed the first law on the CE, 'Circular Economy Promotion Law of the People's Republic of China'. Approval of this law ignites the interest of many researchers towards CE with a wide range of perceptions. This is also backed by the European Union's recent emphasis on transforming the economy into a greener, resilient, profit-oriented, and circular system (European Commission, 2014) and the United Nations of the Sustainable Development Goals Agenda 2030.

4.1.2 | Geographical distribution of publications

Figure 4 below represents the country-wise geographical distribution of the publications. The country of research was determined based on the author's affiliation. From Figure 3, it is evident that significant contributions are from China (13 articles), the UK (13 articles), Italy (6 articles), followed by Sweden (5 articles), and India (4 articles). France, the USA, and Brazil account for two articles each. The analysis also revealed that although China and UK share the same number of publications, China was the first to take the initiative in the CE. The interest of the UK and other European countries has increased in the following years. According to Eddy (2019), a shift from the conventional linear model towards CE has been China's foundation for improving resource productivity and eco-efficiency in the 21st century. EU has taken a greater interest in considering the number of publications from 2015 till 2019, and among EU countries, Italy has shown a more significant number of publications. This is justified because, in 2017, Italy defines its strategic position by providing a general framework for CE in a report Ministry of the Environment and Protection of Land and Sea and Ministry of Economic Development (2017).

Figure 5 shows the distribution of the publications on a broader level as a continent. This is evident from the data that the principal contribution towards the CE is from Asia and Europe, with the least work done in Africa and Australia. Europe, as a continent, has shown great interest in this concept over the last few years. This trend can be rationalised by the EU's emphasis on adopting CE models in all sectors (Petit et al., 2018). The EU took another initiative, 'Towards a circular economy: A zero waste program for Europe' (European Commission, 2014). It is also evident that Asian countries started working on the concept. Interestingly, when we look at Asian countries, China has paid particular attention to implementing CE initiatives. North

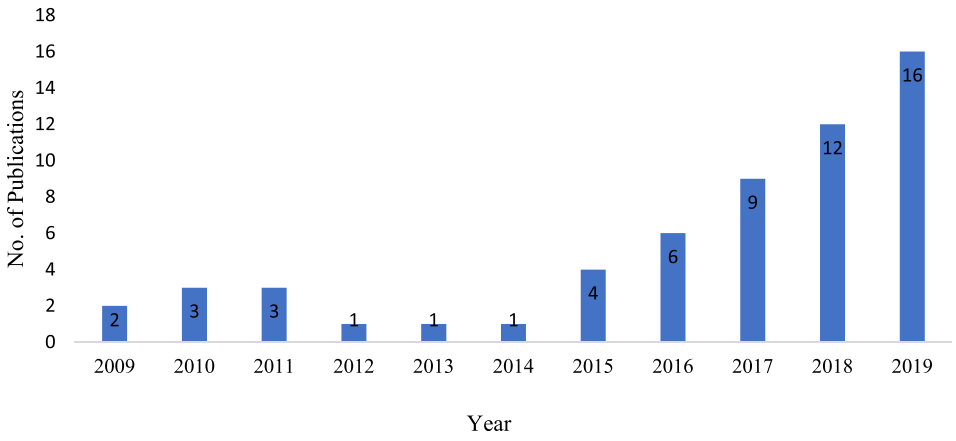


FIGURE 3 Yearly distribution of papers

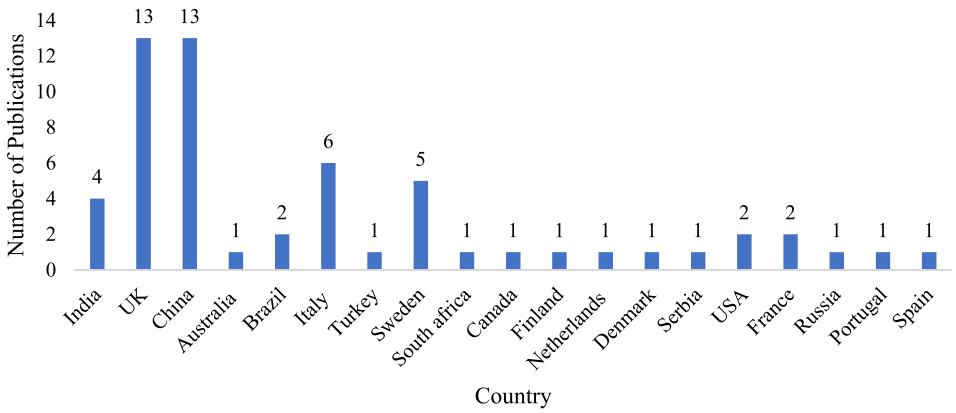


FIGURE 4 Geographical distribution of publications (country-wise)

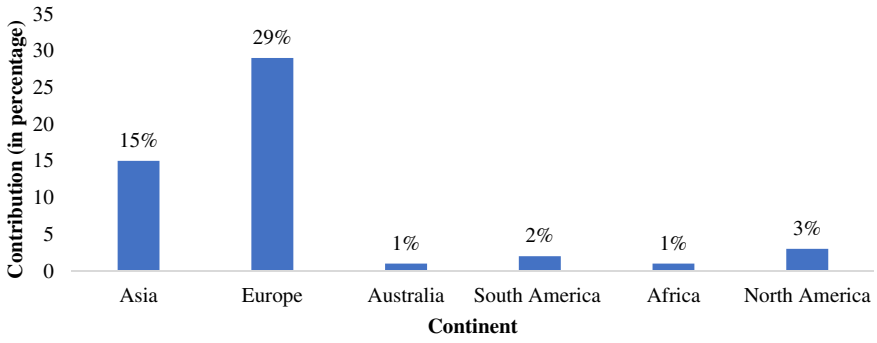


FIGURE 5 Geographical distribution of publications (continent-wise)

America (3%), South America (2%), Africa (1%), and Australia (1%) have contributed fewer works as compared to other regions.

4.1.3 | Distribution of publications by journals

Table 4 shows the distribution of articles published in different scientific journals. The journals, where less than two articles were selected, were categorised as 'Others'. It is evident from Table 4 that the journal, including the highest number of articles, is the *Journal of Cleaner Production* (*JCP*), followed by *Management Decision* (*MANAGE DECIS*). Thirty-nine journals have published various articles related to CE, which confirms the fragmentation of the literature. The predominance of papers published in the *Journal of Cleaner Productions* shows that scholars mainly studied CE as an approach in environmental and sustainability aspects.

TABLE 4 Number of articles per journal

Code	Journal name	No.
JCP	*Journal of Cleaner Production*	15
MANAGE DECIS	*Management Decision*	4
SCM	*Supply Chain Management: An International Journal*	3
JEIM	*Journal of Enterprise Information Management*	3
IJPR	*International Journal of Production Research*	3
Ω IJMS	*Omega: International Journal of Management Science*	2
ED	*Environmental Development*	2
JIE	*Journal of Industrial Ecology*	2
OTH	Others	24

4.1.4 | Industrial distribution

Figure 6 summarises the industrial sectors studied during this review, manufacturing at the top with 24%, followed by the Agriculture sector with 17%, and the environment sector with 12%. It is noteworthy that the waste sector (7% representation) is an emblematical interest for future research. Most of the raw materials used in production in different sectors are exposed to scarcity. Certain publications did not specify any particular industry taking a chunk of 29% of the total, representing that the concept is considered to be applied to multiple industries and is beyond any specific industry as perceived earlier by the authors. Other sectors offering future research opportunities with low current attention include Tourism, Fashion, Automobile, Energy, Water, and Governance.

Another sector comparison was made based on the two significant aspects of the economy: agricultural and non-agricultural, represented in Figure 7.

From Figure 7, Agriculture is a relatively new research area impacted by the globalisation of markets globally. Important to say that most of these publications were published in the last 3 years. It is mentionable that Agri-sector can benefit significantly from further development in the supply chain, especially with many small and medium-sized companies covering a significant portion of this sector. Companies that want to be more competitive should start focusing on revamping their supply chain process and ensuring minimum waste with maximum profits.

4.1.5 | Distribution of publications based on the methodology

72% of the publications finalised for review are qualitative studies, 16% are quantitative, and 12% have used a mixed-method approach, as shown in Figure 8. To effectively implement a robust supply chain model, there is a need for more quantitative, evidence-based analysis and further education and training at all levels.

Figure 9 represents the distribution of publications based on different methodological approaches used by the authors where 48% being conceptual followed by empirical with 22%, analytical compassing 17% while applied to consist of 12%.

4.2 | Content analysis

We used an inductive qualitative content analysis approach to identify the drivers and barriers related to the CE in the AFSC in the examined literature. The motivational drivers and preventive barriers are

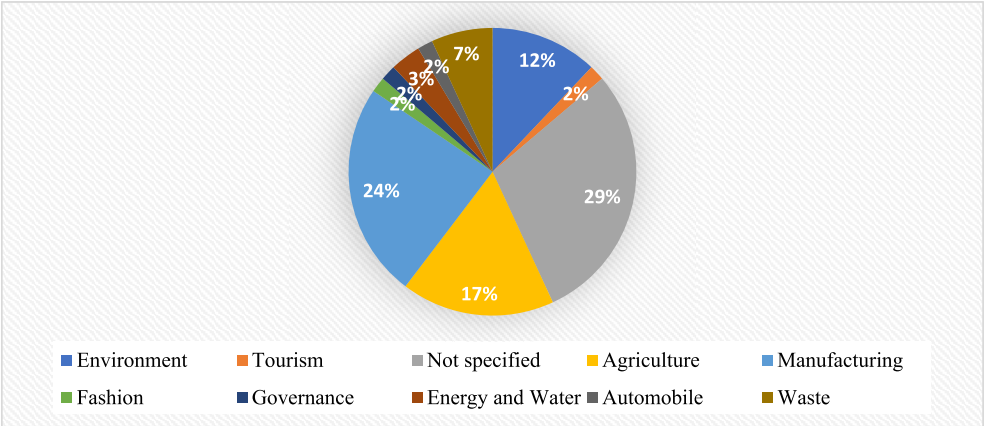


FIGURE 6 Industrial distribution

classified into themes according to their similarities and meanings. These themes include technical and non-technical enablers and CE inhibitors in AFSC and inspired by earlier classification patterns in the existing CE literature. There are six themes for drivers: policy and economy drivers, financial benefits, environmental protection, health benefits, social benefits, and product development: innovative solutions. In contrast, six themes identified under barriers are financial and economic risks, logistical and infrastructural risks, operational risks, knowledge and skills risks, technological risks, public policy, and institutional risk.

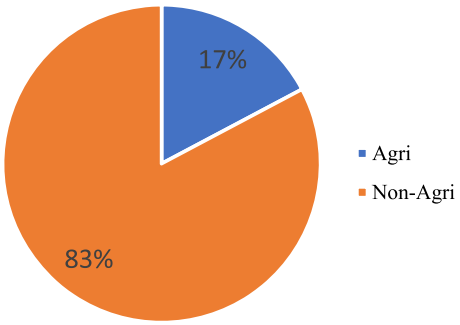


FIGURE 7 Sector-wise distribution

4.2.1 | Identification of drivers

CE implementation in the supply chain is subjected to multiple drivers from farm-to-fork-to-reuse, and it is an essential factor to identify and understand them. These drivers, with their descriptions and sources, are shown in Table 5.

In this study, we also examined the popularity of the CE drivers in AFSC following the number of times that driver appeared in the research studies. Environmental protection, potential laws, and policies for adopting CE and financial benefits came in the top ranking of popularity. The following most common drivers are social benefits and innovative products development. The percentage of driver's distribution among the articles is shown in Figure 10.

4.2.2 | Identification of barriers

Many of the studies have discussed and investigated the barriers to CE that led to sustainability in AFSC. Like drivers, barriers are also classified into different themes. These barriers, with their description and sources, are presented in Table 6.

This study also examined the popularity of CE barriers in AFSC following their frequency of appearances in the research publications. The most often appeared barrier is the institutional risk; lack of existing laws and policies play the most crucial role in hindering the transition from linear to CE. The following most appeared barriers are financial and economic risks followed by technological limitations and lack of logistical and infrastructural facilities for re-entering the waste into the cycle. The overview of the percentage distribution of barriers in articles is presented in Figure 11.

4.3 | Word cloud analysis

Word cloud analysis provides prominence to the words that appear more frequently in the literature. In this research, we also performed a word cloud analysis using Nvivo software 12. The word cloud indicates that CE, supply chain management, environment, sustainability, waste recycling, barriers, and product development are some of the most prominent words used in the literature (Figure 12).

5 | DISCUSSION

5.1 | Drivers of circular economy in agri-food supply chain

5.1.1 | Policy and economy drivers

This theme includes drivers such as laws and regulations regarding product recycling and economic growth or any government initiative

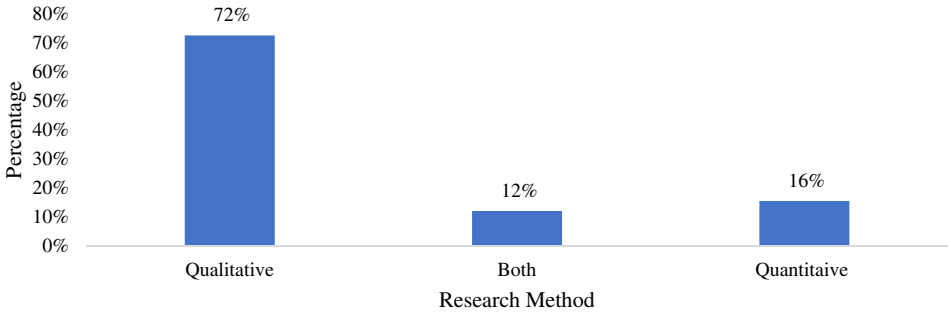


FIGURE 8 Distribution of publications by research method

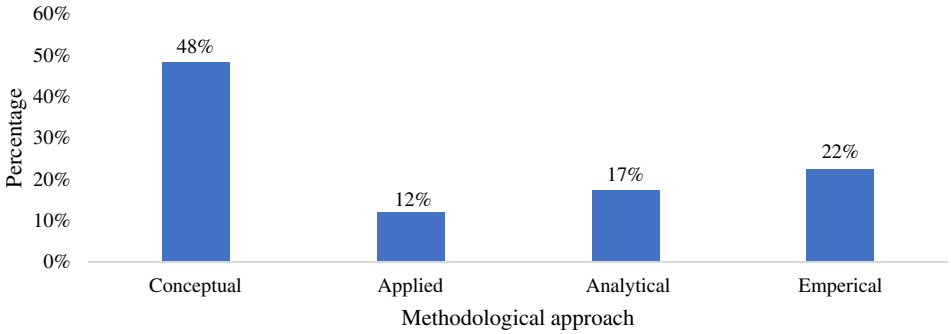


FIGURE 9 Distribution of publications based on the methodological approach

to stipulate CE implementation. In various countries, government authorities have made rules and regulations to promote cleaner production, consumption, and end-of-life management to secure resources, safety, and health (Govindan & Hasanagic, 2018). These policies are imperative drivers for implementing CE and can provide a framework for the businesses to move from linear to a circular model system (Dora et al., 2015; Park et al., 2010). Implementation of CE in AFSC could enhance the long-term revenue generation by recycling activities. Moreover, by providing credits and loans, the government can support enterprises transitioning from linear to CE pathways (Jakhar et al., 2019). The government and legislative support are fundamental in the initial phases of transition from linear to circular (Ghisellini et al., 2016).

5.1.2 | Financial drivers

This theme comprises the financial and economic benefits related to the application of the CE. Enterprises would adopt the CE initiative to pursuit higher profits and increase their market share (Gontard et al., 2018; Yazan et al., 2018). The CE initiative reduces the production waste that could increase profit margins, maintain and attract new customers, and increase the share in return on investment. A linear model of operation involves throwing the end-of-life material expensive and makes it difficult to sustain in the face of rising raw material prices, especially in the agri-food sector where perishability is a significant setback in maintaining the commodities' quality. Closing the loops and enhancing the re-use of material will reduce the demand for virgin materials and help reduce the price instability of raw materials (Jakhar et al., 2019; Zhu et al., 2019a). Beyond profit margins and cost savings, CE's potential for economic development and job creation is enormous; estimates for the UK reveals that CE could generate up to 50,000 new job opportunities in recycling, dismantling, remanufacturing, and energy from waste facilities (Environmental Services Association, 2013).

5.1.3 | Environmental protection drivers

Global warming resulting from waste produced during the production phase and greenhouse gas emissions associated with the consumption phase is a growing international concern among business fraternities and societies (Pagotto & Halog, 2016; Venkata Mohan et al., 2019). A response to the global call for sustainable development by different enterprises focused on economic growth without compromising the environment (Zahraie et al., 2016). Agriculture is the only sector that feeds the nations. The rise in temperature, variation in rainfall, and extreme weather pressure is putting pressure on the global agri-system, which is already struggling to meet the growing food and energy demand (Zhong et al., 2017). Modern agriculture helped the sector meet the increasing food demands by growing production, but it has led to the depletion of natural resources and energy faster (Pringle et al., 2016). Thus, the transition towards a CE is a strategic mean to ensure environmental protection by eliminating both agri- and non-agri waste (Barreiro-Gen & Lozano, 2020; Ilić & Nikolić, 2016; Jain et al., 2018; Sauvé et al., 2016).

5.1.4 | Health drivers

Public health has always taken for granted and is not considered a significant driver (Ilić & Nikolić, 2016). In the traditional business model,

TABLE 5 Circular economy drivers in agri-food supply chain

Drivers	Description	Sources
Policy and economy	This theme includes drivers such as laws to promote leaner production, natural resource conservation, health and safety	Eddy (2019), Geng et al. (2009), Govindan and Hasanagic (2018), Ilić and Nikolić (2016), Jain et al. (2018), Jakhar et al. (2019), Rodriguez-Anton et al. (2019), Yazan et al. (2018)
Financial benefits	This theme comprises the financial and economic benefits	Pinheiro et al. (2018), Borrello et al. (2016), Cardoso de Oliveira et al. (2019), Jakhar et al. (2019), Kalmykova et al. (2018), Yazan et al. (2018)
Environmental protection (Zhu et al., 2019b)	This theme includes ecological conservation, quality of agriculture, and the protection of renewable resources	Genovese et al. (2017), Gontard et al. (2018), Ilić and Nikolić (2016), Jun and Xiang (2011); Kirchherr et al. (2017), Koh et al. (2017), Rodriguez-Anton et al. (2019), Sharma et al. (2019), Vollaro et al. (2016), Zhu et al. (2019b)
Health benefits	This theme includes benefits related to animal and human health	Elia et al. (2016), Geng et al. (2012), Irani and Sharif (2018), Rodriguez-Anton et al. (2019)
Social benefits	This theme includes Social benefits such as Quality of life Job creation	Irani and Sharif (2018); Oliveira et al. (2018), Rodriguez-Anton et al. (2019), Silva et al. (2019), Tura et al. (2019); Zabaniotou et al. (2015)
Product development: an innovative solution	This theme refers to innovative ideas for recycled products and increases the value of products	Borrello et al. (2016), de Jesus et al. (2019), Fedotkina et al. (2019), Franklin-Johnson et al. (2016), Kazancoglu et al. (2018)

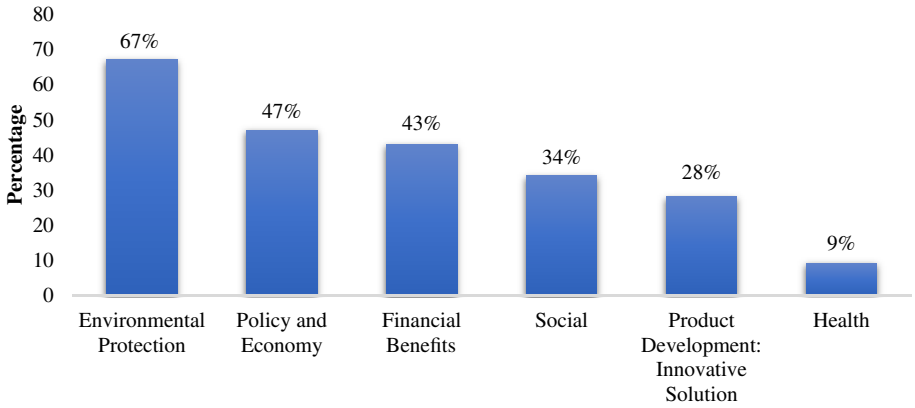


FIGURE 10 Circular economy drivers in agri-food supply chain

a large amount of food waste is directly or indirectly disposed of in the environment and, therefore, it can impact animal and public health (Permana et al., 2015). For instance, humans and animals suffer from illnesses caused by inadequate water and 20% of the diseases are related to environmental issues (Ilić & Nikolić, 2016). A shift from linear to the CE will provide an ample opportunity to yield health benefits (Elia et al., 2016; Geng & Doberstein, 2010; Rodriguez-Anton et al., 2019; Sharma et al., 2019). These benefits are both direct and indirect. The immediate benefits are savings from the healthcare sector. The indirect benefit is developing circular products with minimal environmental impacts of production and consumption, reducing greenhouse gases emission and preserving the ecosystem.

5.1.5 | Social drivers

This theme is associated with social benefits such as creating new jobs and improving the quality of life with CE practices in AFSCs. The agri-food sector is associated with significant challenges such as population growth, climate change, and food security (Irani & Sharif, 2018; Oliveira et al., 2018; Ward et al., 2016) transition from linear to CE crucial for this sector. The implementation of CE models will redesign the production units and re-engineer the whole business cycle. Consequently, this shift will have substantial effects on the overall supply chains, mainly recycling supply chains. CE can provide new job opportunities, especially at entry-level and semi-skilled jobs, to address the regional unemployment and labour market skill gap. These employment opportunities will increase society's overall welfare and living standards (Li & Li, 2011).

5.1.6 | Product development and innovative solution

Under the current linear production system, the agricultural system is wasteful. It produces tons of agri-food waste every year. The use of

TABLE 6 Circular economy barriers in the agri-food supply chain

Barriers	Description	Sources
Financial and Economic (Zhu et al., 2019b)	This theme comprises the financial and economic barriers	Pinheiro et al. (2018); Bressanelli et al. (2019), de Jesus et al. (2019), Farooque et al. (2019), Giunipero et al. (2012), Govindan and Hasanagic (2018), Kirchherr et al. (2018), Mangla et al. (2018), Sharma et al. (2019), Shi et al. (2008), Tura et al. (2019), Zhu et al. (2019b)
Public policy and Institutional	This theme refers to the lack of standard systems for performance assessment, Ineffective recycling policies to obtain high quality New laws with insufficient coordination Existing regulations that do not support the CE Unclear tax policy regarding recycled product	Borrello et al. (2016), Bressanelli et al. (2019), Farooque et al. (2019), Franklin-Johnson et al. 2016); Geng et al. (2012), Geng and Doberstein (2010), Govindan and Hasanagic (2018), Irani and Sharif (2018); Kazancoglu et al. (2018), Korhonen et al. (2018), Mcdowall et al. (2017), Petit et al. (2018), Rodriguez-Anton et al. (2019), Sharma et al. (2019)
Logistical and Infrastructural	This theme Includes issues related to reverse logistics as CE would drastically increase the transportation activities because products are sent back to the specialised site for remanufacturing.	Bernon et al. (2018), Farooque et al. (2019), Irani and Sharif (2018); Kalmykova et al. (2018), Ritzén and Sandström (2017), Sauvé et al. (2016), Tura et al. (2019)
Operational (Zhu et al., 2019b)	This theme includes concerns related to recycled products such as complex system and process of reverse logistics lack of preparation to change the product.	Bressanelli et al. (2019), Geng et al. (2009), Koh et al. (2017), Zhu et al. (2019b)
Knowledge and Skill	This theme includes lack of public awareness lack of reliable information lack of skills lack of consumer awareness of the value of recycled products.	Bressanelli et al. (2019), Fedotkina et al. (2019), Gontard et al. (2018), Kirchherr et al. (2018), Li and Yu (2011); Zabaniotou et al. (2015)
Technological	This theme includes Technological limitations Uncertainty at the end-of-life phase for products Maintaining product quality through the lifecycle of a product Challenges to maintaining durability	Aminoff and Kettunen (2011), Farooque et al. (2019), Geng and Doberstein (2010), Govindan and Hasanagic (2018), Kazancoglu et al. (2018), Oliveira et al. (2018), Rodriguez-Anton et al. (2019), Sauvé et al. (2016), Silva et al. (2019)

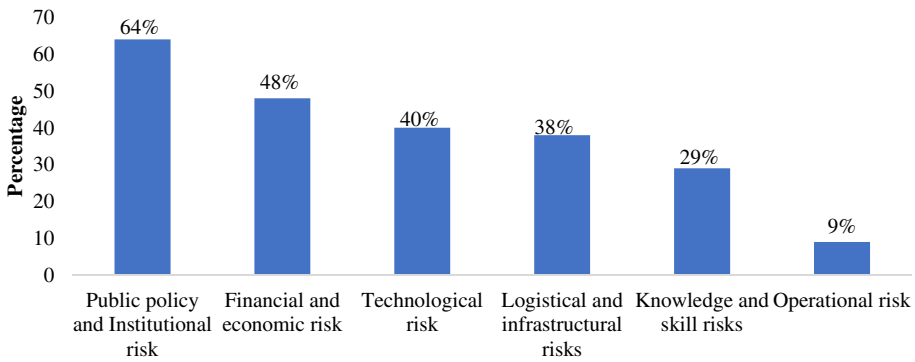


FIGURE 11 Circular economy barriers in the agri-food supply chain

FIGURE 12 Word cloud for the analysed literature

CE in the agri-food sector aims to reduce waste and make the best use of wastes by applying economically possible measures to increase remanufactured commodities. Tackling the utilisation of agri wastes (including by-products and co-products) provides a significant opportunity in the context of CE to develop innovative solution and business practices (Toop et al., 2017). For climate-friendly productivity, these innovations require support from integrated and coherent policies. This shift from linear to circular relies on many changes such as food waste reduction and more sustainable agriculture practices. It involves the change towards environmentally sensitive innovations with positive ecological effects (Colombo et al., 2019; de Jesus et al., 2019; Jabbour et al., 2015).

5.2 | Barriers of circular economy in agri-food supply chain

5.2.1 | Financial and economic barriers

The existing literature supports the primary role of cost and financial constraints that impede the implementation of CE initiatives (Kirchherr et al., 2018). There is an impression among the stakeholders that they have to bear high costs at the initial stage of CE implementation (Giunipero et al., 2012; Shi et al., 2008) agri-wastes from the market will add extra cost to their operations. High prices and low short-term economic and financial benefits are significant hindrances for implementing CE initiatives for businesses. AFSCs have already faced various financial and economic risks due to the seasonality of the production cycle. These risks affect the price, quality, availability, and accessibility of products and services. Among these, price risks are the most unpredictable, mainly in commodity markets where supply and demand conditions are continually changing at the national and international levels. Price risks are directly associated with the quality of the commodity. More financing and human capital are required to invest in inputs and collect the wastes in a shorter time because of seasonality. These direct and indirect costs are a critical obstacle in implementing CE initiatives in the AFSC (Bressanelli et al., 2019; de Jesus et al., 2019; Farooque et al., 2019). The literature also supports that the low prices of many virgin materials and expensive recycling materials impeded CE initiatives (Rizos et al., 2015).

5.2.2 | Public policy and institutional barriers

Public policy and Institutional risks, directly and indirectly, affect the implementation of the CE practices in terms of incentives and decision-making in AFSC. The existing laws on CE are not very strong. There is no standard system that can analyse the effectiveness of the proposed rules. The ineffective institutional policies and lack of legal regulations on collecting and treating waste impede the transition from linear to circular. Also, inadequate government agencies' support and encouragement with a lack of technical capacity to enforce the effective shift towards CE is a significant bottleneck (Kirchherr et al., 2017; Zhu et al., 2019b). An inadequate association to support businesses causes hindrance in the transition process (Mathiyazhagan et al., 2013).

Moreover, the existing taxation system does not support the CE paradigms (Zabaniotou & Kamaterou, 2019). The literature also supports that the lack of financial incentives is also a significant obstacle for CE in the AFSC (Stahel, 2016). The lack of public science-based policies and subsidies increases the funding gap for developing the agriculture economy (Chen & Liu, 2017; Mcdowall et al., 2017; Sharma et al., 2019). The transition from linear to the CE in the agriculture sector cannot be materialised without sufficient capital investment and making the government role more crucial in this transition.

5.2.3 | Logistical and infrastructural barriers

In reverse logistics and infrastructure activities, the AFSC faces numerous issues, and mainly the return flows uncertainty related to quantity, quality, mix, time, and place of return goods (Alfonso-Lizarazo et al., 2013). The principal amount of the commodities sold by original producers never returns; the waste's low collection rate and lack of waste treatment facilities further increase the uncertainty (Ranta et al., 2018). Moreover, the time and place of the collection are also crucial challenges. These uncertainties decrease the probability of getting desired economies of scale and are significant setbacks for implementing CE initiatives. It is also noted that the failure in logistics is transmitted to the entire supply chain (Larson & Halldorsson, 2004). Access to reliable and affordable transport and communications are crucial factors for enterprises moving towards CE transitions (Bernon et al., 2018; van Berkum et al., 2018).

5.2.4 | Operational barriers

Operational barriers originate from the operations. It refers to the enterprise's truncated ability to produce and supply goods and

services due to the breakdown of operating and manufacturing capabilities (Bressanelli et al., 2019). In agri-food supply, operational risks include farm planning, inventory management of perishable goods, and food distribution. Lack of CE framework related to tackling operational uncertainties impedes CE transformation (Koh et al., 2017).

5.2.5 | Knowledge and skill barriers

The implementation of the CE initiatives in the AFSC requires technical knowledge and skills. Lack of awareness and understanding about the impacts of CE in terms of improved commodities and network design of circular products to foster the reuse, remanufacturing, and recycling of the goods are considered one of the barriers in the transition of CE practices. It is interesting that most of the stakeholders only know the term 'circular economy' but do not understand its meaning, particularly in the agriculture sector. On the other hand, skills can facilitate enterprises to design their products based on CE principles regarding reuse and recycling (Fedotkina et al., 2019; Mangla et al., 2018; Rodriguez-Anton et al., 2019). Lack of technical skills and training capabilities can be a significant obstacle in the effective adoption of CE initiatives (Gontard et al., 2018; Kirchherr et al., 2018).

5.2.6 | Technological barriers

We face global environmental damage issues, natural resources depletion, and climate change; the agri-sector is directly prone to these issues (Tsolakis et al., 2014). The development of technology can tackle these issues (Farooque et al., 2019). The availability of relevant technology is a prerequisite for CE implementation (Geng & Doberstein, 2010). According to the relevant studies, this prerequisite is not fulfilled yet and stands as one of the core barriers to implement the CE initiatives (Govindan & Hasanagic, 2018; Kirchherr et al., 2018; Ritzén & Sandström, 2017; Silva et al., 2019). Food commodities having a shorter life span is an added disadvantage to storage and quality damage issues. The uncertainty at the end of the life phase and maintaining the quality of the food commodities makes CE practices more questionable in the absence of relevant technological innovations.

6 | CONCLUSIONS

AFSC is one of the most critical industries in terms of economic returns. To maintain the industry competitiveness, preserve the natural resources, and lesson the environmental afflictions created by it, an efficient and sustainable system is fundamental. Moreover, the soaring growth rate of the world population exerting more pressure on natural resources, and this population pressure making the shift from the traditional linear system to a CE imperative. This great need urges the researchers to explore the initiatives of implementation of CE principles in AFSC.

The systematic review approach designed by Denyer and Tranfield (2009) and Oliveira et al. (2018) was adopted to examine the relevant studies conducted on CE in general and in AFSC particular. The research was narrowed to 58 papers from 884 papers identified by initial electronic analysis using Boolean logic through the keywords. These papers were chosen for the review after applying inclusion and exclusion criteria and quality attributes. Existing CE practices in AFSC particularly and the importance of its implication and the research gaps were identified. The various drivers and barriers relevant to the application of CE in AFSC were also identified. In general, the literature depicted that the CE concept is attaining momentum worldwide among both developed and developing nations for its novel pathway towards sustainable development. But despite growing attention, it was found that CE still has limited implementation. The overall contribution of this study is to obtain insight into the factors affecting the adoption of CE in AFSC.

A qualitative content analysis was used to increase the validity and reliability of the results. The drivers and barriers were divided into different themes based on CE aspects. Drivers are categorised into six themes (i.e., policy and economy, financial, environmental, health, social, and innovation). In contrast, barriers were also classified into six themes (i.e., institutional, economic, logistical and infrastructural, operational, technological, knowledge, and skill risks). Based on the results, it was found that government intervention to stipulate CE initiatives' adoption plays a critical role identified as the second primary driver in the study. We also found that the adopting CE approach in AFSC, environmental restoration, is a significant driver in this analysis. Most agricultural products rely on many environmental factors, including climate, terrain, soil, water, etc. Financial benefits in terms of perusing the highest profit by consuming the waste and reuse of it as a 'green' economy emerged in the literature as the third most crucial driver, which can be an essential factor in attaining economies of scale in this rapidly changing and volatile industry. The lack of consumer's and producer's awareness and interest leads the innovative solution and social benefits at least ranking in the literature, which also depends indirectly on government intervention.

The findings depict that finance has been appeared to be the most persistent vital barrier. The high upfront investment costs regarding the implementation of CE practices generally increase the government's role in providing support and require subsidies. Enterprises are mostly profit-oriented, and profits come before environmental impacts; it is for the government to impose laws and policies that the businesses should follow. Lack of waste treatment facilities and insufficient availability of relevant technology is a crucial challenge for CE transition. Inadequate infrastructure facilities in reverse logistics are the fourth significant barrier in adopting CE initiatives, and this failure is transmitted throughout the entire supply chain. Meanwhile, a lack of knowledge and skills and hesitant company culture is among the pressing barriers limiting CE implementation. The operational risks rank as minor persistent barriers in the existing literature.

Furthermore, this study has various limitations. The main limitation is the choice of methodological approach adopted. The selection

of keywords, inclusion, and exclusion criteria is a subjective component in the search string that may influence the results. Hence the study gives a helicopter view of the drivers and barriers regarding CE for AFSC but remains silent for intra-sector investigation. Consequently, product-based analysis can provide the most appropriate tools and models for implementing CE initiatives in each SC.

Moreover, it is clear that AFSC is more complex than the other SCs and creates a closed-loop supply chain in the agri-food sector; future research should be more concentrated on integrating CE principles at different stages of the supply chain with strong empirical evidence. Therefore, future research could also focus on the final stages of AFSC in the CE perspective, which is less explored in the current literature.

ORCID

Amina Mehmood https://orcid.org/0000-0003-0675-6186
Shehzad Ahmed https://orcid.org/0000-0003-0514-1315
Evi Viza https://orcid.org/0000-0001-5452-5951
Anna Bogush https://orcid.org/0000-0003-2992-6926
Rana Muhammad Ayyub https://orcid.org/0000-0001-7724-8264

REFERENCES

Aghaei Chadegani, A., Salehi, H., Md Yunus, M. M., Farhadi, H., Fooladi, M., Farhadi, M., & Ale Ebrahim, N. (2013). A comparison between two main academic literature collections: Web of science and Scopus databases. *Asian Social Science*, *9*(5), 18–26. https://doi.org/10.5539/ass.v9n5p18

Alfonso-Lizarazo, E. H., Montoya-Torres, J. R., & Gutiérrez-Franco, E. (2013). Modeling reverse logistics process in the agro-industrial sector: The case of the palm oil supply chain. *Applied Mathematical Modelling*, *37*(23), 9652–9664. https://doi.org/10.1016/j.apm.2013.05.015

Aminoff, A., & Kettunen, O. (2011). Sustainable supply chain management in a circular economy – towards supply circles Literature Review.

Bar-Ilan, J. (2010). Citations to the "Introduction to informetrics" indexed by WOS, Scopus and Google Scholar. *Scientometrics*, *82*(3), 495–506. https://doi.org/10.1007/s11192-010-0185-9

Barreiro-Gen, M., & Lozano, R. (2020). How circular is the circular economy? Analysing the implementation of circular economy in organisations. *Business Strategy and the Environment*, *29*(8), 3484–3494. https://doi.org/10.1002/bse.2590

Bastein, T., Roelofs, E., Rietveld, E., & Hoogendoorn, A. (2013). Opportunities for a circular economy in The Netherlands. Report commissioned by The Netherlands Ministry of Infrastructure and Environment. Retrieved from https://www.tno.nl/media/8551/tno-circular-economy-for-ienm.pdf

Bernon, M., Tjahjono, B., & Ripanti, E. F. (2018). Aligning retail reverse logistics practice with circular economy values: An exploratory framework. *Production Planning and Control*, *29*(6), 483–497. https://doi.org/10.1080/09537287.2018.1449266

Borrello, M., Lombardi, A., Pascucci, S., & Cembalo, L. (2016). The seven challenges for transitioning into a bio-based circular economy in the agri-food sector. *Recent Patents on Food, Nutrition & Agriculture*, *8*(1), 39–47. https://doi.org/10.2174/2212798408011603041 4939

Bressanelli, G., Perona, M., & Saccani, N. (2019). Challenges in supply chain redesign for the circular economy: A literature review and a multiple case study. *International Journal of Production Research*, *57*(23), 7395–7422. https://doi.org/10.1080/00207543.2018.1542176

Cardoso de Oliveira, M. C., Machado, M. C., Chiappetta Jabbour, C. J., & Lopes de Sousa Jabbour, A. B. (2019). Paving the way for the circular economy and more sustainable supply chains. *Management of Environmental Quality: An International Journal*, *30*(5), 1095–1113. http://doi.org/10.1108/meq-01-2019-0005

Chen, Q., & Liu, T. (2017). Biogas system in rural China: Upgrading from decentralised to centralised? *Renewable and Sustainable Energy Reviews*, *78*(May), 933–944. https://doi.org/10.1016/j.rser.2017.04.113

Colombo, L. A., Pansera, M., & Owen, R. (2019). The discourse of eco-innovation in the European Union: An analysis of the eco-innovation action plan and horizon 2020. *Journal of Cleaner Production*, *214* (2019), 653–665. https://doi.org/10.1016/j.jclepro.2018.12.150

de Jesus, A., Antunes, P., Santos, R., & Mendonça, S. (2019). Eco-innovation pathways to a circular economy: Envisioning priorities through a Delphi approach. *Journal of Cleaner Production*, *228*, 1494–1513. https://doi.org/10.1016/j.jclepro.2019.04.049

Denyer, D., & Tranfield, D. (2009). Producing a systematic review. In D. A. Buchanan & A. Bryman (Eds.)., *The SAGE handbook of organizational research methods* (pp. 671–689) London: Sage Publications.

Dora, M., Bhatia, M. S., & Gallear, D. (2015). *Supply chain in a circular economy: A multidimensional research agenda* (p. 5). International Conference on Green Supply Chain.

Eddy, R. (2019). The circular economy. *Building Engineer*, *1*, 298–309. https://doi.org/10.36661/2596-142x.2019v1i1.10902

Elia, V., Gnoni, M. G., & Tornese, F. (2016). Measuring circular economy strategies through index methods: A critical analysis. *Journal of Cleaner Production*, *142*, 2741–2751. https://doi.org/10.1016/j.jclepro.2016.10.196

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x

Environmental Services Association. (2013). *Going for growth: A practical route to a circular economy* (pp. 1–16). Retrieved from http://www.esauk.org/esa_reports/Circular_Economy_Report_FINAL_High_Res_For_Release.pdf

Esposito, B., Sessa, M. R., Sica, D., & Malandrino, O. (2020). Towards circular economy in the agri-food sector. A Systematic literature review. *Sustainability*, *12*(18), 1–2. http://doi.org/10.3390/su12187401

European Commission. (2014). Communication from the commission – Towards a circular economy: A zero waste programme for Europe. *European Commission*, *398*, 1–14 Retrieved from https://ec.europa.eu/environment/circular-economy/pdf/circular-economy-communication.pdf

FAO. (2014) *Food Wastage Footprint: Fool cost-accounting*, *Food and Agriculture Organization of the United Nations (FAO)*. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwjYgbWn0pDKAhWHCI4KHUlyCEUQFggoMAE&url=http://www.fao.org/3/a-i3991e.pdf&usg=AFQjCNH7yX7VQI_OF8sfkIIR3yUbjJG06w&sig2=uKA9X-6f2YpJF4i-ZgmBcw&bvm=bv.110151844.d.c2E

Farooque, M., Zhang, A., & Liu, Y. (2019). Barriers to circular food supply chains in China. *Supply Chain Management*, *24*(5), 677–696. https://doi.org/10.1108/SCM-10-2018-0345

Fedotkina, O., Gorbashko, E., & Vatolkina, N. (2019). Circular economy in russia: Drivers and barriers for waste management development. *Sustainability*, *11*(20), 11-18. http://doi.org/10.3390/su11205837

Fink, A. (2005). *Conducting Research Literature Reviews: From the Internet to Paper* (2nd ed.). Thousand Oaks, California: Sage Publications.

Franklin-Johnson, E., Figge, F., & Canning, L. (2016). Resource duration as a managerial indicator for Circular Economy performance. *Journal of Cleaner Production*, *133*, 589–598. http://doi.org/10.1016/j.jclepro.2016.05.023

Geng, Y., & Doberstein, B. (2010). Developing the circular economy in China: Challenges and opportunities for achieving 'leapfrog development. Developing the circular economy in China: Challenges and opportunities for achieving "leapfrog development"', 4509. https://doi.org/10.3843/SusDev.15.3

Geng, Y., Fu, J., Sarkis, J., & Xue, B. (2012). Towards a national circular economy indicator system in China: an evaluation and critical analysis. *Journal of Cleaner Production*, *23*(1), 216–224. https://doi/org/10.1016/j.jclepro.2011.07.005

Geng, Y., Zhu, Q, Doberstein, B., & Fujita, T. (2009). Implementing China's circular economy concept at the regional level: A review of progress in Dalian, China. *Waste Management*, *29*(2), 996–1002. https://doi/org/10.1016/j.wasman.2008.06.036

Genovese, A., Acquaye, A. A., Figueroa, A., & Koh, S. C. L. (2017). Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. *Omega*, *66*, 344–357. http://doi.org/10.1016/j.omega.2015.05.015

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007

Giunipero, L. C., Hooker, R. E., & Denslow, D. (2012). Purchasing and supply management sustainability: Drivers and barriers. *Journal of Purchasing and Supply Management*, *18*(4), 258–269. https://doi.org/10.1016/j.pursup.2012.06.003

Gontard, N., Sonesson, U., Birkved, M., Majone, M., Bolzonella, D., Celli, A., Angellier-Coussy, H., Jang, G. W., Verniquet, A., Broeze, J., Schaer, B., Batista, A. P., & Sebok, A. (2018). A research challenge vision regarding management of agricultural waste in a circular bio-based economy. *Critical Reviews in Environmental Science and Technology*, *48*(6), 614–654. https://doi.org/10.1080/10643389.2018.1471957

Govindan, K., & Hasanagic, M. (2018). A systematic review on drivers, barriers, and practices towards circular economy: A supply chain perspective. *International Journal of Production Research*, *7543*, 1–34. https://doi.org/10.1080/00207543.2017.1402141

Gustavsson, J., Cederberg, C., Sonesson, U., & Emanuelsson, A. (2013). The methodology of the FAO study: "Global Food Losses and Food Waste – extent, causes and prevention" - FAO, 2011 (SIK Report No. 857). Retrieved from https://www.diva-portal.org/smash/get/diva2:944159/FULLTEXT01.pdf

Irani, Z., & Sharif, A. M. (2018). Food security across the enterprise: a puzzle, problem or mess for a circular economy? *Journal of Enterprise Information Management*, *31*(1), 2–9. https://doi.org/10.1108/JEIM-03-2017-0045

Ikhlayel, M. (2018). Indicators for establishing and assessing waste management systems in developing countries: A holistic approach to sustainability and business opportunities. *Business Strategy and Development*, *1*(1), 31–42. https://doi.org/10.1002/bsd2.7

Ilić, M., & Nikolić, M. (2016). Drivers for development of circular economy – A case study of Serbia. *Habitat International*, *56*, 191–200. https://doi.org/10.1016/j.habitatint.2016.06.003

Jabbour, C. J. C., Neto, A. S., Gobbo, J. A., Ribeiro, M. D. S., & De Sousa Jabbour, A. B. L. (2015). Eco-innovations in more sustainable supply chains for a low-carbon economy: A multiple case study of human critical success factors in Brazilian leading companies. *International Journal of Production Economics*, *164*, 245–257. https://doi.org/10.1016/j.ijpe.2014.11.015

Jain, S., Jain, N. K., & Metri, B. (2018). Strategic framework towards measuring a circular supply chain management. *Benchmarking*, *25*(8), 3238–3252. https://doi.org/10.1108/BIJ-11-2017-0304

Jakhar, S. K., Mangla, S. K., Luthra, S., & Kusi-Sarpong, S. (2019). When stakeholder pressure drives the circular economy: Measuring the mediating role of innovation capabilities. *Management Decision*, *57*(4), 904–920. https://doi.org/10.1108/MD-09-2018-0990

Jawahir, I. S., & Bradley, R. (2016). Technological elements of circular economy and the principles of 6R-based closed-loop material flow in sustainable manufacturing. *Procedia CIRP*, *40*, 103–108. https://doi.org/10.1016/j.procir.2016.01.067

Jun, H., & Xiang, H. (2011). Development of circular economy is a fundamental way to achieve agriculture sustainable development in China. *Energy Procedia*, *5*, 1530–1534. http://doi.org/10.1016/j.egypro.2011.03.262

Kalmykova, Y., Sadagopan, M., & Rosado, L. (2018). Circular economy - from review of theories and practices to development of implementation tools. *Resources, Conservation and Recycling*, *135*, 190–201. https://doi.org/10.1016/j.resconrec.2017.10.034

Kazancoglu, Y., Kazancoglu, I., & Sagnak, M. (2018). A new holistic conceptual framework for green supply chain management performance assessment based on circular economy. *Journal of Cleaner Production*. Elsevier Ltd, *195*, 1282–1299. https://doi.org/10.1016/j.jclepro.2018.06.015

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M. (2018). Barriers to the circular economy: Evidence from the European Union (EU). *Ecological Economics*, *150*, 264–272. https://doi.org/10.1016/j.ecolecon.2018.04.028

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Resources, Conservation & Recycling Conceptualising the circular economy: An analysis of 114 definitions, *127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Koh, S. C. L., Gunasekaran, A., Morris, J., Obayi, R., & Ebrahimi, S. M. (2017). Conceptualising a circular framework of supply chain resource sustainability. *International Journal of Operations and Production Management*, *37*(10), 1520–1540. https://doi.org/10.1108/IJOPM-02-2016-0078

Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. *Journal of Cleaner Production*, *175*, 544–552. https://doi/org/10.1016/j.jclepro.2017.12.111

Kummu, M., de Moel, H., Porkka, M., Siebert, S., Varis, O., & Ward, P. J. (2012). Lost food, wasted resources: Global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use. *Science of the Total Environment*, *438*, 477–489. https://doi.org/10.1016/j.scitotenv.2012.08.092

Larson, P. D., & Halldorsson, A. (2004). Logistics versus supply chain management: An international survey. *International Journal of Logistics Research and Applications*, *7*(1), 17–31. https://doi.org/10.1080/13675560310001619240

Lasaridi, K., & Stentiford, E. (2011). "Upcycling" organic waste in a world of thinly distributed resources. *Waste Management and Research*, *29*(11), 1115–1116. https://doi.org/10.1177/0734242X11426526

Li, X., & Li, Y. (2011). Driving forces on China's circular economy: From government's perspectives. *Energy Procedia*, *5*, 297–301. https://doi.org/10.1016/j.egypro.2011.03.051

Li, J., & Yu, K. (2011). A study on legislative and policy tools for promoting the circular economic model for waste management in China. *Journal of Material Cycles and Waste Management*, *13*(2), 103–112. https://doi.org/10.1007/s10163-011-0010-4

MacArthur, E. (2013). Towards the circular economy: Opportunities for the consumer goods sector. Ellen MacArthur Foundation. Available online: http://www.ellenmacarthurfoundation.org/business/reports

Mangla, S. K., Luthra, S., Mishra, N., Singh, A., Rana, N. P., Dora, M., & Dwivedi, Y. (2018). Barriers to effective circular supply chain management in a developing country context. *Production Planning and Control*, *29*(6), 551–569. https://doi.org/10.1080/09537287.2018.1449265

Mathiyazhagan, K., Govindan, K., NoorulHaq, A., & Geng, Y. (2013). An ISM approach for the barrier analysis in implementing green supply chain management. *Journal of Cleaner Production*, *47*, 283–297. https://doi.org/10.1016/j.jclepro.2012.10.042

Mcdowall, W., Geng, Y., Huang, B., & Bartekov, E. (2017). Circular economy policies in China, *21*(3), 651–661. https://doi.org/10.1111/jiec.12597

Ministry of the Environment and Protection of Land and Sea and Ministry of Economic Development. (2017) Towards a Model of Circular Economy for Italy - Overview and Strategic Framework (pp. 1–60).

Retrieved from https://circulareconomy.europa.eu/platform/sites/default/files/strategy_-_towards_a_model_eng_completo.pdf

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of web of science and Scopus: A comparative analysis. *Scientometrics*, *106*(1), 213–228. https://doi.org/10.1007/s11192-015-1765-5

Morseletto, P. (2020). Restorative and regenerative: Exploring the concepts in the circular economy. *Journal of Industrial Ecology*, *24*(4), 763–773. https://doi.org/10.1111/jiec.12987

Nattassha, R., Nattassha, R., Handayati, Y., Simatupang, T. M., & Siallagan, M. (2020). Understanding circular economy implementation in the Agri-food supply chain: The case of an Indonesian organic fertiliser producer. *Agriculture and Food Security*, *9*(1), 1–16. https://doi.org/10.1186/s40066-020-00264-8

OECD. (2011). *Resource productivity in the G8 and the OECD a report in the framework of the Kobe 3R*. Author Retrieved from http://www.oecd.org/env/waste/47944428.pdf

Oguntoye, O., & Quartey, S. H. (2020). Environmental support programmes for small businesses: A systematic literature review. *Business Strategy and Development*, *3*(3), 304–317. https://doi.org/10.1002/bsd2.96

Oliveira, D., Souza, L., & Rocha, I. (2018). A systematic literature review on green supply chain management: Research implications and future perspectives Rio da Silva a, Henrique Martins Rocha b, *187*, 537–561. https://doi.org/10.1016/j.jclepro.2018.03.083

Pagotto, M., & Halog, A. (2016). Towards a circular economy in Australian Agri-food industry: An application of input-output oriented approaches for analyzing resource efficiency and competitiveness potential. *Journal of Industrial Ecology*, *20*(5), 1176–1186. https://doi.org/10.1111/jiec.12373

Parfitt, J., Barthel, M., & MacNaughton, S. (2010). Food waste within food supply chains: Quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365* (1554), 3065–3081. https://doi.org/10.1098/rstb.2010.0126

Park, J., Sarkis, J., & Wu, Z. (2010). Creating integrated business and environmental value within the context of China's circular economy and ecological modernisation. *Journal of Cleaner Production*, *18*(15), 1494–1501. https://doi.org/10.1016/j.jclepro.2010.06.001

Permana, A. S., Towolioe, S., Aziz, N. A., & Ho, C. S. (2015). Sustainable solid waste management practices and perceived cleanliness in a low-income city. *Habitat International*, *49*, 197–205. https://doi.org/10.1016/j.habitatint.2015.05.028

Petit, G., Sablayrolles, C., & Yannou-Le Bris, G. (2018). Combining eco-social and environmental indicators to assess the sustainability performance of a food value chain: A case study. *Journal of Cleaner Production*, *191*, 135–143. https://doi.org/10.1016/j.jclepro.2018.04.156

Petticrew, M., & Roberts, H. (2008). Systematic Reviews in the Social Sciences: A Practical Guide. https://doi.org/10.1002/9780470754887

Pinheiro, M. A. P., Seles, B. M. R. P., Fiorini, P. D. C., Jugend, D., de Sousa Jabbour, A. B. L., da Silva, H. M. R., & Latan, H. (2018). The role of new product development in underpinning the circular economy: A systematic review and integrative framework. *Management Decision*, *57*(4), 840–862. http://doi.org/10.1108/md-07-2018-0782

Pringle, T., Barwood, M., & Rahimifard, S. (2016). The challenges in achieving a circular economy within leather recycling. *Procedia CIRP.*, *48*, 544–549. https://doi.org/10.1016/j.procir.2016.04.112

Rafi-Ul-Shan, P. M., Grant, D. B., Perry, P., & Ahmed, S. (2018). Relationship between sustainability and risk management in fashion supply chains: A systematic literature review. *International Journal of Retail and Distribution Management*, *46*(5), 466–486. https://doi.org/10.1108/IJRDM-04-2017-0092

Ranta, V., Aarikka-Stenroos, L., & Mäkinen, S. J. (2018). Creating value in the circular economy: A structured multiple-case analysis of business models. *Journal of Cleaner Production*, *201*, 988–1000. https://doi.org/10.1016/j.jclepro.2018.08.072

Ritzén, S., & Sandström, G. Ö. (2017). Barriers to the circular economy – Integration of perspectives and domains. *Procedia CIRP*, *64*, 7–12. https://doi.org/10.1016/j.procir.2017.03.005

Rizos, V., Behrens, A., Kafyeke, T., Hirschnitz-Garbera, M., & Ioannou, A. (2015). The Circular Economy: Barriers and Opportunities for SMEs. CEPS Working Documents No. 412/September 2015 (412).

Rodriguez-Anton, J. M., Rubio-Andrada, L., Celemín-Pedroche, M. S., & Alonso-Almeida, M. D. M. (2019). Analysis of the relations between circular economy and sustainable development goals. *International Journal of Sustainable Development and World Ecology*, *26*(8), 708–720. https://doi.org/10.1080/13504509.2019.1666754

Sassanelli, C., Rosa, P., Rocca, R., & Terzi, S. (2019). Circular economy performance assessment methods: A systematic literature review. *Journal of Cleaner Production*, *229*, 440–453. https://doi.org/10.1016/j.jclepro.2019.05.019

Sauvé, S., Bernard, S., & Sloan, P. (2016). Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. *Environmental Development*, *17*, 48–56. https://doi.org/10.1016/j.envdev.2015.09.002

Sharma, Y. K., Mangla, S. K., Patil, P. P., & Liu, S. (2019). When challenges impede the process: For circular economy-driven sustainability practices in food supply chain. *Management Decision*, *57*(4), 995–1017. https://doi.org/10.1108/MD-09-2018-1056

Shi, H., Peng, S. Z., Liu, Y., & Zhong, P. (2008). Barriers to the implementation of cleaner production in Chinese SMEs: Government, industry and expert stakeholders' perspectives. *Journal of Cleaner Production*, *16*(7), 842–852. https://doi.org/10.1016/j.jclepro.2007.05.002

Silva, F. C., Mackenzie, U. P., Paulo, S., Shibao, F. Y., Julho, U. N. D., Kruglianskas, I., Vargas, F. G., Antonio, P., Sinisgalli, A., & Paulo, U. D. S. (2019). Circular economy: Analysis of the implementation of practices in the Brazilian network. *Revista de Gestão*, *26*(1), 39–60. https://doi.org/10.1108/REGE-03-2018-0044

Stahel, W. R. (2016). The circular economy. *Nature*, *531*(7595), 435–438. https://doi.org/10.1038/531435a

Toop, T. A., Ward, S., Oldfield, T., Hull, M., Kirby, M. E., & Theodorou, M. K. (2017). AgroCycle – Developing a circular economy in agriculture. *Energy Procedia*, *123*, 76–80. https://doi.org/10.1016/j.egypro.2017.07.269

Tseng, M. L., Chiu, A. S. F., Chien, C. F., & Tan, R. R. (2019). Pathways and barriers to circularity in food systems. *Resources, Conservation and Recycling*, *143*, 236–237. https://doi.org/10.1016/j.resconrec.2019.01.015

Tsolakis, N. K., Keramydas, C. A., Toka, A. K., Aidonis, D. A., & Iakovou, E. T. (2014). Agrifood supply chain management: A comprehensive hierarchical decision-making framework and a critical taxonomy. *Biosystems Engineering*, *120*, 47–64. https://doi.org/10.1016/j.biosystemseng.2013.10.014

Tura, N., Hanski, J., Ahola, T., Ståhle, M., Piiparinen, S., & Valkokari, P. (2019). Unlocking circular business: A framework of barriers and drivers. *Journal of Cleaner Production*, *212*, 90–98. http://doi.org/10.1016/j.jclepro.2018.11.202

van Berkum, S., Dengerink, J., & Ruben, R. (2018). The food systems approach: Sustainable solutions for a sufficient supply of healthy food. *Wageningen Economic Research*, *064*, 32 Retrieved from http://library.wur.nl/WebQuery/wurpubs/538076

Venkata Mohan, S., Dahiya, S., Amulya, K., Katakojwala, R., & Vanitha, T. K. (2019). Can circular bioeconomy be fueled by waste biorefineries – A closer look. *Bioresource Technology Reports*, *7*, 100277. https://doi.org/10.1016/j.biteb.2019.100277

Vollaro, M., Galioto, F., & Viaggi, D. (2016). The circular economy and agriculture: new opportunities for re-using Phosphorus as fertilizer. *Bio-Based and Applied Economics*, *5*(3), 267–285.

Ward, S. M., Holden, N. M., White, E. P., & Oldfield, T. L. (2016). The "circular economy" applied to the agriculture (livestock production) sector, Workshop on the sustainability of the EU's livestock production

systems, (October 2018), pp. 1-11. Available at: http://www.agrocycle.eu

Yanes-Estévez, V., Oreja-Rodríguez, J. R., & García-Pérez, A. M. (2010). Perceived environmental uncertainty in the agrifood supply chain. *British Food Journal*, *112*(7), 688–709. https://doi.org/10.1108/00070701011058235

Yazan, D. M., Cafagna, D., Fraccascia, L., Mes, M., Pontrandolfo, P., & Zijm, H. (2018). Economic sustainability of biogas production from animal manure: A regional circular economy model. *Management Research Review*, *41*(5), 605–624. https://doi.org/10.1108/MRR-02-2018-0053

Zabaniotou, A., & Kamaterou, P. (2019). Food waste valorisation advocating circular bioeconomy - a critical review of potentialities and perspectives of spent coffee grounds biorefinery. *Journal of Cleaner Production*, *211*, 1553–1566. https://doi.org/10.1016/j.jclepro.2018.11.230

Zabaniotou, A., Rovas, D., Libutti, A., & Monteleone, M. (2015). Boosting circular economy and closing the loop in agriculture: Case study of a small-scale pyrolysis–biochar based system integrated in an olive farm in symbiosis with an olive mill. *Environmental Development*, *14*, 22–36. http://doi.org/10.1016/j.envdev.2014.12.002

Zahraie, B., Everett, A. M., Walton, S., & Kirkwood, J. (2016). Environmental entrepreneurs facilitating change toward sustainability: A case study of the wine industry in New Zealand. *Small Enterprise Research*, *23*(1), 39–57. https://doi.org/10.1080/13215906.2016.1188717

Zhong, R., Xu, X., & Wang, L. (2017). Food supply chain management: Systems, implementations, and future research. *Industrial Management and Data Systems*, *117*(9), 2085–2114. https://doi.org/10.1108/IMDS-09-2016-0391

Zhu, J., Fan, C., Shi, H., & Shi, L. (2019a). Efforts for a circular economy in China: A comprehensive review of policies. *Journal of Industrial Ecology*, *23*(1), 110–118. https://doi.org/10.1111/jiec.12754

Zhu, Q., Jia, R., & Lin, X. (2019b). Building sustainable circular agriculture in China: Economic viability and entrepreneurship. *Management Decision*, *57*(4), 1108–1122. https://doi.org/10.1108/MD-06-2018-0639

How to cite this article: Mehmood, A., Ahmed, S., Viza, E., Bogush, A., & Ayyub, R. M. (2021). Drivers and barriers towards circular economy in agri-food supply chain: A review. *Business Strategy & Development*, 1–17. https://doi.org/10.1002/bsd2.171