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RESEARCH PAPER

Adopting Global Circular Food Supply Chain Practices: Drivers, Barriers, and Strategies for Food Industry in Indonesia

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ABSTRACT
Food supply chain management has become a crucial issue due to increasing food waste caused by globalization and population growth, which not only harms the environment but also social and economic aspects. Indonesia, as a developing country with a population of over 280 million, generated food loss and waste (FLW), amounting to 48 million tons per year or 44% throughout the supply chain in 2018. The largest amount occurs at the consumption stage. However, to date, Indonesia has yet to develop a comprehensive strategy to reduce FLW, making global-level strategies essential for designing a tailored approach for the country. The circular model has proven to be a powerful solution to overcome this, but its implementation is quite challenging due to the involvement of many stakeholders along the supply chain. So, it is important to understand the driving factors of a circular economy in the food supply chain (FSC), which can stimulate the development of a circular food supply chain. These barrier factors can cause the failure of circular practices in the FSC, as well as strategies to overcome and mitigate the barriers that arise at the global level as a consideration in designing a circular food supply chain (CFSC) practice strategy in Indonesia. Therefore, this study conducted a systematic literature review by analyzing 43 articles to answer specific research questions related to drivers, barriers, and CFSC strategies. The results present nine main drivers, main barriers, and strategies, of which there are 47 sub-drivers, 50 barriers, and 47 strategies. Out of all the strategies identified, 24 greatest strategies using Pareto and SWOT analysis can be adopted for CFSC practice in Indonesia. This research contributes to the existing literature with the strategies, along with the responsible FSC stakeholders.

KEYWORDS: *Circular economy; Food industry; Food loss and waste; Food supply chain.*

1. Introduction

Growing food loss and waste (FLW) is a global problem that not only threatens food security but also results in various negative impacts on society (social), economy, and ecology (environment) [1-5]. The Food and Agriculture Organization of the United Nations (FAO) reports that approximately 1.3 billion metrics, or about one-third of all food produced for human consumption worldwide, is wasted each year or lost along the food supply chain (FSC) [6-10].
According to UNEP [11], global food waste in 2019 hit approximately 931 million tonnes, with households, food services, and retail accounting for 61%, 26%, and 13%, respectively, resulting in 17% of the total edible food waste generated [12]. In this case, food waste becomes significant because food demand has increased as many as three times in the last 55 years [13-16] along with the increasing population, which is expected to continue to grow by 3 billion in the next 30 years [17-19].
Indonesia is recorded as the fourth most populous country [20], with the largest population of more than 280 million people. FLW generation in Indonesia extends 48 million tons/year, so in 2018, Indonesia was recorded as the second largest FLW-producing country in the world [21]. In 2019, the percentage of food waste generation reached 45%, while the percentage of food waste generation reached 55%, with the largest generation existing at the consumption stage [22]. Soma [23] revealed that food consumption behavior and the food production supply chain contribute to food waste in Indonesia. Therefore, the food industry requires sustainable consumption and production (SCP) to reduce loss and waste [12].
The food industry is one of the largest industries in the world, acting as a complex global

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network of various businesses that provide food to society. Yet, FLW in agri-food supply chains in developing countries remains an ongoing problem [12, 17], especially for sustainable agricultural development [24]. The Indonesian government spends around USD 1.5 billion on food subsidies for the poor and more than USD 2.3 billion on annual fertilizer subsidies [25]. If Indonesia is committed to reducing food loss and waste, meeting the government's food needs can be achieved with a lower budget. Additional funds could be allocated to other urgent areas, such as infrastructure and poverty alleviation [26].

The food industry is one of the largest industries in the world, acting as a complex global network of various businesses that provide food to society. Yet, FLW in agri-food supply chains in developing countries remains an ongoing problem [12, 17], especially for sustainable agricultural development [24]. The Indonesian government spends around USD 1.5 billion on food subsidies for the poor and more than USD 2.3 billion on annual fertilizer subsidies [25]. If Indonesia is committed to reducing food loss and waste, meeting the government's food needs can be achieved with a lower budget. Additional funds could be allocated to other urgent areas, such as infrastructure and poverty alleviation [26].

Moreover, sustainable agricultural development has been promoted globally, as specified in Goal 2.4 of the United Nations Sustainable Development Goals. The main principle of this goal is to increase production while preserving the ecosystem through environmentally friendly agricultural practices. Waste management is key to achieving this goal [12]. In the context of the FSC, Target 12.3 in the UN Sustainable Development Goals (SDGs) emphasizes the importance of reducing food waste to 50% by 2030 [14, 27, 28]. It shows that FSC is very important for the welfare of society [13]. FSC is highly related to human daily life and provides food necessary for human survival [29], from the production of products to their delivery to consumers [18].

In the FSC, food moves from producers to consumers through various processes of production, processing, distribution, retail, and consumption. Thus, food transitions from farmers to consumers in a domino-like pattern. This process involves multiple actors, including farmers, producers, processors, distributors, and retailers. Each stage in this supply chain is interconnected and dependent on one another, starting from planting, harvesting, processing, packaging, storage, transportation, and finally distribution to the market.

So sustainable food supply chains (SFSC) need to be developed and put into practice [5, 16, 30, 31] considering the increasingly large generation of negative impacts, together with increasing pressure from consumers and society, pushing companies, governments, and planners so that you immediately take real action. In general, a sustainable supply chain is defined as a structure that includes three dimensions of sustainable development, namely environmental, social, and economic, as well as collaboration among companies to manage the flow of materials, information, and capital [32].

In the FSC, strong waste management must confirm the implementation of the 3R principle (reuse, recovery, recycle) before disposing of as little waste as possible to landfills so that a closed supply chain or so-called 'closed loop system' is needed [1-3, 15]. Meanwhile, the Indonesian government still deals with many challenges in regulating this waste management system. Waluyo and Kharisma [26] suggested that the circular economy concept can answer this problem. The circular economy approach is alleged to be able to overcome this challenge because it can maximize the use of produced food and reduce global FLW effectively and dynamically [12, 33]. The circular economy (CE) concept also aims to focus on a set of operations that have a positive impact on the environment by optimizing the use of resources to ensure environmental and economic sustainability [3, 5, 12, 15, 27, 32] through building restorative, regenerative, and environmentally friendly supply chains [34, 35]. So, reducing FLW at each stage of FSC requires applying the CE approach [36]. In addition to reducing waste, CE also enables effective waste management with reuse and recycling from the top of the waste hierarchy to disposal at the bottom [13, 16, 35], resulting in high-added-value materials [15]. CE emphasizes the importance of rethinking the entire food chain, from production to consumption, transportation, processing, and waste management [27].

In previous years, the CE concept has received great global attention from both researchers and practitioners in terms of its potential to overcome economic, social, and environmental challenges [5, 27, 33]. Experts in food systems are captivated by the concept of CE as a potential response to all future uncertainties and difficulties [37]. The CE concept has emerged as an alternative to linear economic systems [27]. CE's mission is to challenge traditional linear economic models [3, 5, 38]. The transition to CE requires efforts to overcome the traditional linear economic model [3, 39] consisting of mining and the use of raw materials, eventually leading to the discarding of the resulting products.

In contrast, CE relies on the principles of using and manufacturing smarter products [12, 15, 40], extending the service life of products and their parts [2, 3] and applying principles to ensure beneficial applications of materials [15, 19, 40, 41]. These principles are based on the 9R strategy [15, 41, 42]–namely, reject, rethink, reduce, reuse, repair, renew, produce, remanufacture, repurpose, recycle, and recover.

In the application of CE, different industries may require collaboration with various supply chain actors and diverse waste management techniques and resource recovery procedures [43]. CE needs to be integrated with processes in the food supply chain [15]. Therefore, identifying industry-specific barriers and the relationships between them is necessary to overcome challenges in implementation [43]. Moreover, Although the contribution of CE to the food industry has been researched from various perspectives, from on-farm production to household consumption, identifying the most critical drivers [15] and the most crucial barriers to implementing CE in the food supply chain is crucial [1, 5, 37, 43, 44]. Circular supply chain (CSC) emphasizes a systemic approach by redesigning the entire product lifecycle to minimize waste, optimize material usage, and create systems for recycling or reuse (reuse, remanufacture, recycle). It is not merely about managing waste but eliminating the sources of waste from the outset and building a holistically sustainable supply chain.

The main focus of CSC is to prevent waste through more efficient product and production process designs, such as creating modular products, extending product lifespans, or using recyclable materials. It aims to reduce dependence on new raw materials and minimize environmental impact throughout the supply chain. This approach goes beyond addressing waste as a byproduct and encompasses a broader scope by involving all actors in the supply chain, from raw material suppliers to end consumers. It fosters cross-industry impact through collaboration in the collection, reprocessing, and redistribution of materials or products. The effect is more significant and applicable across various sectors. In Indonesia, the application of CE is still relatively new, and there are only a few studies related to this [45]. Therefore, this study can contribute to increasing scientific research on CE in Indonesia. As a result, the research questions of this study can be summarized as:

- RQ1: What are the drivers of implementing circular food supply chains at the global level that can be adopted for food supply chains in Indonesia?
- RQ2: What are the barriers to implementing circular food supply chains at the global level that can be adopted for food supply chains in Indonesia?
- RQ3: What strategies have been implemented to implement circular food supply chains at the global level that can be adopted for food supply chains in Indonesia?
- RQ4: What are the recommended strategies for implementing circular food supply chains for the food industry in Indonesia, which are designed from the results of adoption at the global level?

The research question also represents the novelty of this study by exploring CFSC practices at the global level to design a comprehensive strategy for Indonesia. Previously, Widodo et al. [46] conducted a study on recommendations for sustainable interventions in Indonesia using the DPSIR model to address the increase in FLW. One of the recommended outcomes was recycling and recovery, highlighting the need for further research on the circular economy encompassing the 9Rs. Hence, this study aims to identify drivers and barriers as well as strategies for implementing circular food supply chains at the global level. The results of adopting this strategy are then recommended for implementing circular food supply chains in the Indonesian food industry, of course, after carrying out Pareto and SWOT analysis.

This study offers a unique approach by examining the drivers, pressures, and strategies for implementing a Circular Economy (CE) in the food supply chain globally and then adapting them to the Indonesian context. It adds value through cross-country exploration that may not have previously focused on designing locally based strategies with a global perspective.

The study is organized as follows. Section 2 shows previous work and research gaps related to the circular economy in the food supply chain or Circular Food Supply Chain (CFSC) and explains the novelty and further contributions of this study. Section 3 describes the systematic literature review used in this research. Section 4 presents the analysis and research findings. Section 5 discusses the findings, and Section 6 concludes research contributions, limitations, and future research.

2. Previous Work

CE is recently a popular model promoted by the European Union, some national governments, and many companies around the world. Yet, the scientific content and research related to CE concepts are still insubstantial and unorganized. CE is a collection of vague and isolated ideas from several fields and concepts of a semi-professional nature. It is an economic system built from a societal production-consumption system that maximizes services resulting from the nature-society-nature linear throughput flow of materials and energy. It is performed using cyclical material flows, renewable energy sources, and cascading-type energy flows. CE is recommended as an approach to economic growth that is aligned with sustainable environmental, social, and economic development and successfully contributes to these three dimensions [52].

The application of CE has been carried out in a wide range of industries and sectors—such as the automotive industry, construction industry, textile and clothing industry, food supply chain, biofuel industry, and municipal solid waste processing systems—and has been the subject of intensive research [1]. From a circular economy perspective, the agri-food sector is one of the main sectors that need to take action to adopt sustainability principles [47]. The CE concept and its practices are almost exclusively developed and led by practitioners, such as policymakers, businesses, business consultants, business associations, business foundations, and others. Despite this, the application of CE faces significant challenges and remains underexplored due to its primary focus on linear economic models [12].

Several previous studies discuss CE in the FSC or agrifood sector. Perdana et al. [24] have conducted research on circular supply chain governance to utilize waste and minimize food loss in fresh agricultural products; most vegetable and dairy farmers (80% and 75% of respondents, respectively) do not manage their agricultural waste well. The results of their work discovered that coordination and information sharing between supply chain actors can solve the problem of agricultural loss and waste. In the research, they recommend further studies to gain a comprehensive understanding of food loss and expand the scope of the study to various supply chain governance structures that can influence food loss and agricultural waste.

Delouyi et al. [1] studied the barriers to implementing a circular economy in the food supply chain. His work succeeded in analyzing a total of 15 barriers in 6 dimensions based on the food supply chain situation in Iran. These findings may differ from other countries, especially developed countries. Their study refers to the literature and the opinions of a panel of experts, which may have limited the accuracy of the analysis. Thus, the author suggested that other research can be carried out using similar methods in different countries and regions to provide additional insight into this topic using other qualitative or quantitative methods, with a special focus on systems thinking to consider the food supply chain as a whole, which is very interesting to future research. Third, further research can prioritize eliminating barriers based on the country's capabilities.

Erhan Ada et al. [15] explored the role of digital technology in the transition to a smart, sustainable, and circular food supply chain. The research was referred to academic journals and conference articles in English between 2008 and 2020. Thus, other languages and publications were excluded from this study. This research focuses on the 9R concept and other CE dimensions that are also important for the food industry. The results present five main categories of drivers with 22 sub-drivers of circular economy transition in the food supply chain. Various research items, such as research reports and books, can be added as future work. Various solutions can be developed by leveraging Industry 4.0 techniques and other CE dimensions. The CE drivers in FSC can be adapted to various particular digital technologies.

Only four articles in the literature reviewed used the term 'CFSC.' Farooque et al. [43]

identified and systematically analyzed the causal relationships among barriers to CFSC in China. Nesrin Ada et al. [5] analyzed the obstacles to CFSC and proposed industry 4.0 solutions. Mangla et al. [48] identified the impact of information hiding on circular food supply chains in a business-to-business context. Furthermore, Kabadurmus et al. [19] proposed the CFSC model to deal with food waste.

In their research, Farooque et al. [43] identified eight barriers and two main causes of barriers, namely weak environmental regulations and enforcement and lack of market preferences/ pressure. The author realizes that the list of barriers identified in his research is far from complete, although it is sufficient to meet the research objectives. So, future research can expand the list of barriers under the most relevant theoretical framework identified in the study to suit the research goals.

The work of Nesrin Ada et al. [5] classified seven categories of barriers, namely "culture", "business and business finance", "regulation and governance", "technology", "managerial", "supply chain management", "knowledge, and skills". The findings demonstrated the need to identify barriers that prevent the transition to CE. The findings also showed that these CE challenges can be addressed through Industry 4.0, which includes various technologies, such as the Internet of Things (IoT), cloud technology, machine learning, and blockchain. A limitation of this study is that it used open-access articles and conference papers in English between 2010 and 2020. Thus, other languages and other types of papers were excluded from this study; the relationships analyzed are mainly keyword links, and the results are not empirical findings about the potential of these technologies in the food sector.Mangla et al. [48] conducted research based on the proposed framework and case studies with empirical research to comprehend the differences between groups. They stated that more empirical research is required on existing variables and that the proposed framework can be generalized to the wider food industry. By examining various tracking dimensions, the proposed framework can be used in other developing countries, such as Brazil, China, India, Russia, South Korea, Mexico, etc., and the results can be compared in future studies.

Furthermore, research by Kabadurmus et al. [19] suggested that the proposed model is beneficial for small and large cities since it provides a Pareto-optimal set in which the total amount of food waste distributed is maximized and the total costs are minimized. They recommend future research to conduct a more in-depth study of this network model. In addition, for another future research direction, priorities between food waste and food-related waste can be differentiated so that more realistic results can be obtained as recommendations for local governments.

Apart from Farooque et al. [43], who have studied barriers to CFSC, Mehmood et al. [33] and Ouro-Salim and Guarnieri [27] have also studied drivers and barriers to implementing circular economics in agrifood and food supply chains. Ouro-Salim and Guarnieri [27] examined drivers and barriers in the institution of circular economy practices in the food supply chain by reviewing 25 studies. The findings found four driver constructions and nine barriers. The results also show that normative drivers are the most frequently identified among various institutional pressures, followed by mimetic and coercive pressures. Meanwhile, Mehmood et al. [33] studied the drivers and barriers of circular economics in the agri-food supply chain by reviewing 58 studies. The study succeeded in finding six drivers, namely policy and economy, financial benefits, environmental protection, health benefits, social benefits, and product development: an innovative solution; and six barriers for circular economy practices, namely financial and economic, public policy and institutional, logistical and infrastructure, operational, knowledge and skills, and technological.

Both studies succeeded in presenting drivers and barriers according to their research objectives. However, the most important thing from this study regarding circular economy practices in the food supply chain is the solution or strategy designed by considering the identified drivers and barriers. Therefore, this research fills the empirical gap with Pareto analysis to determine priority drivers (strength and opportunity) and priority barriers (weakness and threat). Furthermore, the priority strategy in implementing CFSC is designed using the integrated Pareto SWOT (strength, weakness, opportunity, threat) analysis method. The resulting strategy is then recommended for implementation in Indonesia's food industry sector.

Furthermore, highlighting CE research in the food supply chain sector in Indonesia, Kurniawan et al. [49] researched resource recovery in Indonesia, showing how the application of CE principles has enabled waste reduction at the community level. Meanwhile, the study by Fatimah et al. [50] reviewed an Industry 4.0-based CE approach for smart waste management systems to achieve sustainable development goals. He proposed a CE waste management system for Indonesia, showing how technological developments can complement sustainable waste management.

There appears to be an empirical gap in the prior research. Such studies highlight the lack of research that directly engages businesses in developing countries and focuses on how their actions lead to the emergence of FLW. So, this research contributes to supplementing research on the topic of CE in Indonesia by examining the role of all stakeholders, especially in a sustainable food supply chain.

3. Design of Systematic Literature Review

This paper focuses on drivers, pressures, and strategies in implementing CE in the food supply chain or CFSC globally. This paper uses literature analysis to examine the drivers and main pressures in CFSC implementation in various countries and what strategies have been implemented so far from various perspectives to identify models of relationships and interactions between CE dimensions at supply chain stages and food industry subsectors to be adopted in FSC Indonesia. It is important to identify these elements to prevent food waste and loss along the FSC. So, the research method chosen is systematic literature review (SLR), which can identify, select, critically assess research, and interpret findings from various studies to answer formulated questions clearly [51]. SLR follows specific procedures that are reliable, repeatable, and applicable across a wide range of conditions and periods [5]. This kind of analysis aims to identify objective features [52]. Multiple researchers were contributed to ensure greater validity, objectivity, and reliability of the results compared to the assessment of one single researcher.

The use of the SLR method to identify key elements in implementing CE and the integration of the Pareto principle in SWOT analysis demonstrate a combination of methods that are rarely explicitly applied in CE studies within the food supply chain. This model not only identifies key elements but also prioritizes them quantitatively, creating data-driven strategies for implementing CFSC in Indonesia. This literature analysis should also follow a clear and pre-defined process [5], as shown in Figure 1.

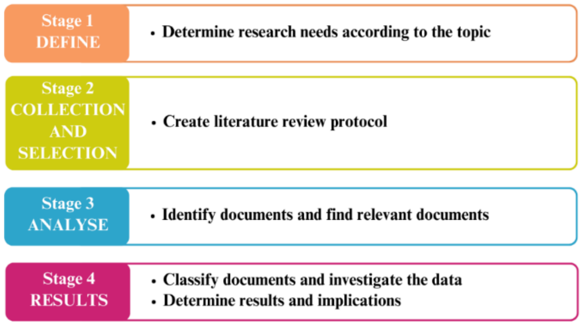

Fig.1. Stage of Systematic Literature Review

3.1. Data selection process

Data collection in this study employed Publish or Perish (PoP) software on the Scopus database (Figure 2). The keyword used for searching is "circular food supply chain" in the title without limiting the year of publication. The keyword can include several terms, such as CE and FSC or CE and Agrifood. The Scopus database is applied; referring to research by Anker et al. [53], the number of Scopus citations is 26% higher compared to Web of Science (WoS) in the range of 8–42% in different journals; they argue that this may be caused by the fact that Scopus has a more extensive journal database than WoS (20,000 vs. 14,000 journals), so Scopus has access to more possible citations. Bakhmat et al. [54] also proved the same thing by comparing Scopus with WoS and Google Scholar. The availability of individual profiles for all authors, institutions, and serial sources, as well as an interconnected database interface, makes Scopus more user-friendly for practical use. The search results identified 82 articles. Next, the screening was carried out based on predetermined inclusion and exclusion criteria, as can be seen in Figure 2. Inclusion criteria contain (1) articles with easily available full text, (2) articles written in English, and (3) articles published in international journals. Meanwhile, the exclusion criteria used include (1) articles without full text, (2) articles written in languages other than English, and (3) non-journal literature or articles. The selection process used inclusion and exclusion criteria to come up with 61 articles. Before deep diving into those articles, at the eligibility stage, access to the full text of the article is checked. Still, the results obtained only 43 articles that could be accessed in full. So, only 43 articles were thoroughly reviewed to extract metadata (see Table 1). This number is considered sufficient to be able to study drivers, barriers, and strategies if you look at previous scientific literature research on CE, such as research conducted by Ouro-Salim and Guarnieri [27], which examined drivers and barriers in the institutionalization of CE practices in FSC towards 25 literature. Next, the flow chart for the data selection process using the PRISMA diagram is shown in Figure 2.

3.2. Data analysis

The Pareto principle states that for many events, about 80% of the effects originate from 20% of the causes, which results in the "80/20 rule" heuristic of the Pareto principle [68].

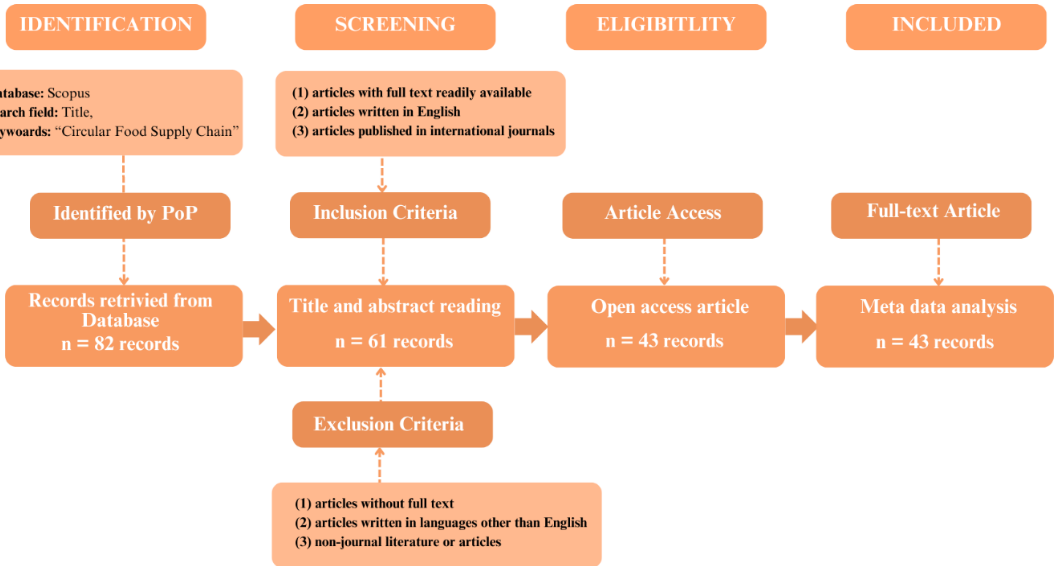

Fig.2. PRISMA Flow Chart of the SLR for Data Selection

Tab.1. Pre-processing Category Data

Id	References	Country	Id	References	Country
1	[13]	India	23	[55]	China
2	[56]	France	24	[57]	India
3	[30]	Portugal	25	[58]	Finland
4	[59]	UK	26	[37]	Sri Lanka
5	[38]	Turkey	27	[4]	Italy
6	[12]	India	28	[60]	Italy
7	[29]	Mexico	29	[61]	Italy
8	[24]	Indonesia	30	[5]	Turkey
9	[14]	India	31	[33]	UK
10	[2]	Turkey	32	[62]	Italy
11	[3]	Germany	33	[18]	Turkey
12	[32]	Turkey	34	[63]	Italy
13	[27]	Brazil	35	[35]	US
14	[1]	Iran	36	[48]	India
15	[15]	Turkey	37	[31]	UK
16	[17]	Indonesia	38	[44]	Indonesia
17	[39]	Greece	39	[64]	UK
18	[34]	UK	40	[65]	Mexico
19	[28]	Italy	41	[43]	China
20	[66]	UK	42	[67]	India
21	[16]	UK	43	[40]	UK
22	[19]	Turkey			

Pareto analysis was used in this study because the main data is the frequency of mentions, which limits the scope of analysis techniques that can be applied. The total (cumulative) frequency is considered to be 100% so that the "most important" barrier occupies a substantial amount (80%) of the cumulative percentage of citation frequencies, and the "most useful" barrier occupies only the remaining 20% of occurrences. This study utilizes Pareto diagrams (i.e., histograms and curves) to classify the most important components of drivers and barriers in each taxonomy.
Meanwhile, SWOT is a strategic tool for evaluating the internal and external environment of an organization or process. In the CFSC study, SWOT is used to analyze internal and external factors that influence the implementation of CFSC, both in terms of drivers (strengths and opportunities) and barriers (weaknesses and threats), and helps develop appropriate strategies by exploiting strengths and opportunities and minimizing weaknesses and threats.

4. Analysis and Result

4.1. Data characteristics

After going through the data selection process, 43 articles were reviewed in total. There is no publication year limit in this study, so in the Scopus database, it was found that the topic of CFSC or CE in FSC or agrifood was only researched explicitly in 2019. However, some studies have discussed it in other databases earlier. Research on this topic was published in the Google Scholar database in 2016 by Borrello et al. [69]. The distribution of publication years for the 43 articles can be seen in Figure 3.

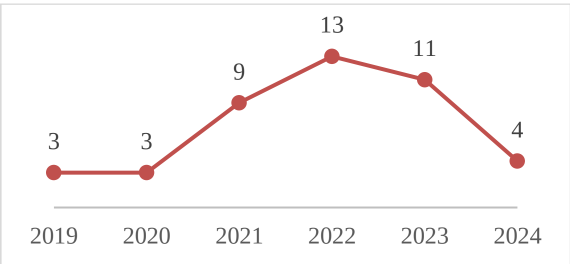

Fig.3. Publication Distribution Year

Based on Figure 3, it can be seen that the trend of this topic increased in 2021. It is related to the rise in FLW issues and consumer awareness of environmentally friendly issues. WWF-UK [70] reported that around 2.5 billion tonnes of food go uneaten every year, including 1.2 billion tonnes that never leave the farm. This means that around 40% of all food grown is wasted. This phenomenon occurs in various countries with varying amounts of FLW. According to Chalak, Abou-Daher, Chaaban, & Abiad [71], it is influenced by the level of income, urbanization, and economic growth in each country.
As a result of this increase in FLW, consumers are increasingly demanding food produced with sustainable practices and want to be involved in the process of increasing food sustainability [72]. Currently, every country is trying to find the best alternative solution for minimizing FLW, one of which is the application of the circular economy concept, which has become popular recently. Several countries that have studied the implementation of CE in FSC are listed in Figure 4.

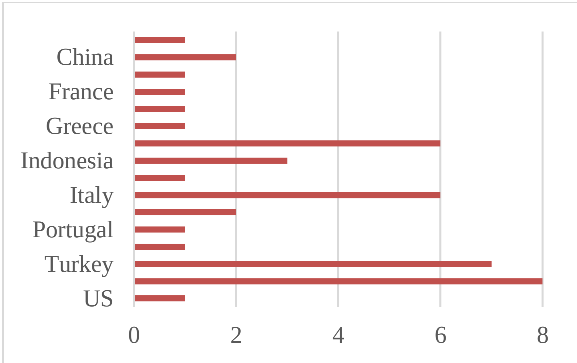

Fig.4. The Distribution of Country Conducting Study on CFSC

Figure 4 shows that most publications originated from the UK, with eight studies. This finding relates to the increase in FLW in the UK, which in Jeswani et al. [73] study findings show that 13.1 million tonnes of food waste is generated annually in the UK across the supply chain, causing greenhouse gas emissions of 27 million tonnes of CO_2 eq./year and emphasizes the need to consider the environmental impact of food waste and involve all supply chain actors in formulating food waste reduction strategies. Then, Turkey published seven studies. The FLW phenomenon in Turkey is also increasingly pressing, where the annual average per capita food waste generated in Turkey is higher than the global average, with 93 kg compared to 74 kilograms globally [11].
In addition, Italy and India contributed a total of

6 publications on this topic. Looking at FLW conditions in Italy, Grant et al. [74] have carried out a comparative assessment of food waste over three years and found that waste increased from 187.2 to 203.8 grams per capita per week (p= 0, 00). Meanwhile, India produces around 62 Metric Tons (MT) of municipal solid waste every year [75], which is estimated to reach 165 million MT in 2030 [14]. However, countries that have less CE topic research contributions to FSC do not necessarily have less FLW generation. However, this could be related to the country's awareness and responsiveness to handling FLW.

4.2. CFSC global drivers analysis

So far, the findings show that researchers have discussed and categorized the drivers of CFSC implementation in various ways. Dossa et al. [34] acknowledged five main drivers of CFSC implementation adopted from previous research, including policy and economy, health, environmental protection, society, and product development. Mehmood et al. [33] classified six main drivers: policy and economy, financial benefits, environmental protection, health benefits, social benefits, and product development. Oura-Salim and Guarnieri [27] identified four main drivers: institutional pressure, coercive, normative, and mimetic. Erhan Ada et al. [15] identified five clusters of drivers: economic and managerial, environmental, supply chain management, technological, and regulatory and social, of which the cluster contains a total of 22 sub-drivers. Based on this literature, this study considers nine main drivers of CFSC implementation: environmental, economic, managerial, technological, supply chain management, regulatory, social, technical and operational, and business, as shown in Table 2.

Table 2 shows the drivers that share significant motivation towards implementing CFSC. As mentioned in Table 2, drivers are categorized into nine groups, as follows: environmental, economic, managerial, technological, supply chain management, regulatory, social, technical and operational, and business, with a total of 47 sub-drivers. This study also classifies driver findings into internal factors and external factors. This classification is essential to understand the potential of each driver based on its source, whether the drivers that emerge internally or externally, so that it can facilitate strategic decision-making and preparation of CFSC implementation plans. The findings succeeded in identifying 23 drivers as internal factors and 24 other drivers including external factors. The most significant driver, based on their appearance in the literature, can be noticed in Table 3 and are represented in Figure 5.

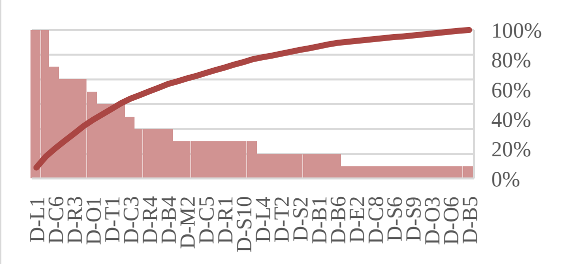

Fig.5. Pareto Drivers CFSC diagram

In addition, the role of stakeholders is also exceedingly important in CFSC implementation. The CE business model requires trust from community stakeholders to create a collaborative environment that has the potential to improve social sustainability performance. One of the important findings of Bag et al. [2] study is that the level of involvement of community stakeholders can mediate the relationship between their trust in a company and the company's social sustainability performance. Community stakeholders should be informed about the CE model adopted by a company. Clark and Wilson [64] stated in their study that it is still unclear which stakeholder groups in the supply chain will take responsibility for implementing behavioral studies in the development process.This study also pinpoints each stakeholder responsible for the emergence of motivational drivers for implementing CFSC. In this case, there are three stakeholder groups identified, namely "producers," consisting of farmers, fishermen, food collectors/suppliers, food industry, distributors, and traders; "consumers" consisting of individuals and institutions/organizations; and "government" includes the central and regional legislature and executive. Drivers in the environmental, economic, managerial, technological, supply chain, business, as well as technical and operational categories, are the responsibility of the producer.

The social category drivers are the responsibility of the consumer, while the regulatory category is, of course, the responsibility of the government. Ultimately, to manage food at local, national, and international levels, all actors—including producers, suppliers, consumers, and government agencies—must collaborate. This cooperation will result in socio-economic development and prosperity for a country [76].

4.3. CFSC Global barriers analysis

Besides drivers, many researchers have separately identified barriers to implementing CFSC. Farooque et al. [43] identified eight main barriers to implementing CFSC: lack of financial resources; limited expertise, technology, and information; organizational and management culture; uncertainty about benefits; lack of economies of scale; weak environmental regulations and enforcement; lack of market preferences/pressures; lack of collaboration/support from supply chain actors. Mehmood et al. [33] identified six main barriers: financial and economic, public policy and institutional, logistical and infrastructure, operational, knowledge and skills, and technological. Ouro-Salim and Guarnieri [27] identified nine barrier clusters: strong institutions, consumers and actors, financial aspects, technologies and innovation, quantification, infrastructure issues, governance, methodology, and geographical distance, with a total of 26 sub-barriers. Delouyi et al. [1] identified six dimensions, which include 15 barriers and categorized them into two groups: hard barriers and soft barriers.

The six dimensions that have been identified include production issues, management and collaboration issues, technical and technological capabilities, financial issues, government policies, and culture. Based on this literature, this study considers nine main barriers to implementing CFSC: economic and financial, technology and information, knowledge and skills, managerial, business, regulatory and government, socio-cultural, infrastructure, and supply chain. These barriers become clusters containing 50 sub-barriers, as depicted in Table 4.

Tab.2. Potential drivers of CFSC implementation

No	Drivers	Sub Driver		SWOT		Stakeholders	References
				IF	EF		
				S	O		
1	Environment (D-L)	D-L1	Overcoming the issue of environmental damage		X	Producers (farmers, fishermen, food collectors/suppliers, food industry, distributors and traders)	[30, 29, 24, 14, 15, 34, 19, 55, 58, 33, 35, 67]
		D-L2	Overcoming the issue of resource scarcity		X		[3, 32, 15, 34, 66, 61, 35, 64]
		D-L3	Renewable energy demand		X		[14]
		D-L4	Efficient use of materials and energy	X			[4, 15]
2	Economy (D-E)	D-E1	Increase cost and resource efficiency	X			[38, 12, 29, 24, 14, 2, 18, 1, 15, 17, 19, 62]
		D-E2	Green economic growth potential		X		[2]
		D-E3	Increased profitability	X			[1, 27, 55]
		D-E4	Economic optimization	X			[17, 29, 44, 55, 67]
3	Managerial (D-M)	D-M1	Increased trust among stakeholders		X		[38]
		D-M2	Relationship management with stakeholders	X			[4, 14, 24]
		D-M3	Institutional pressure	X			[1, 27]
4	Technological (D-T)	D-T1	The emergence of new technological innovations	X			[1, 2, 5, 14, 40, 57]
		D-T2	Availability of adequate technological knowledge	X			[15, 18]
		D-T3	Digitalization		X		[5, 39, 57]
5	Supply chain	D-C1	Supply chain density	X			[30, 55]

	Management (D-C)	D-C2	Effective supply chain integration	X			[12, 14, 24, 38]
		D-C3	Supply chain traceability	X			[18, 38, 39, 48, 62]
		D-C5	Supply chain system development	X			[15, 29, 37]
		D-C6	Utilization of waste along the supply chain	X			[4, 15, 17, 19, 24, 55, 63, 64]
		D-C7	Minimize risks associated with the supply chain	X			[16, 37, 62]
		D-C8	Adaptation to modern agriculture	X			[29]
6	Regulatory (D-R)	D-R1	Certification standards		X	Government (central and regional legislature and executive)	[27, 29, 30]
		D-R2	Legitimacy		X		[59]
		D-R3	There is a government policy regarding environmental friendliness		X		[1, 2, 16, 27, 28, 29, 38, 55]
		D-R4	Adoption for sustainable development targets		X		[12, 24, 43, 44]
7	Social (D-S)	D-S1	Increasing consumer awareness of sustainability		X	Consumers (individual communities and institutions/organizations)	[1, 15, 27, 28, 29, 30]
		D-S2	Improved quality of life with increased sustainability		X		[15, 38]
		D-S3	Potential to create jobs		X		[2, 12, 14, 32]
		D-S4	Changes in consumer behavior		X		[2, 27, 28, 29, 40, 48, 65, 67]
		D-S5	Social norms		X		[2, 27]
		D-S6	Food security		X		[32]
		D-S7	Local community support		X		[32]
		D-S8	Social responsibility		X		[17, 55, 62]
		D-S9	Reducing poverty		X		[55]
		D-S10	Health implications		X		[29, 30, 55]
8	Technic and Operational (D-O)	D-O1	Increased operational efficiency in the production and distribution phase	X		Producers (farmers, fishermen, food collectors/suppliers, food industry, distributors and traders)	[15, 18, 24, 30, 31, 38, 40]
		D-O2	Increased food security		X		[38]
		D-O3	Improve operational efficiency	X			[29]
		D-O4	Development of technical knowledge and abilities	X			[2, 11, 15]
		D-O5	Increased productivity using tools	X			[15]
		D-O6	Safety dimension		X		[62]
9	Business (D-B)	D-B1	Business model innovation	X			[14, 44]
		D-B2	Building brand image and gaining reputation	X			[1, 2]
		D-B3	Pressure from food company competitors		X		[27]
		D-B4	Achieve competitive advantage	X			[14, 15, 27, 66]
		D-B5	Customer satisfaction		X		[15]
		D-B6	Product development	X			[55, 67]

IF: Internal Factor, EF: External Factor, S: Strengths, O: Opportunities

Tab.3. Frequency of drivers for CFSC implementation in the literature

Sub Drivers	F	P (%)	C	Sub Drivers	F	P (%)	C
D-L1	12	7.41	7.41	D-L4	2	1.23	81.48
D-E1	12	7.41	14.81	D-M3	2	1.23	82.72
D-C6	9	5.56	20.37	D-T2	2	1.23	83.95
D-L2	8	4.94	25.31	D-C1	2	1.23	85.19
D-R3	8	4.94	30.25	D-S2	2	1.23	86.42
D-S4	8	4.94	35.19	D-S5	2	1.23	87.65
D-O1	7	4.32	39.51	D-B1	2	1.23	88.89
D-E4	6	3.70	43.21	D-B2	2	1.23	90.12
D-T1	6	3.70	46.91	D-B6	2	1.23	91.36
D-S1	6	3.70	50.62	D-L3	1	0.62	91.98
D-C3	5	3.09	53.70	D-E2	1	0.62	92.59
D-C2	4	2.47	56.17	D-M1	1	0.62	93.21
D-R4	4	2.47	58.64	D-C8	1	0.62	93.83
D-S3	4	2.47	61.11	D-R2	1	0.62	94.44
D-B4	4	2.47	63.58	D-S6	1	0.62	95.06
D-E3	3	1.85	65.43	D-S7	1	0.62	95.68
D-M2	3	1.85	67.28	D-S9	1	0.62	96.30
D-T3	3	1.85	69.14	D-O2	1	0.62	96.91
D-C5	3	1.85	70.99	D-O3	1	0.62	97.53
D-C7	3	1.85	72.84	D-O5	1	0.62	98.15
D-R1	3	1.85	74.69	D-O6	1	0.62	98.77
D-S8	3	1.85	76.54	D-B3	1	0.62	99.38
D-S10	3	1.85	78.40	D-B5	1	0.62	100.00
D-O4	3	1.85	80.25				

F: Frequency, P: Percentage, C: Cumulative percentage

Table 4 illustrates the barriers that are classified as significant challenges to the implementation of CFSC. As mentioned in Table 4, barriers are categorized into nine categories, namely: economic and financial, technology and information, knowledge and skills, managerial, business, regulatory and government, socio-cultural, infrastructure, and supply chain, with a total of 50 sub-barriers. This study also sorts the findings of barriers into the vulnerability category and the threats category. This classification is important for understanding the sources of barriers that arise.

Barriers are categorized as weaknesses if they are internal, indicating organizational or system weaknesses, such as lack of financial capability, lack of implementation of environmentally friendly technology, lack of technical skills, etc. Since these factors originate from within, the organization or related entity has direct control to correct them. Meanwhile, the external threats category, such as unsupportive government policies or pressure from market competition, can become a threat since it cannot be controlled internally. Therefore, the focus of the strategy is only on anticipating or reducing its impact. The findings succeeded in identifying 36 barriers in the weakness category and 14 others in the threats category. The most significant barriers based on their appearance in the literature can be seen in Table 5 and are represented in Figure 6.

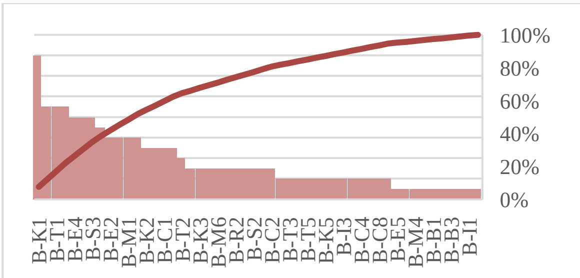

Fig.6. Pareto Drivers CFSC diagram

As with drivers, the identification of each stakeholder is also carried out at each barrier. Identification of these stakeholders is very significant in terms of analyzing each CE barrier in FSC since various stakeholders play different roles, influences, and interests in the process. Understanding who is involved and how they relate to specific barriers helps generate a more suitable design and effective strategies.

Tab.4. Potential barriers to CFSC implementation

No	Barriers	Sub Barriers		SWOT IF W	SWOT EF T	Stakeholder	References
1	Economy and Financial (B-E)	B-E1	Lack of financial capability for long-term CE goals	X		Producers (farmers, fishermen, food collectors/ suppliers, food industry, distributors and traders)	[12, 17, 29]
		B-E2	Requires higher costs	X			[2, 14, 29, 39, 48, 57]
		B-E3	Resource limitations	X			[1, 3, 15, 16, 27, 43, 55, 66]
		B-E4	High investment costs	X			[1, 13, 16, 27, 37, 39, 61, 62]
		B-E5	ROI Issues	X			[3]
		B-E6	Lack of financial support and incentives by institutions	X			[1, 27]
		B-E7	Low short-term economic benefits	X			[1]
2	Technology and Information (B-T)	B-T1	Lack of environmentally friendly technological innovation	X			[1, 12, 13, 16, 27, 37, 55, 59, 67]
		B-T2	Immaturity of supply chain technology	X			[12, 13, 27, 37]
		B-T3	Complexity of data integration and management	X			[3, 16]
		B-T4	Lack of integrated IT systems	X			[37, 60]
		B-T5	Lack of transparency and access to information from various supply chain actors	X			[37, 61]
3	Knowledge and Skill (B-K)	B-K1	Lack of skilled technical personnel	X			[1, 3, 13, 15, 16, 17, 27, 29, 37, 43, 44, 60, 61, 67]
		B-K2	Lack of CE framework and standards in place	X			[12, 13, 16, 19, 29]
		B-K3	Lack of circular design aspects	X			[1, 12, 27]
		B-K4	Limited expertise in information and technology	X			[14, 16]
		B-K5	Lack of focus on quality and safety standards	X			[14, 16]
		B-K6	Limited knowledge of Food supply chain practitioners	X			[16, 24, 44, 60, 61, 67]
4	Managerial (B-M)	B-M1	The problem of supply chain (SC) partners in innovation collaboration	X			[27, 43, 48, 55, 56, 61]
		B-M2	Lack of support from top management	X			[1, 3, 12, 29, 37]
		B-M3	Lack of collaboration and integration between stakeholders	X			[1, 3, 14, 37, 60, 66]
		B-M4	Lack of organizational readiness	X			[3]
		B-M5	Lack of information exchange between supply chain partners	X			[1, 48, 60]
		B-M6	Challenges in sharing the surplus fairly	X			[18, 55, 62]
		B-M7	Ineffective Workforce Management	X			[3]
5	Business (B-B)	B-B1	Lack of competitive advantage	X			[16]
		B-B2	Lack of entrepreneurial innovation	X			[16]
		B-B3	Competition from existing linear businesses	X			[37]

6	Regulation and Government (B-R)	B-R1	Lack of support from the government		X	Government (central and regional legislature and executive)	[13, 17, 44]
		B-R2	Less favorable tax system		X		[16, 40, 59]
		B-R3	Lack of environmental regulations and law enforcement		X		[3, 12, 27]
		B-R4	Lack of CE policy and enforcement from the government		X		[1, 12, 14, 16, 29, 37, 39, 43, 67]
		B-R5	Lack of incentive schemes from the government for CE adoption		X		[12, 37]
7	Sosio-Culture (B-S)	B-S1	lack of public/customer awareness and acceptance		X	Consumers (individual communities and institutions/ organizations)	[1, 13, 14, 27, 37, 39, 56]
		B-S2	Bad corporate social responsibility		X		[12, 27, 67]
		B-S3	Lack of market preference and enthusiasm		X		[1, 3, 12, 16, 27, 37, 39, 43]
		B-S4	Community culture		X		[27, 39, 43, 44, 48, 60, 61]
		B-S5	Company culture and employee connection		X		[37]
8	Infrastructure (B-I)	B-I1	Lack of Proper Waste Infrastructure	X		Producers (farmers, fishermen, food collectors/ suppliers, food industry, distributors and traders)	[48]
		B-I2	Lack of logistical and technical infrastructure	X			[12, 13, 67]
		B-I3	Cold chain and storage facilities are limited	X			[14, 67]
9	Supply Chain (B-C)	B-C1	Complex supply chain network	X			[1, 13, 14, 55, 59]
		B-C2	Traceability issues	X			[12, 14, 67]
		B-C3	Negligence in the agri-food sector	X			[3, 28]
		B-C4	Supply chain governance	X			[24, 55]
		B-C5	Geographical challenges		X		[37]
		B-C6	Uncertainty and more ambiguous situations		X		[18, 43]
		B-C7	Packaging problems and limited availability of environmentally friendly materials	X			[1, 12, 30, 40, 67]
		B-C8	Seasonal limitations and vulnerability to changing market conditions		X		[27, 40]
		B-C9	Security issues		X		[13, 16]

W: Weaknesses, T: Threats

In this case, producers are responsible for several barriers that arise in the implementation of CFSC, which include economic and financial, technology and information, knowledge and skills, managerial, business, infrastructure, and supply chain. Consumers are responsible for every barrier that arises in the socio-cultural cluster, and the Government is responsible for barriers related to regulation and governance.

4.4. CFSC global strategies analysis

CFSC practices involve a range of organizations adopting new CE-related practices and operations. The process of adopting new operations and practices is influenced by drivers (motivators), barriers (obstacles, difficulties), and enablers (facilitators) who help reduce or overcome these issues [34].

Various studies have conducted meta-analyses and systematic reviews of the CFSC literature, such as Farooque et al. [43], Ouro-Salim and Guarnieri [27], and Mehmood et al. [33]. Based on their studies, most of the literature related to CE in FSC discusses drivers and barriers. At the same time, only a few documents focus on ways to overcome these challenges. In this regard, the study of Dossa et al. [34] presents several enablers of barriers that were adopted from the research of Mishra et al. [77] and have been modified.

This study identifies strategies as a way to overcome barriers to CFSC practice.

Tab.5. Frequency of barriers to CFSC implementation in the literature

Sub Barriers	F	P (%)	C	Sub Barriers	F	P (%)	C
B-K1	14	7.53	7.53	B-I2	3	1.61	79.03
B-E3	9	4.84	12.37	B-C2	3	1.61	80.65
B-T1	9	4.84	17.20	B-E6	2	1.08	81.72
B-R4	9	4.84	22.04	B-T3	2	1.08	82.80
B-E4	8	4.30	26.34	B-T4	2	1.08	83.87
B-S1	8	4.30	30.65	B-T5	2	1.08	84.95
B-S3	8	4.30	34.95	B-K4	2	1.08	86.02
B-S4	7	3.76	38.71	B-K5	2	1.08	87.10
B-E2	6	3.23	41.94	B-R5	2	1.08	88.17
B-K6	6	3.23	45.16	B-I3	2	1.08	89.25
B-M1	6	3.23	48.39	B-C3	2	1.08	90.32
B-M3	6	3.23	51.61	B-C4	2	1.08	91.40
B-K2	5	2.69	54.30	B-C6	2	1.08	92.47
B-M2	5	2.69	56.99	B-C8	2	1.08	93.55
B-C1	5	2.69	59.68	B-C9	2	1.08	94.62
B-C7	5	2.69	62.37	B-E5	1	0.54	95.16
B-T2	4	2.15	64.52	B-E7	1	0.54	95.70
B-E1	3	1.61	66.13	B-M4	1	0.54	96.24
B-K3	3	1.61	67.74	B-M7	1	0.54	96.77
B-M5	3	1.61	69.35	B-B1	1	0.54	97.31
B-M6	3	1.61	70.97	B-B2	1	0.54	97.85
B-R1	3	1.61	72.58	B-B3	1	0.54	98.39
B-R2	3	1.61	74.19	B-S5	1	0.54	98.92
B-R3	3	1.61	75.81	B-I1	1	0.54	99.46
B-S2	3	1.61	77.42	B-C5	1	0.54	100.00

By considering the identified barrier categories, this strategy was also created with nine categories, the same as the barriers category.

There are a total of 47 strategies identified and classified based on SWOT Strategies that include S-O (Strength-Opportunity), W-O (Weakness-Opportunity), (Strength-Threat), and W-T (Weakness-Threat), as in Table 6. Strategy design uses the approach SWOT is very important because it helps organizations identify internal factors (strengths and weaknesses) and external factors (opportunities and threats). By connecting these elements, organizations can design strategies that are targeted, efficient, and realistic. The ensuing strategies are then categorized into S-O, W-O, S-T, and W-T to ensure that all aspects, both internal and external, have been considered.

Table 6 represents 47 CFSC practice strategies, with 12 strategies included in the S-O category, 14 strategies in the W-O category, 11 strategies in the S-T category, and 10 strategies in the W-T category. Strategies related to technology and business often fall into the S-O category because they leverage an organization's internal strength, such as technological capabilities, established business infrastructure, or innovation, to seize external opportunities, such as market trends, changing consumer needs, or the adoption of new technology. Likewise, green marketing and efforts to create awareness are also related to internal awareness before ultimately being able to influence externally.

Strategies related to knowledge, skills, managerial and financial capabilities are categorized as W-O because this strategy focuses on overcoming internal weaknesses such as lack of access to funding, lack of worker skills and knowledge, lack of collaboration and integration between stakeholders, and so on. Strategies related to infrastructure and supply chains are categorized into S-T because this strategy utilizes internal strengths such as a strong supply chain network, reliable logistics infrastructure, or production facilities to reduce the impact of external threats such as supply disruptions, market changes, and others. Strategies related to regulations and government, as well as social and cultural, fall into the W-T category because the focus is on overcoming internal weaknesses so that the organization can survive external threats.

Tab.6. Global strategies to overcome CFSC practice barriers

Strategies	Sub Strategies		SO	WO	ST	WT	Stakeholder	References
			SWOT Strategy Codes					
Economy and Financial (S-E)	S-E1	Green marketing and efforts to create awareness	X				Producers (farmers, fishermen, food collectors/ suppliers, food industry, distributors and traders)	[13]
	S-E2	Reduce CE implementation costs		X				[1]
	S-E3	Access to funding		X				[29]
Information and Technology (S-T)	S-T1	Implementation of blockchain technology, IoT, AI	X					[3, 12, 15, 16, 27, 32, 38, 62, 65]
	S-T2	Technology development innovation	X					[1, 14, 28, 37, 60, 61, 67]
	S-T3	Radio frequency identification (RFID) global positioning system (GPS), and big data analysis (BDA)	X					[3]
	S-T4	Digitalization and data management	X					[29, 39]
	S-T5	Use of appropriate technology	X					[5, 40, 62]
Knowledge and Skills (S-K)	S-K1	Increase education and awareness regarding CE concepts through workshops, webinars, and outreach programs		X				[14, 24, 37, 40, 56, 67]
	S-K2	Design, implementation and monitoring of CE projects		X				[56]
	S-K3	Upgrading employee skills with updated tools and techniques		X				[14]
	S-K4	Educate traditional farmers to adopt sustainable practices in agricultural activities		X				[67]
Managerial (S-M)	S-M1	Building partnerships		X				[14, 30]
	S-M2	Collaboration among various stakeholders in the food supply chain		X				[4, 15, 24, 29, 30, 38, 40, 48, 55, 61]
	S-M3	Coordination and sharing of information and knowledge in the supply chain		X				[3, 15, 24, 27, 48, 56]
	S-M4	Support from top management in the organization		X				[1, 57]
	S-M5	Evaluate organizational characteristics		X				[29, 55]
	S-M6	Circular thinking and driving innovation across the system		X				[31, 62, 66]
	S-M7	Management team ability		X				[18]
	S-M8	Building partnerships and networks with community organizations, Non-Governmental Organizations (NGOs)		X				[56]
Business (S-B)	S-B1	Carry out future business scenario mapping	X					[31]
	S-B2	Support businesses in designing their collection networks more efficiently and effectively	X					[55]
	S-B3	Sustainability collaboration opportunities for business people	X					[37]
	S-B4	Implementation of technology and business models	X					[63]

	S-B5	Analyze processes, and develop product designs by involving users	X					[15, 48]
	S-B6	Influence consumer behavior	X					[28, 40, 48]
Regulation and Government (S-R)	S-R1	Government and bureaucratic support				X	Government (central and regional legislature and executive)	[5, 13, 29, 37, 40, 48, 65, 67]
	S-R2	Improved government policies on waste and sustainability				X		[3, 12, 27, 28, 32, 37]
	S-R3	Provide incentives for those who want to adopt CE practices in their business				X		[12, 27, 37, 55]
	S-R4	Enforcement of strict policies for waste management, recycling and recovery				X		[12, 14, 15, 24, 37, 55]
	S-R5	Government policy to promote CE				X		[1, 4, 37, 44, 55, 57]
	S-R6	Monitor recommended practices				X		[37]
Sosio-Culture (S-S)	S-S1	Society and government must support businesses that create environmentally friendly products				X	Consumers (individual communities and institutions/ organization	[29, 37]
	S-S2	Engaging consumers in the circular economy				X		[43, 55, 60]
	S-S3	Create a community organization for food aid				X		[55]
	S-S4	Assisting with CE and sustainability campaigns				X		[43, 65]
Infrastructure (S-I)	S-I1	Build adequate cold chain infrastructure			X		Producers (farmers, fishermen, food collectors/ suppliers, food industry, distributors and traders)	[12, 67]
	S-I2	Improve infrastructure and transportation			X			[3, 16, 19, 48, 67]
Supply Chain (S-C)	S-C1	Optimize routes to overcome poor logistics networks			X			[14]
	S-C2	Influence and manage the supply chain cycle			X			[30]
	S-C3	Logistics system restructuring			X			[12, 65]
	S-C4	Food manufacturing companies must routinely monitor per capita hazardous waste production and processing			X			[12]
	S-C5	Traceability			X			[14]
	S-C6	Increase transparency in food production			X			[62]
	S-C7	Facilitate the entry of smallholder farmers into circular AFSC			X			[3]
	S-C8	Facilitate the use of reusable, recyclable and recoverable materials			X			[1]
	S-C9	Resource valorization, and environmentally friendly innovation			X			[17, 37]

In this context, companies have weaknesses in their ability or readiness to comply with regulations or in understanding social and cultural dynamics, so they are at risk of experiencing negative impacts from external.

In addition, this study also recognizes the stakeholders who are responsible for the strategy. Identification of stakeholders in implementing the CFSC strategy is essential because the food supply chain involves many actors with interdependent interests and roles. So, producers are responsible for implementing strategies to overcome barriers that arise in the economic and financial, technology and information, knowledge and skills, managerial, business, infrastructure, and supply chain dimensions.

Consumers are responsible for implementing strategies to overcome barriers that arise in the socio-cultural dimension, and the Government is responsible for overcoming barriers related to regulation and governance by implementing effective and efficient strategies. The priority of CFSC practice strategies based on their frequency contributions in the literature is demonstrated in Table 7 and Figure 7.

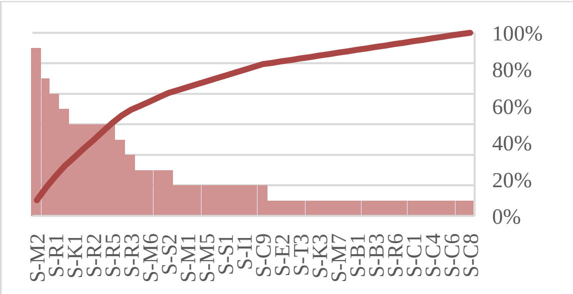

Fig.7. Pareto strategies CFSC diagram

5. Discussion

Based on data derived from the Indonesian Ministry of Environment and Forestry (KLHK), in 2018, as much as 44% of waste generated in Indonesia was food waste. Domestic waste in Indonesia is dominated by food waste. Indonesia has committed to refining food waste management based on National Strategy Policy Guidelines (Presidential Regulation No. 97/2017), with a reduction target of 30% and waste handling of 70% by 2025. Currently, the FLW study in Indonesia is being carried out as an effort to support low-carbon development and circular economy practices [22].

Dewilda et al. [78] performed research on waste management in Padang, Indonesia, employing the 3R concept (reduce, reuse, recycle) as part of the CE concept, which includes 9R. The results of his research showed that the amount of waste produced reached 27.44 tonnes/day or the equivalent of 250.31 m^3/day, with organic waste as the largest contributor at 85.06%. However, if the 3R concept is implemented, the amount of waste taken to the landfill will be reduced from 16.24 tonnes/day to 0.49 tonnes/day.

This proves that the circular model has the potential to overcome waste management problems in Indonesia. By referring to the research objectives, this study presents the main findings, namely drivers, barriers, and global CFSC practice strategies to design CFSC implementation strategies in Indonesia.

Tab.7. Priority of CFSC implementation strategies based on frequency contribution

Strategies	F	P (%)	C	Strategies	F	P (%)	C
S-M2	11	8.59	8.59	S-C9	2	1.56	82.81
S-T1	9	7.03	15.63	S-E1	1	0.78	83.59
S-R1	8	6.25	21.88	S-E2	1	0.78	84.38
S-T2	7	5.47	27.34	S-E3	1	0.78	85.16
S-K1	6	4.69	32.03	S-T3	1	0.78	85.94
S-M3	6	4.69	36.72	S-K2	1	0.78	86.72
S-R2	6	4.69	41.41	S-K3	1	0.78	87.50
S-R4	6	4.69	46.09	S-K4	1	0.78	88.28
S-R5	6	4.69	50.78	S-M7	1	0.78	89.06
S-I2	5	3.91	54.69	S-M8	1	0.78	89.84
S-R3	4	3.13	57.81	S-B1	1	0.78	90.63
S-T5	3	2.34	60.16	S-B2	1	0.78	91.41
S-M6	3	2.34	62.50	S-B3	1	0.78	92.19
S-B6	3	2.34	64.84	S-B4	1	0.78	92.97
S-S2	3	2.34	67.19	S-R6	1	0.78	93.75
S-T4	2	1.56	68.75	S-S3	1	0.78	94.53
S-M1	2	1.56	70.31	S-C1	1	0.78	95.31
S-M4	2	1.56	71.88	S-C2	1	0.78	96.09
S-M5	2	1.56	73.44	S-C4	1	0.78	96.88
S-B5	2	1.56	75.00	S-C5	1	0.78	97.66
S-S1	2	1.56	76.56	S-C6	1	0.78	98.44
S-S4	2	1.56	78.13	S-C7	1	0.78	99.22
S-I1	2	1.56	79.69	S-C8	1	0.78	100.00
S-C3	2	1.56	81.25				

There was a total of 47 driver findings, 50 barrier findings, and 47 strategy findings to overcome barriers. Each element of the identified drivers, barriers, and strategies is subjected to further analysis using Pareto and SWOT. With Pareto, researchers can identify priority elements that contribute to the success or failure of CFSC practices.

Table 3 showcases the percentage order of appearance frequency of driver elements in the literature, which shows that the environmental dimension, precisely the sub-driver 'overcoming the issue of environmental damage', and the economic dimension, precisely the sub-driver 'increasing cost and resource efficiency', are the drivers with the highest frequency, which shows that the majority of CFSC practices are carried out based on this motivation. It is related to efforts to increase competitive advantages and globalization, so companies strive to increase profits by minimizing the use of resources to ensure environmental and economic sustainability [32]. The current linear "take-create-waste-extractive" model leads to the depletion of natural resources and environmental degradation [35].

Meanwhile, food waste is also a global problem for developed and developing countries [15]. So, it is not surprising that 'utilization of waste along the supply chain' is the third driver that appears most often. The rapid increase in food wastage has caused greater damage to the environment [19]. Indonesia is an example of a developing country where the problem of food loss and agricultural waste is more severe than that of developed countries because agricultural supply chain actors in Indonesia are considered to lack knowledge, technology, and infrastructure [24], [79]. Research on how CE is adopted to solve food and waste supply chain problems has highlighted processes of social and technical transition [17].

Besides the waste problem, 'scarcity of resources' was also highlighted as a motive for switching from a linear model to a circular model. It also aligns with the existence of government policies regarding environmental friendliness, which can be an important driver for business actors to implement CE. In various countries, government authorities have created rules and regulations to promote cleaner production, consumption, and end-of-life management to secure resources, safety, and health [33, 80]. By complying with environmental laws and regulations related to circular principles, companies can seek to build their legitimacy in the eyes of stakeholders, including regulators, customers, and investors [27, 80].

Therefore, consumers play an important role in CE practices. 'Changes in consumer behavior' can encourage companies to develop their businesses to be more environmentally friendly [27]. At the global level, increasing consumer awareness of sustainability has driven changes in consumption behavior. Increasing consumer awareness of the environment and increasing the use of single-use plastic packaging is a significant challenge for the packaging supply chain in England [64].

Today's consumers are increasingly aware of the health benefits and risks associated with food consumption [77] and want to know the origins and sustainability of the various processes involved in the value chain, such as procurement, production, distribution, and packaging. According to Anastasiadis et al. [39], consumers are willing to pay more if a product is more sustainable and environmentally friendly as long as relevant information is shared through traceability labeling. However, the successful implementation of logistics tools will be through changing habits by everyone, especially consumers, because the main goal is the reduction of waste production [65].

Figure 5 represents the Pareto diagram of CFSC practice drivers. Apart from the top 6 drivers with the highest frequency mentioned, 18 other drivers contribute 80% of what motivates the implementation of CFSC, which can be seen in Table 5. Although many reasons are driving the practice of this circular model, the current approach is still based on a resource-focused linear economy, and the transition to a circular model faces significant challenges. These barriers prevent businesses from moving towards more circular systems [37].

Table 5 shows the most frequently mentioned barriers. Twenty-seven barriers contribute to the potential failure of CFSC practices. The top ten barriers include lack of skilled technical personnel, limited resources, lack of environmentally friendly technological innovation, lack of CE policies and enforcement from the government, high investment costs, lack of public/customer awareness and acceptance, lack of market preference and enthusiasm, and culture, require higher costs and practitioners with limited knowledge of the food supply chain.

Integrating the restorative and regenerative philosophy of the circular economy (CE) into existing food supply chain systems deals with technical and technological challenges. Limited technical expertise and lack of information about CE-compliant technologies [37] obstruct the integration of CE in food supply chain management. According to Kumar et al. [13], people working in FSC rarely have the application-based knowledge and technical skills to implement complex advanced technologies. This lack of skills is an issue in implementing a circular model that is more transparent and integrated with the recent technology employment.

Regulation and government support are essential to attain sustainable and circular policy goals [3]. Governments in various developed countries have provided incentives, certification standards, and regulations that encourage the adoption of the circular economy. Government support serves as a crucial catalyst for the transition to a circular economy. In Indonesia, there is no specific legal basis for managing food waste. Still, there is a legal basis for food waste according to the Waste Management Law Roadmap for Waste Reduction by Producers, as well as Law Number 32 of 2009 concerning Environmental Protection and Management [81].

Government support is also important in creating a conducive environment for new technologies. Many developing countries have inadequate laws and regulations for the operationalization of new technologies [13]. Technologies supporting circular supply chains are still at an early stage of development, and further progress is needed to enable effective information sharing and collaboration between public and private actors throughout the product life cycle.

Indonesia has a lower level of support and policy enforcement than developed countries. Circular business models require the exchange of information at various stages, from design and production to distribution, use, maintenance, and recovery. These exchanges can help extend product shelf life and reduce risks arising from disruptions in the food distribution process [27].

At the global level, the need for advanced technologies such as blockchain, IoT, and AI has been identified as a key driver to enhance transparency and efficiency. Technology is seen as a critical solution for creating a more efficient food supply chain. According to Kumar et al. [13], most stakeholders in FSC in developing countries originated from rural areas and are less familiar with technology. They ignore new technology. Moreover, stakeholders other than farmers fear losing their jobs or are reluctant to learn new skills. Awareness among farmers is also very low, and they are unfamiliar with the benefits of basic information and communication technology (ICT) tools for them. In Indonesia, the adoption of digital technology remains low due to the lack of technological infrastructure and expertise. The use of advanced technologies is still limited to large corporations. The level of technological readiness in Indonesia lags far behind that of developed countries.

Likewise, adequate returns for both upstream innovators and investors are an important factor for the successful adoption of new technologies. High investment costs and long payback periods hinder the decisions of core companies, farmers, and upstream stakeholders to invest in new technologies. Industry often views these technologies as additional costs without significant improvements in profits [13]. So, high costs are a significant barrier to the adoption and implementation of circular economy (CE) practices [82].

This demonstrates that large investments and high operational costs are major obstacles to implementing circular supply chains at the global level. Similarly, in Indonesia, economic challenges are more complex due to the limited financial capacity of many small and medium enterprises (SMEs) that dominate the food sector. Coupled with dependence on imported materials, price fluctuations become a significant issue. Indonesia faces more severe constraints in terms of access to financing and reliance on imported food materials. Although existing literature suggests that these barriers can be overcome, financial barriers remain a persistent obstacle to achieving CE in food supply chains [83].

This study pinpoints global strategies to overcome CFSC practice barriers, as illustrated in Table 6. Out of the 47 strategies identified, 24 strategies are prioritized since they contribute 80 percent to the CFSC literature. The sequence of strategies is represented in Table 7, and the Pareto diagram in Figure 7. A total of 24 top strategies can be adopted as strategies for implementing CFSC in Indonesia, which can be seen in Figure 8.

There are eight W-T strategies, seven W-O strategies, three S-T strategies, and 6 S-O strategies.

5.1. W-T strategies

The eight W-T strategies include five closely related to 'regulation and governance', namely government support and bureaucracy; improving government policies on waste and sustainability; enforcement of strict policies for waste management, recycling, and recovery; and government policies to promote CE and provide incentives for those who wish to adopt CE practices in their businesses. This is very relevant to Indonesia, which currently issues no specific legal basis regarding waste management using a circular economy model.

According to Faishal and Suprapto [76], the Indonesian government should encourage food producers and processors to use sustainable production and packaging patterns. Therefore, incentives and subsidies need to be provided to producers/processors of food products. This can further motivate organizations to engage in sustainable production patterns. In addition, this step can increase competition among food producers to improve product standards and quality, which will eventually improve human health and protect the environment from unsustainable food products.

Apart from that, there are three other WT strategies related to 'social culture', namely involving consumers in the circular economy, society, and the government, which must support businesses that create environmentally friendly products and help with CE and sustainability campaigns. According to Farida et al. [84], consumer participation is very important to maintain the sustainability of recycling programs. Consumers' attitudes, moral norms, and awareness of consequences significantly influence their intention to recycle. Besides that, Filimonau et al. [85] found that irresponsible consumer behavior has a significant impact and contributes to waste production.

For example, the impact of this behavior can be seen in the increasing amount of food product waste in final disposal sites (TPA) in Indonesia. In addition, waste in Indonesian landfills is dominated by food packaging, the amount of which exceeds other types of waste [86]. The consumption of plastic packaging by Indonesian consumers is contrary to their recycling behavior [84]. In this case, the government can also play a role in encouraging people to use organic food and only buy the amount according to their needs rather than storing excess food, which is a major source of waste [76].

W-T	S-T
• Support and bureaucracy • Improving government policies on waste and sustainability • Enforcement of strict policies for waste management, recycling, and recovery • Recycling, and recovery • Government policies to promote CE and provide incentives for those who wish to adopt CE practices in their businesses • Involving consumers in the circular economy • Society, and the government must support businesses that create environmentally friendly products • Help with CE and sustainability campaigns	• Improve infrastructure and transportation • Build adequate cold chain infrastructure • Logistics system restructuring
W-O	**S-O**
• Collaboration among various stakeholders in the food supply chain • Building partnerships • Increase education and awareness regarding CE concepts through workshops, webinars, and outreach programs • Coordination and sharing of information and knowledge in the supply chain • Circular thinking and driving innovation across the system • Support from top management in the organization • Evaluate organizational characteristics	• Implementation of blockchain technology, IoT, AI • Technology development innovation • Use of appropriate technology • Digitalization and data management • Influence consumer behavior • Analyze processes, and develop product designs by involving users

Fig.8. Adopted Strategy for CFSC Implementation in Indonesia

5.2. S-T strategies

There are three S-T strategies for CFSC practice in Indonesia: initiating adequate cold chain infrastructure, improving infrastructure and transportation, and restructuring the logistics system. In developing countries, the food sector is relatively less prioritized during planning, and governments often fail to reduce food waste due to limited resources and adequate infrastructure. This results in a decrease in the performance of the cold chain system [67]. This unsupportive condition also occurs in developing countries such as Indonesia, so this strategy is very relatable.

5.3. W-O strategies

The seven W-O strategies include six strategies related to 'managerial,' which are a collaboration between various stakeholders in the food supply chain, coordination and sharing of information and knowledge in the supply chain, circular thinking and encouraging innovation throughout the system, building partnerships, support from top management in the organization, evaluating organizational characteristics, and one strategy related to 'knowledge and skills' namely increasing education and awareness regarding CE concepts through workshops, webinars, and outreach programs. Circular model practices can run effectively through collaborative efforts from supply chain stakeholders [30, 56].

According to Faroque et. [43], supply chain partners also require the sharing of information and knowledge in the supply chain to facilitate coordination. In addition, the support of top managers is very important because they can design policies and strategies for new initiatives in the business. The high level of support and commitment of top managers to reduce, reuse, recycle, and recover policies enable them to meet CE [1]. It is suggested for the companies to evaluate behavior towards a circular model that not only considers environmental aspects but also social aspects [55]. Lastly, farmer knowledge and awareness are critical factors in practicing CFSC, as well as the appropriate use of technology and techniques. Managers and policymakers should provide regular training to develop the necessary skills among farmers and employees [67].

5.4. S-O strategies

There are six S-O strategies, including four strategies related to 'technology and information,' which are the implementation of blockchain, IoT, and AI technology; technological development innovation, the utilization of appropriate technology; and digitization and data management. Technology plays an important role in supporting the reduction of food waste [87] by providing opportunities for sharing food surpluses between suppliers and consumers, as well as a monitoring framework for food waste data for various stakeholders in the food supply chain, which in turn will enable economic optimization [1, 17].

In the post-harvest phase, technological solutions aim to ensure the food safety and quality of any materials and/or components intended to come into contact with food during production, handling, or storage, potentially affecting human health [88]. So, to implement new concepts such as a circular economy, they must be integrated with digital technology such as blockchain technology, the Internet of Things (IoT), etc [89] [60]. Digitalization and, most importantly, data management are key drivers for advancing circular economy models. The European Commission has recognized the importance of digital technologies as a key driver for the transition towards a circular economy in its new Circular Economy Action Plan [39].

The other two strategies are closely related to 'business,' namely influencing consumer behavior and process analysis and developing product designs by involving users. Supply chain stakeholders in Clark's study [64] stated that identifying and influencing consumer behavior is accessible. Transformative technology (TT) can be a sustainable solution to increase perceived value and change consumer behavior when switching to CE packaging systems. Additionally, involving consumers in the development of environmentally friendly product designs is a good idea. The use of TT in packaging can increase consumer awareness of the benefits of packaging and encourage changes in consumer behavior to value packaging materials and act responsibly when disposing of packaging waste. TT can help engage consumers with a brand and shift to more sustainable actions in a supply chain.

6. Conclusion

FLW signifies a critical threat to future food security in developing countries. Indonesia is the second largest FLW-producing country in the world, with an estimated 300 kg per capita per year. CE has been established as an important strategy for reducing food waste and increasing sustainability in FSCs. However, research on how CFSC can be implemented effectively is still inadequate. It is revealed in the literature review, which shows the lack of studies related to FLW along the FSC in developing countries, as well as the need for insight and conceptualization regarding the implementation of this circular model, along with the obstacles and enablers to overcome it. The alteration from a linear economy to a circular economy requires analysis from multiple perspectives. So, in this research, research on drivers is reviewed (strengths and opportunities), barriers (weaknesses and threats), and strategies for implementing CFSC globally.

Answering the research question (RQ) and research objectives, this study classified nine categories of drivers, barriers, and strategies with 47 sub-drivers, 50 sub-barriers, and 47 sub-strategies, which have been analyzed using Pareto to determine priority elements.

RQ1: There are 24 drivers of global CFSC practices that can be considered for implementation in Indonesia, namely two drivers in the environmental category, "Overcoming the issue of environmental damage" and "Overcoming the issue of resource scarcity"; three drivers in the economic category, "Increase cost and resource efficiency," "Increased profitability," and "Economic optimization"; five drivers in the supply chain management category, "Effective supply chain integration," "Supply chain traceability," "Supply chain system development," "Utilization of waste along the supply chain," and "Minimize risks associated with the supply chain"; one driver in the managerial category, "Relationship management with stakeholders"; two drivers in the technic and operation category, "Increased operational efficiency in the production and distribution phase" and "Development of technical knowledge and abilities"; two drivers in the technological category, "The emergence of new technological innovations" and "Digitalization"; three drivers in the regulatory category, "Certification standards", "There is a government policy regarding environmental friendliness", and "Adoption for sustainable development targets"; and five drivers in the social category, "Increasing consumer awareness of sustainability", "Potential to create jobs," "Changes in consumer behavior," "Social responsibility," and "Health implications". Identification of drivers can help accelerate CFSC adoption by stressing the factors that motivate companies to shift to circular practices.

RQ2: There are 27 barriers to global CFSC practices that can be considered for implementation in Indonesia, namely four barriers in the Economy and Financial category, including "Lack of financial capability for long-term CE goals", "Requires higher costs", "Resource limitations", and "High investment costs"; two barriers in the Technology and Information category, including "Lack of environmentally friendly technological innovation" and "Immaturity of supply chain technology"; four barriers in the Knowledge and Skill category, including "Lack of skilled technical personnel", "Lack of CE framework and standards in place", "Lack of circular design aspects", and "Limited knowledge of Food supply chain practitioners"; five barriers in the managerial category, including "The problem of supply chain (SC) partners in innovation collaboration", "Lack of support from top management", "Lack of collaboration and integration between stakeholders", "Lack of information exchange between supply chain partners", and "Challenges in sharing the surplus fairly"; four barriers in the Regulation and Government category, including "Lack of support from the government", "Less favorable tax system", "Lack of environmental regulations and law enforcement", and "Lack of CE policy and enforcement from the government"; four barriers in the Socio-Culture category, including "Lack of public/customer awareness and acceptance", "Bad corporate social responsibility", "Lack of market preference and enthusiasm," and "Community culture"; one barrier in the Infrastructure category, namely "Lack of logistical and technical infrastructure"; and three barriers in the Supply Chain category, including "Complex supply chain network", "Traceability issues", and "Packaging problems and limited availability of environmentally friendly materials". Understanding the barriers allows stakeholders to overcome challenges that obstruct the transition from a linear to a circular model.

RQ3: Identifying strategies becomes very important-which is rarely discussed-to provide a solution to the barriers that arise. In this case, several strategies have been identified at the global level related to CFSC practices, including four strategies in the Information and Technology category: “Implementation of blockchain technology, IoT, AI”, “Technology development innovation”, “Digitalization and data management”, and “Use of appropriate technology”; one strategy in the Knowledge and Skills category: “Increase education and awareness regarding CE concepts through workshops, webinars, and outreach programs”; six strategies in the Managerial category: “Building partnerships”, “Collaboration among various stakeholders in the food supply chain”, “Coordination and sharing of information and knowledge in the supply chain”, “Support from top management in the organization”, “Evaluate organizational characteristics”, and “Circular thinking and driving innovation across the system”; two strategies in the Business category: “Analyze processes, and develop product designs by involving users” and “Influence consumer behavior”; five strategies in the Regulation and Government category: “Government and bureaucratic support”, “Improved government policies on waste and sustainability”, “Provide incentives for those who want to adopt CE practices in their business”, “Enforcement of strict policies for waste management, recycling and recovery”, and “Government policy to promote CE”; three strategies in the Socio-Culture category: “Society and government must support businesses that create environmentally friendly products”, “Engaging consumers in the circular economy”, and “Assisting with CE and sustainability campaigns”; two strategies in the Infrastructure category: “Build adequate cold chain infrastructure”, and “Improve infrastructure and transportation”; and one strategy in the Supply Chain category: “Logistics system restructuring”.

RQ4: This research presents the 24 best strategies that can be adopted for CE practice in Indonesia, including eight W-T strategies related to 'regulation and governance' and 'socio-cultural.' The government and society or consumers are responsible for implementing this strategy. There are three S-T strategies regarding 'infrastructure' and 'supply chain management,' which are the responsibility of producers, including farmers, fishermen, food collectors/suppliers, the food industry, distributors, and traders. Later, there are seven W-O strategies regarding 'managerial' and 'knowledge and skills,' which are also the responsibility of the producer. Finally, there are six S-O strategies related to 'technology and information' and 'business,' which are also the responsibility of the producer as a stakeholder.

This research contributes to research on CE in FSC or CFSC by representing drivers, barriers, and implementation strategies. Especially in Indonesia, there is little literature on this topic. This research fills the gap in systematic research in the literature on CE barriers without presenting strategies to overcome them. These findings offer important theoretical implications for circular operations research. It also provides managerial implications for stakeholders along the food supply chain, which are classified into three main types: governments, producers, and consumers. Each stakeholder has the same level of legitimacy, power, and urgency because of their competence, potential, and different levels of interest.

The government can develop policies to support the implementation of CE in the FSC. Producers can apply the proposed strategies to reduce food waste, adopt circular technologies, or improve their logistics efficiency. Consumers can be encouraged to participate in the circular economy through awareness campaigns or incentives to reduce food waste at the household level. Most importantly, collaboration among stakeholders is crucial, as the success of CE implementation relies on the synergy of various parties with different roles and responsibilities.

Despite several contributions, this research has limitations. As a limitation of this research, this study includes open-access articles and papers published only in journals in English with keywords in the specific title, namely 'circular food supply chain.' Thus, other languages and other types of papers were not included in this study. The keywords used also have an impact on the amount of research found and the findings produced. Future research could use more general inclusion and exclusion criteria to involve a wider range of literature. Using broader inclusion and exclusion criteria can provide an opportunity to involve more relevant literature, thereby expanding the scope of the study and generating more comprehensive findings.

Furthermore, the current research focuses on identifying the drivers, pressures, and strategies in the theoretical implementation of CFSC. Future research could take the next step by empirically testing whether the strategies identified in the literature can truly overcome the existing barriers.

This could be done using a case study approach to analyze how different countries or companies have implemented these strategies and whether they have successfully addressed the barriers. This research would provide more concrete evidence regarding the effectiveness of the proposed strategies.

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