

Circular Economy-driven Sustainability Adoption Practices in the Food Supply Chain: An Analysis of Managerial Perceptions

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Abstract

The circular economy has emerged as a new paradigm for sustainability. The 'take-make-reutilise' concept of the circular model is considered to be far more superior to the traditional 'take-make-dispose' linear model. The concepts of circular economy and sustainability are closely related; the circular economy is considered a driver to more sustainable business. Our existing global food system is highly unsustainable. Roughly, one-third of the total food produced gets lost or waste at different stages of food supply chain. Further, the agriculture sector is also a victim of and a major contributor to climate change. Hence, our food system is in urgent need of transformation from the existing unsustainable to be made more sustainable and healthier. So, it is critically important to adopt circular economy-driven sustainability practices in the food industry and its supply chain. While there have been many studies in the past which built conceptual knowledge on the circular economy and sustainable food business practices, rarely any study attempts to investigate the perception of food business managers/executives by integrating both concepts.

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The article analyses the circular-economy driven sustainability adoption practices in the food supply chain. Based on the survey of managers and business executives of 26 selected food companies in India, the study investigates the managerial perception on sustainability adoption practices in food supply chain. The findings indicate that food business managers and executives believe that adoption of sustainable practices is extremely important for food business sustainability. However, their sustainability adoption practices were found to be on moderate level across the food supply chain. The major recommendation is that the government should take the proactive approach to educate the agri-food industry particularly the traditional food enterprises including SMEs about the benefits of the adoption of circular economy and sustainability approaches. Policy-based initiatives are required to develop the enabling conditions in terms of provision of necessary infrastructure, delivering technical-know, promoting innovations and extending the financial support for successful adoption of circular economy-driven sustainability practices by agri-food sector and its supply chain.

Keywords

Food production, sustainable production, food supply chain, circular economy, managerial perceptions, sustainability in emerging markets

Introduction

The world has made spectacular progress in every aspect of human wellbeing; unfortunately, the fundamental problem of hunger still exists in the scientific-driven world of today. Agricultural science has made tremendous progress in terms of increasing productivity and overall food production as the world currently producing 4 billion metric tonne of food per year yet some 690 million people regularly go to bed hungry (FAO, 2011, 2020). Of the total global food production, about one-third i.e., 1.3 billion tonne of food worth about \$750 billion gets lost or wasted each year (FAO, 2013). Clearly, hunger is not a production issue rather it is a logistics issue. Food distribution is different from the distribution of other consumer goods due to perishable nature of food. Unlike other goods, foods undergo quality deterioration caused by spoilage throughout the food supply chain, until the final consumption (Akkerman et al., 2010). Shorter shelf lives of food products, high customer expectations and low-profit margins are some important challenges which characterise the food supply chain. Due to these characteristics, the topic of food supply chain has received a lot of attention from academia and the industry alike in the areas of food quality and safety. But research on food supply chain sustainability has gained momentum only in the last few decades (Ahi & Searcy, 2013). Sustainability commonly refers to how needs of the current generation could be met without compromising the needs of the future generation. It has three dimensions—economic, environmental and social. Environmental sustainability is one of the major challenges the supply chains face today. The role of environmental sustainability is more prominent in the food distribution systems as the food and agricultural commodities are perishable in

nature due to which there are heavy food losses or wastages. The food waste occurring in the supply chain is particularly high in developing economies like India where almost 40% of the food is wasted in comparison to the developed economies where about 33% of the food is lost in the supply chain (Bordoloi, 2016; FAO, 2011; Kaza et al., 2018). This food waste can be accounted to the limited and inefficient use of the resources, poor business operations management and lack of knowledge on environmental sustainability (Birthal et al., 2005; Parwez, 2013). Therefore, minimisation of food waste is an important step which food industries can take in order to make their supply chain sustainable and also profitable. Sustainable supply chains also have the potential to improve products, processes, meet customer demands in a better way and thus adding more value to the business (Camilleri, 2017). A sustainable business operation involves green practices that aim to reduce their environmental footprint, efficient use of resources and cut down on waste (Ahmad, 2015).

In order to fully utilise resources and minimise the waste, food industries are transforming from linear supply chain model to a circular one (Genovese et al., 2017). A circular economy is modern economic system of closed loops in which materials and resources retain their maximum value over multiple product life cycles (Han et al., 2020; Reikea et al., 2018). The circular economy has long existed in the books of environmental sciences. Many researchers have attempted to describe it but there is a lack of scientific consensus to define the term 'circular economy' (Kirchherr et al., 2017; Korsunova et al., 2021). The World Economic Forum defined the circular economy as an industrial system that is restorative or regenerative by intention and design. The circular economy refers to economic model that aimed to produce long-lasting goods in a sustainable manner. Unfortunately, most businesses in today's world use a linear economy model which is based on 'take-make-waste' approach to landfill. Instead, material and resources are reused, repaired and recycled that lead to reduction in consumption of materials and waste. Our existing food system is unsustainable and under increasing pressure from a rising global population and in urgent need of transformation to be made sustainable and healthier (Hawkes & Voegelé, 2018; Huntjens, 2021; WBCSD, 2018). The adoption of circular-economy driven sustainability practices can greatly help the sector deliver social, economic and environmental benefits.

Sustainability Adoption by Businesses: Emerging Source of Competitive Advantage

'Forget how business is affecting sustainability; ask how sustainability is impacting business?' When managers and executives refer to sustainability, what do they exactly mean? Companies all over the world define the term sustainability in myriad ways. There is no single established definition of the term, however, research and regulatory bodies define sustainability as the ways in which needs of the current generation could be met without compromising the needs of the future generation. Although there seems to be no consensus on the definition of

sustainability between businesses yet they do believe that business sustainability will have a great impact on the way businesses think, act and manage themselves (Hopkins et al., 2009). However, there is general understanding of businesses that sustainability is about doing business without harming the environment and lives on the planet (Srivastava, 2006). Nowadays, sustainability is also seen as a business strategy to gain competitive advantage over its rivals (Ojo et al., 2015). The importance of sustainability being clear, the measurement of sustainability in the business poses itself as a hassle to the executives and the managers alike. Previous researches have argued that sustainability is an internally focused concept for businesses and it is measured by the financial benefits to the firm. Sustainable initiatives are often evaluated by the company in the form of waste reduction, cost-saving, product differentiation, risk mitigation and overall improvement in process and product quality (Banerjee, 2001; de Visser-Amundson & Kleijnen, 2020). This is why the concept of circular economy is seen as a crucial element to promote sustainability in the businesses.

Circular Food Supply Chain: Rationale for Circular Solutions to the Linear Problems of Agri-food Sector

The food supply chain that follows a 'farm to fork' structure connects three main sectors: the agricultural sector (cultivation, livestock, fishing and aquaculture), the food industry (firms dealing in processing of fruits, vegetables, spices, poultry & meat, beverages, etc.) and the distribution sectors (logistics including wholesale and retail) (Handayati et al., 2015; Zhong et al., 2017). Agriculture as the primary sector is the most resource-intensive stage of the agri-food supply chain (Wunderlich & Martinez, 2018). Primary agriculture aims at providing healthy and nutritious food to feed the population often places intense pressure on natural resources and the environment (Tengberg & Torheim, 2007). Historically, in India, the Green Revolution phase during the 1960s–1980s has catalysed agricultural production and transformed the country's image from the begging bowl to food basket for the world (Chand & Raju, 2008). However, even after the passing five decades of the green revolution phase, Indian agriculture continues to adopt the linear economy approach (i.e., take-make-use-dispose) causing several issues and environmental concerns (Nath, 2013). The existing linear system of food production is unsustainable (Borrello et al., 2017). The Economic Survey 2015–2016 claims Indian agriculture to be 'a victim of its past success—especially the green revolution'. Criticism of the green revolution includes land degradation, diminishing water resources, pollution of underground water and the decline in productivity which are putting serious challenges to food security. The immense pressure on agriculture to address increasing food demands will continue in near future, particularly in developing and emerging economies which agri-food sector needs to address on urgent basis.

Today, more than one third of all the food produced in the world is discarded as waste. In other words, 16% of all calories currently produced for human consumption as food is lost or wasted due to the linear economy which is based on

the concept of take-make-and-dispose (Silva, Ex-DG FAO, 2016). The food losses and waste occurs in the entire food supply chain including logistics, distribution and also at the household level (Dora, 2019). Agri-food sector is also known for the inefficient utilisation of vested resources. Apart from that, more than 13% of the world’s greenhouse gas emissions have resulted from food and agriculture (Russell, 2014). Agriculture and food industry faced with the dual challenges of food security and climate change needs to be addressed in a sustainable manner (Baker et al., 2017). Therefore, the existing linear model of wasteful ‘take-make-dispose’ pattern of agri-food sector and its supply chain needs action in transition towards circularity in the food system (Zanten et al., 2019).

The adoption of circular economy by agri-food sector and its supply chain can offer sustainable solutions by the reduction in food loss/waste and minimise resource inputs (or maximise resource efficiency) through reducing, reusing, recycling and recovering materials in the supply chain stages of production, processing, distribution and consumption processes (Figure 1). This will be resulting terms of more healthy food for all, less emission of greenhouse gases, mitigation of climate change, increased productivity, competitive advantage for business and sustained economic growth.

In principle, the concept of circular economy sounds great considering the benefit it offers to businesses, society and the environment. But, its adoption particularly in developing countries is very challenging and complex due to poor enabling conditions and Infrastructure bottlenecks (Sousa-Zomer et al., 2018). For instance, in India, a majority of traditional food processing enterprises are lacking knowledge and technical know-how about circular economy including sustainability practices, which are some of the major challenges for the adoption of circular economy.

This study aims at analysing the managerial perception of the adoption of circular economy-driven sustainability practices at the stages of procurement, processing, packaging, logistics, distribution and warehousing management of food supply chain. This work has been structured into six sections. After the introduction, the literature review as the second section built the theoretical foundation of the study on circular-economy driven sustainable strategies & practices in supply chain. The third section provides a framework for circular-

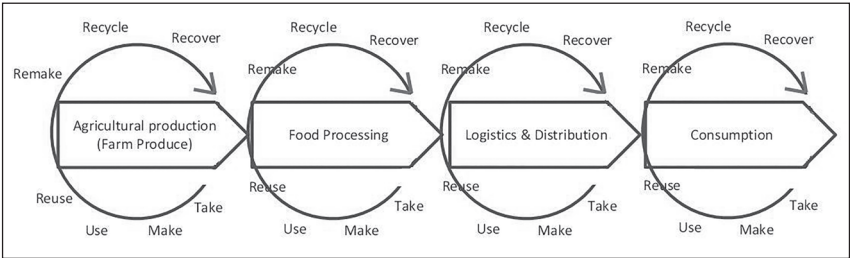


Figure 1. Circular Food Supply Chain

economy driven sustainability practices. In the fourth section, the methodology adopted in the research work has been described. In the next fifth section, the results obtained are discussed in detail along with relevant findings. Finally, in the last section, the most relevant conclusions and policy implications were discussed. The limitations of the study were also stated.

Literature Review: Circular Economy-driven Sustainable Strategies and Practices in Supply Chain

The concept of circular economy is trending as a different and sustainable way to do business and fix climate change. It is forcing companies to rethink everything, starting from the product design through manufacturing to the distribution and consumption process. This transformative approach redefines the traditional linear (end-of-life concept) based industrial production system with circular 'restoration' and 'regeneration' approach in the entire supply chain (Kirchherr et al., 2017). Circular economy is considered a driver that influences more sustainable businesses (Barros et al., 2021). The agri-food sector in developing countries is facing difficulty to feed the growing population due to the emerging challenges of climate change, environmental degradation, desertification & land degradation and huge food losses and waste in the food supply chain (Malorgio & Marangon, 2021). Therefore, the agri-food sector needs immediate action to adopt the circular-economy driven sustainability practices that can lead to a food-secure and a healthier economy. The adoption of circular economy by the agri-food sector has the potential to minimise food losses & waste and ensure food & nutritional security while saving the environment and resources. Accordingly, food companies across the world are pushing to adopt circular economy-driven social, economic and environmental sustainability practices along the food supply chains (Sharma et al., 2019).

The growing environmental consciousness among consumers drives their purchasing decision that has increased demand for more environmental friendly food products that pressurise food industry (Sudeeptha & Galahitiyawe, 2020; Tetra Pak, 2019). Further, there are increased government initiatives to address the climate change issues forcing companies to adopt sustainable strategies and practices to contribute to build a cleaner, healthier and prosperous world (Berrone et al., 2013; Huang, Hu, et al., 2016). According to Elkington (1994), a company is to be considered as sustainable if it performs on all three dimensions of sustainability framework to meet the triple objectives, that is, (a) being economically viable, (b) being socially beneficial and (c) being environmentally responsible. This condition reflects the win-win situation for business, society and the environment. Creating a truly circular food economy requires adoption of sustainable practices by businesses and their supply chain.

A transition from linear to circular economy can lower the resource use (or increase resource use efficiency) and lessen environmental impacts through the adoption of 3R's strategies of reduce-reuse-recycle and sometimes expanded to 7R's (rethink-reduce-reuse-repair-refurbish-recover-recycle) or even more

R’s-strategies (Geissdoerfer et al., 2017). Adoption of the circular economy model as an economic system of closed loops keeps materials, parts and products at their highest utility and value while reducing the pressure and impact on natural resources and the environment (Fogarassy & Finger, 2020). Considering the scope of the circularity concept, the food supply chain is the area where adaptation to circular economy strategies can provide a great solution particularly in dealing with food losses or waste. The gain for food supply chain stakeholders and businesses adopting circular economy strategies and practices as reported by many studies include greater efficiency and profitability, less cost, better innovation and stronger relationships with customers (Antoniou et al., 2019; Boon & Anuga, 2020).

A circular economy path in supply chain starts from sustainable sourcing and procurement (Nath, 2013). Switching to a circular procurement path not just focuses on what materials we buy and the way we buy but looks beyond that and considers whole life of materials in terms of their reusability or recyclability (Molin et al., 2021). Sustainable procurement involves close collaboration with green suppliers for efficient utilisation of materials and reducing wastages & thereby minimising environmental impacts (Arora et al., 2020; Difrancesco et al., 2022). A successful sustainable procurement operation enables the firm to adopt sustainable manufacturing practices to accelerate the transition to a circular-economy driven supply chain (Moktadir et al., 2019). Circular manufacturing essentially considers the environmental, social and economic objectives of sustainability while making a high-quality product. Apart from that, manufacturing activities also integrate sustainable product design and eco-packaging aspects (Ekanayake et al., 2012). The firm extends the sustainable practices beyond manufacturing and integrates logistics activities that involve storage and transportation to move products through the supply chain (Ahmed & Monem,

Table 1. Major Studies on Circular-economy Driven Sustainability Practices in Supply Chain

Supply Chain Stage-wise Sustainability			
S. No.	Practices	Description	References
I.	Sustainable sourcing & procurement	<ul style="list-style-type: none">• Sustainable sourcing is the act of obtaining required materials, products and services from suppliers that adhere to social, ethical and environmental standards.• Circularity based procurement is strategic in nature that is based on cooperation, coordination and long term relationship building with suppliers.	Feng & Huatuco (2022); Handfield et al. (2002); Jia & Jiang (2018); Jones et al. (2007); Khodaverdi & Jafarian (2013); Mattas et al. (2022); Miemczyk et al. (2012); Migliore et al. (2020); Roehrich et al. (2017); Thiebault & Tonda (2018); Tikkanen (2014); Walker et al. (2012); Zsidisin & Siferd (2001).

(Table 1 continued)

(Table 1 continued)

Supply Chain Stage-wise Sustainability		
S. No.	Practices	References
2.	Sustainable product designing, manufacturing & packaging	<ul style="list-style-type: none"> Sustainable product design is the approach to creating long-lasting products that are easy to reuse and recycle, unlike the buy-use-throw away approach of 'linear' economy. Sustainable manufacturing is the creation of products through economically and environmentally sound processes/eco-efficient practices that reduces waste and increases business performance. Sustainable packaging refers to the use of eco-friendly packaging material to wrap/protect/preserve the product that is safe for individuals and easy to recyclable (or reusable, compostable); and minimises environmental impact & footprint.
3.	Sustainable logistics, warehousing & distribution	<ul style="list-style-type: none"> Sustainable logistics refers to the efforts to measure & reduce the environmental impact of logistics activities and minimise resource consumption. Sustainable warehouse is about going green and adopting energy-efficient practices such as automated warehouse, lean warehousing and green building that reduce the carbon footprint/ environmental impact & improve operations. Sustainable distribution refers to the economically viable logistics practices that minimise environmental impact.

2020; Vienazindiene et al., 2021). Table 1 summarises the supply chain stage-wise major studies on circular-economy driven sustainability practices.

The previous studies on adoption of circular economy and sustainability practices were largely conducted in developed countries’ contexts; further, both the concepts were attempted in disintegrated manner. This research study addresses this gap and integrates both the concepts and investigates the adoption of circular-economy driven sustainability practices by food industry and its food supply chain based on managerial perception.

Framework for Circular-economy Driven Sustainability Practices in Supply Chain

There is a direct connection between the concept of circular economy and sustainability (Coste-Maniere et al., 2019; Rathinamoorthy, 2019). The circular economy model fits directly into the sustainability adoption framework and application to the food supply chain context. The adoption of circular economy-driven sustainability practices along the agri-food supply chain, namely agricultural production, food processing, logistics & distribution and consumption can address the issues of significant food losses or wastages including inefficient utilisation of resources (Dora, 2019). Figure 2 presents a framework for the adoption of the circular-economy driven sustainability practices in the food supply chain used in the study.

Data and Methodology

The study has adopted exploratory research design which is suitable when the objective is to gain insight into an emerging concept such as circular economy and

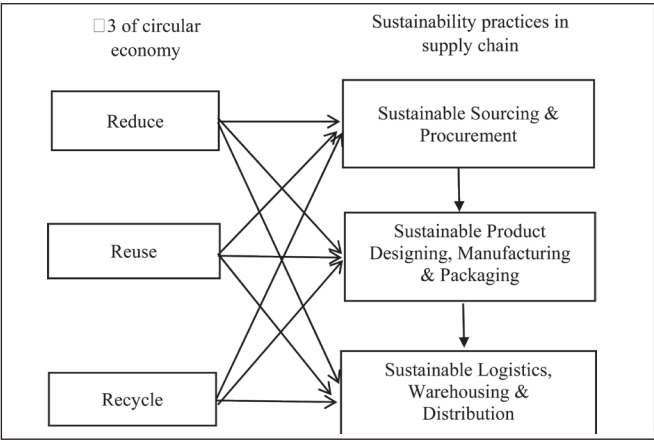


Figure 2. Framework for Circular-economy Driven Sustainability Practices in Food Supply Chain

sustainability for its better understanding and measurements (Filippini, 1997; Forza, 2002; Malhotra & Grover, 1998).

Sampling Procedure

Despite circular economy and sustainability concepts have become increasingly popular and interest in companies, the number of firms adopting circular economy approach with sustainability practices is limited particularly in developing countries. Hence, the study focused the sample on food companies in India which were engaged with circular-economy driven sustainability practices (to the extent of low or high). To identify such food companies, a purposive sampling method was employed (Hibberts et al., 2012; Walker et al., 2021). Although the food processing industry in India is still at a nascent stage of development with limited firms having circular economy and sustainability orientation, this purposive sampling method reduces the potential target population for sampling. However, it serves the purpose of the study, that is, all samples possess the intended characteristics of the adoption of circular-economy driven sustainability practices. The identification of such circular food firms with sustainability orientation was done through various sources such as sustainability/CSR reports of companies, media reports, social media, etc. On the basis of available information, a total of 45 food companies with circular-economy driven sustainability practices were identified for the survey.

From each selected food firm, only one managerial response was collected. The respondents were typically senior managers or executives who possess a higher level of awareness and knowledge about circular economy and sustainability practices and were also involved in the implementation of such practices in their organisation. Their responses were collected through the telephonic survey using a structured questionnaire. Out of a total of 45 selected food companies, a total of 26 companies' managers/executives have responded with valid responses. This represents a survey response rate of 58%, which is considerable for business surveys (Dillman, 2011).

Survey Instrument

A survey questionnaire was developed considering the study objectives. The survey questions covered circular-economy driven sustainability practices at different stages of food supply chain. The major stages and activities covered under the study are procurement, product design, manufacturing & packaging, distribution, logistics and warehouse management. A five-point Likert scale was used that offers five different options for the respondents to express how much they agree or disagree with a particular statement (representing a circular-economy driven sustainability practice). The questionnaire was shared and discussed with three academic experts and equal number of food industry experts for their feedback (Piyathanavong et al., 2019). Their

suggestions were incorporated to improve the ease of questions, structure and logical flow of the questionnaire. A pilot test was performed to ensure both reliability and validity of the questionnaire (Johanson & Brooks, 2010; Piyathanavong et al., 2019).

Data Analysis

The data collected was examined using the SPSS 20.0. A descriptive analysis was carried out (mean and standard deviation) to analyse the perception of managers and executives on the adoption of circular-economy driven sustainability practices at the different stages of the food supply chain.

Results and Discussion

Circular economy is gaining considerable attention from all industry professionals including food industry (Malik et al., 2022). The business community believe that a circular economy approach offers solutions to the problems of the existing industrial ‘linear’ model which assumes that resources are infinite. A circular economy offers solutions for sustainability challenges through re-introducing the discarded materials into the economic system and thus brings operational efficiency and minimises the use of resource inputs (Donner et al., 2020; Rizos et al., 2016; Velenturf et al., 2019). The circular economy approach can simultaneously achieve several goals of increasing recourse use efficiency, generate new business opportunities, reducing costs & price volatility, food security and reducing greenhouse gas emissions (Kalmykova et al., 2018; Malik et al., 2022). Although circular economy and sustainability are different concepts, both are closely connected. The adoption of circular economy is considered a pathway to achieve sustainability (Walker et al., 2021).

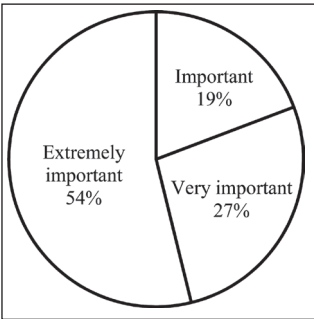


Figure 3. How Much Important Is the Adoption of Circular-economy Driven Sustainability Practices for Food Business Sustainability?

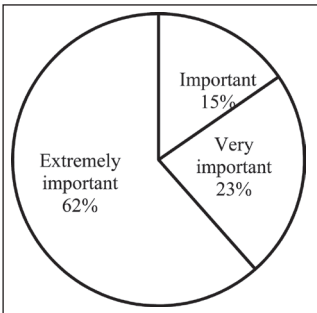


Figure 4. How Much Important Is the Adoption of Circular-economy Driven Sustainability Practices in Food Supply Chain for Sustainable Food System?

Figures 3 and 4 illustrate the percentage response of managers and executives on the respective questions on (a) how much important is the adoption of circular-economy driven sustainability practices for food business sustainability? and (b) how much important is the adoption of circular-economy driven sustainability practices in food supply chain for sustainable food system? Result indicates that a majority (>80%) of the food industry managers/executive believe that adoption of circular-economy driven sustainability practices are ‘very important’ to ‘extremely important’ for their business and its supply chain.

Towards a Circular Economy for Sustainable Food System

A circular economy is more sustainable production and consumption model that is based on principles, strategies and practices that aim to reduce, reuse and recycle materials and other resources that enter the supply chain. Table 2 presents the descriptive statistics for the response to adoption of circular-economy based principles and strategies by the surveyed food companies. Result indicates that there were favourable responses toward the adoption of circularity principles and strategies in terms of 7R’s (i.e., rethinking business models, redesigning the product, reusing materials/by-products, reducing wastage, repairing components/parts and recovering embedded energy). Result suggests that food companies are rejecting the linear take-make-waste economy and moving towards the circular path that is a restorative or regenerative. The adoption of circular economy by food businesses can be clarified in terms of tangible and intangible benefits such as new business opportunities, reduction in food loss/waste, minimise use of input resources, reducing cost, access to market and innovation of products. Some companies adopt the circular economy as a strategic approach to take the long term economic and environmental benefits, apart from meeting out the regulatory requirements.

Circular-economy Driven Sustainable Practices in Procurement

Circularity starts from the procurement. As compared to ‘traditional’ procurement, the circular economy procurement is strategic in nature that focuses on more

Table 2. Circular-economy Principles and Strategies for Sustainable Food System

	Mean*	Std Dev.
Re-thinking business models & sharing economy practices	4.1	1.093
Redesign of product/package	3.9	1.093
Reuse of materials/by-products	4.3	1.018
Reduce wastage of resources/energy consumption/carbon footprint	4.3	1.116
Recycle of materials/waste/parts	4.0	1.280
Repair components/parts for durability	4.3	0.892
Recover embedded energy from non-recyclable waste (waste-to-energy)	3.8	1.234

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

Table 3. Circular-economy Driven Sustainable Practices in Procurement

	Mean*	Std Dev.
Implementing green procurement policy	4.0	1.095
Selecting eco-minded suppliers with high-quality raw materials supply	3.9	1.243
Consider suppliers as sustainable business partner	3.2	1.120
Training manpower for green purchase practices	2.5	1.303
Minimise delivery times by removing unnecessary deliveries	3.1	1.230
Regular audit for suppliers in compliance with sustainability targets	4.2	1.059
Reduce inventory level on non-critical supply for lowering carrying cost, waste minimisation & material obsolescence	3.1	1.211
Improve overall transaction efficiency through best inventory management & control practices	3.8	1.297

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

collaborative, cooperative, innovative and green mindset suppliers (Schmid & Kutzner, 2021). Procuring for circular business takes a different approach that reduces, prevents or reverses obsolescence of materials/waste/by-products or resources leading to develop a sustainable value chain (Seb, 2021). Simply put, the circular economy promotes procurement that controls cost, secures value and meets environmental, social and economic performance goals.

The analysis of managerial responses revealed that there is moderate to high degree of favourable response towards the adoption of circular-economy driven sustainable sourcing and procurement practices (Table 3). The most favourable sustainability practices were observed in terms of implementing green procurement policy, selection of eco-friendly suppliers, regular audits for suppliers (in compliance with sustainability targets) and improving overall transaction efficiency through best inventory management & control practices. The motivation for adoption of circular-economy driven procurement practices suggests advantage of high productivity, cost reduction, competitiveness and green company reputation in the market. Sustainable sourcing is also linked with social, ethical and environmental performance factors.

Circular-economy Driven Sustainable Practices in Product Design, Manufacturing & Packaging

Circular economy begins with the idea of a product and product design (Hollander et al., 2017). Circular product design creates long-lasting products that are easy to reuse and recycle. Further, manufacturing in a circular economy is the crucial step that involves switching from the ‘take-make-dispose’ linear economy to a regenerative business model. Circularity provides the opportunity to incorporate green attributes into a product including its packaging. Circular packaging incorporates the circular economy strategies of recyclable and renewable packaging materials that also integrate with sustainability efforts.

Table 4. Circular-economy Driven Sustainable Practices in Product Design, Manufacturing & Packaging

	Mean*	Std Dev.
Reduced consumption of material and energy through efficient product design	3.8	1.084
Minimise the use of hazardous materials through redesigned/ efficient product/process designing	4.3	0.928
Use of clean energy sources for energy saving	3.0	1.483
Use of green technologies for water saving	2.5	1.503
Use of green technologies for waste reduction	3.2	1.156
Use of green technology to reduce GHGs emission	3.2	1.266
Implementation of good manufacturing practices (GMP)	3.0	1.637
Process optimisation through lean manufacturing operations	3.1	1.440
Quality standards certification	4.6	0.804
Application of risk management practices	3.8	1.142
Use of non-toxic packaging material	4.0	1.183
Reusability of package /packaging materials	3.9	1.306
Use of eco-labelling	3.2	1.347

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

Table 4 depicts the results of perception analysis on the adoption of circular-economy driven sustainable practices in product design, manufacturing & packaging. Results indicate that there were moderate-level favourable responses observed in terms of—reduced consumption of material/energy, minimise the use of hazardous materials, quality standards certification, risk management practices and use of non-toxic packaging material. Moderate-level positive response was also recorded towards the reusability of packaging materials. While the responses on adoption of remaining sustainability practices were average.

Circular-economy Driven Sustainable Practices in Logistics and Distribution

The circular economy is directly linked to logistics. As the circular economy reduces the resources consumption including basic raw materials, this will result in less procurement transport requirements (Neuhold, 2022). Regarding the distribution, it involves the movement of vehicles and products across the territory and boundaries, the circular-economy driven sustainability practices can greatly help logistics and warehousing to be greener and benefit all stakeholders with less environmental footprints. The survey results presented in Table 5 reveal that there was a moderate level of adoption of sustainable practices in logistics and warehouse operations management by the food industry. However, much favourable response was recorded for optimising truckloads as it accounts for a significant proportion of logistics costs.

Table 5. Circular-economy Driven Sustainable Practices in Distribution, Logistics & Warehouse Management

	Mean*	Std Dev.
Optimised truck loads in transportation process	4.2	0.895
Proper vehicle route mapping to minimise unnecessary distance travel	3.3	1.129
Reverse logistics practices	3.4	1.391
Improve warehouse layout	3.7	1.002
Regular service of trucks and other vehicles	3.3	1.192
Switching to more efficient transportation systems (LPG etc.)	3.2	1.541
Optimising location of distribution hubs	3.2	1.713
Strategic placing of warehouses & distribution centres	3.0	1.399
Wholesalers/retailers & 3PLs are considered business partners	3.3	1.538

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

Conclusion and Policy Implication

As the world population inching towards a projected figure of 8.5 billion in 2030 (and 10 billion by 2050); the traditional ‘take-make-consume-throw away’ approach of the linear economy would no longer make any sense. The above population growth will give unprecedented upsurge in global middle class (mostly Asians) from some 4 billion (in 2021) to 5.5 billion by 2030 (European Union). Importantly, the emerging economies particularly China and India will represent over 40% of the global middle class by 2030. This will lead to increase in food demand by approx. 35% by 2030 (as compared to 2012); the adoption of circular economy by food industry and its supply chains can reduce the food waste and losses & provide a sustainable food supply system. Importantly, the circular economy and sustainability concepts are different but both are closely connected. The adoption of circular economy is considered a pathway to achieve sustainability. A circular-economy driven sustainability practice offers many opportunities and benefits for the business, simultaneously it also achieves the goal of social, economic and environmental performance. Considering the multiple benefits it offers for all, the food industry in the developed world is leading in the adoption of circular economy approach. However, despite the popularity of the concepts of circular economy and sustainability, the developing countries are slow to take the advantage of its adoption.

The study was undertaken with the purpose to analyse the managerial perceptions of circular-economy driven sustainability adoption practices by Indian food industry and its supply chain. The review of various studies on circular economy and sustainability has provided an understanding of linearity, circularity and sustainability concepts and their application in the context of food supply chain management. Although circular economy is an emerging concept, there is a lack of consensus on a common definition and theoretical framework for the adoption by industry. The ‘circularity’ feature of food supply chains relates to an

increase in the rate of reuse, recovery and recycling processes which ultimately benefits the environment and communities. The adoption of circular-economy driven sustainability practices in supply chain keeps the materials, parts and products at their highest utility and value and also extending their useful life.

The study has resulted that adoption of circular-economy driven sustainability practices both for food business sustainability and sustainable food system were 'very important' to 'extremely important'. This is very positive and encouraging sign from food industry in the country on their step-up on sustainability path. The food industry responses were also favourable on the adoption of circular-economy principles/strategies in terms of 7R's strategies (rethink-reduce-reuse-repair-refurbish-recover-recycle). The analysis of circular-economy driven sustainability adoption practices in different stages of the agri-food supply chain observed a varying responses. At the sourcing and procurement stages, the favourable managerial response was recorded on the adoption of green procurement policy, selection of eco-friendly suppliers and regular audit of suppliers including inventory management & control practices. At the manufacturing stage, a moderate-level responses were recorded towards the integration of sustainability measures in various operations such as reduced consumption of material/energy, reduced use of hazardous materials, quality standards certification, use of non-toxic packaging material and risk management practices. At the distribution & logistics stage of the food chain, the analysis revealed moderate-level adoption, particularly in activities of optimising truckloads and improving warehouse layout. The remaining responses on sustainability adoption practices in the food supply chain were neutral or average.

Conclusively, the study has resulted that there was moderate to high-level adoption of circular-economy driven sustainability practices at different stages of the food supply chain. However, the degree of adoption of various sustainability practices may vary from firm to firm. This indicates that Indian food industry is moving towards the circular-economy driven sustainability path attracted by new business opportunities, minimise resource inputs (or maximise resource efficiency), reduce food wastage, less costs, low price volatility, green company image and reduce greenhouse gas emissions. Simultaneously, the food business will achieve the goals of social, economic and environmental performance. This will help the agri-food sector to develop a sustainable food system in the country in order to address the emerging concern for food security for growing population. Now, it is the government's turn to extend all possible support for food industry in their successful move from traditional linear (take-make-use-dispose) approach to circular-economy driven sustainability model of regenerative that offers social, economic and environmental benefits.

Policy Implications

This study has shown a moderate to high-level adoption of circular-economy driven sustainability adoption practices by managers/executives of the food companies. The food industry is very different from other industries and therefore, the nature of the industry should always be kept in mind while devising any policies

on addressing the environmental concerns. Food companies deal with intermediate to finished goods, which belong to the fast-moving consumer goods category. The product is highly perishable which in turn increases the risk and the importance of having a smooth and agile supply chain. The food industry is largely monopolistic in nature with each company delivering the same kind of product with a little variation to the consumer. Therefore, there is a cut-throat competition in the market. In such a scenario, it is obvious that the basic objective of a food company is to cut the costs, increase the production and sales and have efficient supply network in order to earn economic profits.

If the government and policymakers encourage the food industry to adopt sustainable practices, they must focus on the cost reduction, risk reduction and increase in operational profit characteristics of the sustainable food business practices rather than relying on the environmental aspects alone. After all, increasing the shareholder's value is one of the main reasons for existence of any business.

Limitations

While this study has generated interesting results, there have been some limitations that should be addressed by future researchers working on the theme. The first and foremost limitation is the small sample size and limited geographical scope to a few states in India. Secondly, the study was based on managerial perception analysis. The interested researchers can do actual observation at the firm level practices and in-depth quantitative analysis for more realistic figures. The third limitation is that the study was conducted in the food sector context; future researchers may look into the non-food sector supply chain and analyse the circular-economy driven sustainability adoption practices.

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References

- Ačkar, Đ. (2021). Sustainable food processing. *Sustainability*, 13, 9628. <https://doi.org/10.3390/su13179628>
- Accorsi, R., Baruffaldi, G., & Manzini, R. (2020). A closed-loop packaging network design model to foster infinitely reusable and recyclable containers in food industry. *Sustainable Production and Consumption*, 24, 48–61.
- Ahi, P., & Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production*, 52, 329–341.
- Ahmad, S. (2015). Green human resource management: Policies and practices. *Cogent Business & Management*, 2(1), 1–13.

- Ahmed, M. M. A. W., & Abd El Monem, N. (2020). Sustainable and green transportation for better quality of life case study greater Cairo–Egypt. *HBRC Journal*, 16(1), 17–37.
- Akkerman, R., Farahani, P., & Grunow, M. (2010). Quality, safety and sustainability in food distribution: A review of quantitative operations management approaches and challenges. *OR Spectrum*, 32(4), 863–904.
- Albuquerque, T. L. M., Mattos, C. A., Scur, G., & Kissimoto, K. (2019). Life cycle costing and externalities to analyze circular economy strategy: Comparison between aluminium packaging and tinplate. *Journal of Cleaner Production*, 234, 477–486.
- Antoniou, N., Monlau, F., Sambusiti, C., Ficara, E., Barakat, A., & Zabaniotou, A. (2019). Contribution to circular economy options of mixed agricultural wastes management: Coupling anaerobic digestion with gasification for enhanced energy and material recovery. *Journal of Cleaner Production*, 209, 505–514.
- Arora, A., Arora, A. S., Sivakumar, K., & Burke, G. (2020). Strategic sustainable purchasing, environmental collaboration, and organizational sustainability performance: The moderating role of supply base size. *Supply Chain Management: An International Journal*, 25(6), 709–728.
- Baker, B., Omer, A., Oldham, L., & Burger, L. (2017). *Natural resource conservation in agriculture*. Mississippi State University Extension Service. <http://extension.msstate.edu/sites/default/files/publications/publications/P3050.pdf>
- Bank, R., & Murphy, R. (2013). *Warehousing Sustainability Standards Development*. 20th Advances in Production Management Systems (APMS), State College, PA, United States, pp. 294–301.
- Banerjee, S. B. (2001). Managerial perceptions of corporate environmentalism: Interpretations from industry and strategic implications for organizations. *Journal of Management Studies*, 38(4), 489–513.
- Barros, M. V., Salvador, R., do Prado, G. F., de Francisco, A. C., & Piekarski, C. M. (2021). Circular economy as a driver to sustainable businesses. *Cleaner Environmental Systems*, 2, 100006.
- Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L. R. (2013). Necessity as the mother of green inventions: Institutional pressures and environmental innovations. *Strategic Management Journal*, 34(8), 891–909.
- Birthal, P. S., Joshi, P. K., & Gulati, A. (2005). *Vertical coordination in high value food commodities: Implications for smallholders* [MTID Discussion Paper No. 85]. IFPRI.
- Boon, E. K., & Anuga, S. W. (2020). Circular economy and its relevance for improving food and nutrition security in Sub-Saharan Africa: The case of Ghana. *Materials Circular Economy*, 2(5). <https://doi.org/10.1007/s42824-020-00005-z>
- Bordoloi, B. (2016). *Curbing food wastage in a hungry world*. <https://www.thehindubusinessline.com/opinion/curbing-food-wastage-in-a-hungry-world/article9285737.ece>
- Borrello, M., Caracciolo, F., Lombardi, A., Pascucci, S., & Cembalo, L. (2017). Consumers' perspective on circular economy strategy for reducing food waste. *Sustainability*, 9(1), 141. <https://doi.org/10.3390/su9010141>
- Camilleri, M. A. (2017). Corporate sustainability and responsibility: Creating value for business, society and the environment. *AJSSR*, 2, 59–74.
- Casarejos, F., Bastos, C. R., Rufin, C., & Frota, M. N. (2018). Rethinking packaging production and consumption vis-a-vis circular economy: A case study of compostable cassava starch based material. *Journal of Cleaner Production*, 201, 1019–1028.

- Chand, R., & Raju, S. S. (2008). *Instability in Indian agriculture during different phases of technology and policy* [Discussion Paper No. NPP 01/2008]. https://krishi.icar.gov.in/jspui/bitstream/123456789/815/1/oth_12.pdf
- Coste-Maniere, I., Croizet, K., Sette, E., Fanien, A., Guezguez, H., & Lafforgue, H. (2019). Circular economy: A necessary (r)evolution. In S. S. Muthu (Ed.), *Circular economy in textiles and apparel* (pp. 123–148). Woodhead Publishing.
- Curioso, G., & Brooke, W. (2018). *Sustainable logistics & supply chain management: Challenges & future outlook* [ISCM 7920 Seminar Paper Research]. University of Wisconsin.
- Delabre, I., Rodriguez, L. O., Smallwood, J. M., Scharlemann, J. P., Alcamo, J., Antonarakis, A. S., Rowhani, P., Hazell, R. J., Aksnes, D. L., Balvanera, P., & Lundquist, C. J. (2021). Actions on sustainable food production and consumption for the post-2020 global biodiversity framework. *Science Advances*, 7(12), eabc8259.
- de Visser-Amundson, A., & Kleijnen, M. (2020). Nudging in food waste management: Where sustainability meets cost-effectiveness. In E. Närvänen, N. Mesiranta, M. Mattila, & A. Heikkinen (Eds.), *Food waste management*. Palgrave Macmillan. https://doi.org/10.1007/978-3-030-20561-4_3
- Difrancesco, R. M., Luzzini, D., & Patrucco, A. S. (2022). Purchasing realized absorptive capacity as the gateway to sustainable supply chain management. *International Journal of Operations & Production Management*, 42(5), 603–636
- Dillman, D. A. (2011). *Mail and internet surveys: The tailored design method: 2007 update with new internet, visual, and mixed-mode guide*. John Wiley & Sons.
- Donner, M., Gohier, R., & Vries, H. (2020). A new circular business model typology for creating value from agro-waste. *Science of the Total Environment*, 716, 1–11.
- Dora, M. (2019). Collaboration in a circular economy: Learning from the farmers to reduce food waste. *Journal of Enterprise Information Management*, 33(4), 769–789.
- Drejeris, R., & Samuolaitis, M. (2020). Development of sustainable distribution logistics system. *Research for Rural Development*, 35, 169–175.
- Ekanayake, E., Jayatilaka, P. R., & Kulatunga, A. K. (2012). *Incorporating sustainable concepts for product design, development and manufacturing* [Conference Paper]. International Conference on Sustainable Built Environment, Kandy, Sri Lanka.
- Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, 36, 90–100.
- FAO. (2011). *Global food losses and food waste: Extent, causes and prevention*. <https://www.fao.org/3/mb060e/mb060e.pdf>
- FAO. (2013). *Food wastage footprint: Impacts on natural resources*.
- FAO, IFAD, UNICEF, WFP, & WHO. (2020). *The state of food security and nutrition in the world 2020*. FAO, IFAD, UNICEF, WFP and WHO. <https://doi.org/10.4060/ca9692en>
- Feng, K., & Huatuco, L. H. (2022). Sustainable purchasing practices: A study of fresh food SMEs in Yorkshire. In S. G. Scholz, R. J. Howlett, & R. Setchi (Eds.), *Sustainable design and manufacturing* (pp. 149–158). Springer. https://doi.org/10.1007/978-981-16-6128-0_15
- Fichtinger, J., Ries, J., Grosse, E., & Baker, P. (2015). Assessing the environmental impact of integrated inventory and warehouse management. *International Journal of Production Economics*, 170(Part C), 717–729.

- Filippini, R. (1997). Operations management research: Some reflections on evolution, models and empirical studies in OM. *International Journal of Operations & Production Management*, 17(7), 655–670.
- Fogarassy, C., & Finger, D. (2020). Theoretical and practical approaches of circular economy for business models and technological solutions. *Resources*, 9(1), 76.
- Forza, C. (2002). Survey research in operations management: A process-based perspective. *International Journal of Operations & Production Management*, 22, 152–194.
- Geissdoerfer, M., Savaget, P., Bocken, N., & Hultink, E. J. (2017). The Circular Economy: A new sustainability paradigm? *Journal of Cleaner Production*, 143, 757–768.
- 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(Part B), 344–357.
- Gong, M., & Kong, Y. (2013). The implementation of green logistics in supermarkets in Sweden and China: A case study for ICA MAXI and JIA JIAYUE. University of Gavle. <https://www.semanticscholar.org/paper/The-implementation-of-green-logistics-in-in-Sweden-Gong-Kong/e3fead41716bc76932912f57ce095b522791e97>
- Gonzalez-Boubeta, I., Vázquez, M. F., Caamaño, P. D., & Prado, J. C. P. (2018). Economic and environmental packaging sustainability: A case study. *Journal of Industrial Engineering and Management*, 11(2), 229–238.
- Han, J., Heshmati, A., & Rashidghalam, M. (2020). Circular economy business models with a focus on servitization. *Sustainability*, 12, 1–17.
- Handayati, Y., Simatupang, T. M., & Perdana, T. (2015). Agri-food supply chain coordination: The state-of-the-art and recent developments. *Logistics Research*, 8(5), 1–15. <https://doi.org/10.1007/s12159-015-0125-4>
- Handfield, R., Walton, S. V., Sroufe, R., & Melnyk, S. A. (2002). Applying environmental criteria to supplier assessment: A study in the application of the analytical hierarchy process. *European Journal of Operational Research*, 141(1), 70–87.
- Hawkes, C., & Voegelé, J. (2018). *Our food system is broken. Here are 3 ways to fix it*. The World Economic Forum. <https://www.weforum.org/agenda/2018/01/our-food-system-is-broken-three-ways-to-fix-it/>
- Hibberts, M., Johnson, R., & Hudson, K. (2012). Common survey sampling techniques. In G. Lior (Ed.), *Handbook of survey methodology for the social sciences* (pp. 53–74). Springer.
- Hollander, M. C. den, Bakker, C. A., & Hultink, E. J. (2017). Product design in a circular economy: Development of a typology of key concepts and terms. *Journal of Industrial Ecology*, 21(3), 517–525.
- Huang, X., Hu, Z-P., Liu, C-S., Yu, D-J., & Yu, L-F. (2016). The relationships between regulatory and customer pressure, green organizational responses, and green innovation performance. *Journal of Cleaner Production*, 112, 3423–3433.
- Hopkins M. S., Townend, A., Khayat, Z., Balagopal, B., Reeves, M., & Berns, M. (2009). The business of sustainability: What it means to managers now. *MIT Sloan Management Review*, 51(1), 20.
- Huang, X., Tu, J-C., & Hung, S-J. (2016). Developing a decision model of sustainable product design and development from product servicizing in Taiwan. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(5), 1285–1302.

- Huntjens, P. (2021). Transition to a sustainable and healthy agri-food system. In *Towards a natural social contract* (pp. 139–157). Springer. https://doi.org/10.1007/978-3-030-67130-3_6
- Jia, F., & Jiang, Y. (2018). Sustainable global sourcing: A systematic literature review and bibliometric analysis. *Sustainability*, 10(3), 595.
- Johanson, G. A., & Brooks, G. P. (2010). Initial scale development: Sample size for pilot studies. *Educational and Psychological Measurement*, 70, 394–400.
- Jones, K., Raper, K. C., Whipple, J. M., & Mollenkopf, D. (2007). Commodity-procurement strategies of food companies: A case study. *Journal of Food Distribution Research*, 38(3), 37–53.
- Kalmykova, Y., Sadagopan, M., & Rosado, L. (2018). Circular economy: From review of theories and practices to development of implementation tools. *Resources, Conservation & Recycling*, 135, 190–201.
- Kaza, S., Yao, L. C., Bhada-Tata, P., & Woerden, F. van. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. Urban Development; World Bank.
- Khodaverdi, R., & Jafarian, A. (2013). A fuzzy multi criteria approach for measuring sustainability performance of a supplier based on triple bottom line approach. *Journal of Cleaner Production*, 47, 345–354.
- Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, 127, 221–232. <http://dx.doi.org/10.1016/j.resconrec.2017.09.005>
- Knorr, D., Augustin, M. A., & Tiwari, B. (2020). Advancing the role of food processing for improved integration in sustainable food chains. *Frontiers in Nutrition*, 7, 34. <https://www.frontiersin.org/articles/10.3389/fnut.2020.00034/full>
- Korsunova, A., Horn, S., & Vainio, A. (2021). Understanding circular economy in everyday life: Perceptions of young adults in the Finnish context. *Sustainable Production and Consumption*, 26, 759–769.
- Lazaridesa, H. N. (2011). Food processing technology in a sustainable food supply chain. *Procedia Food Science*, 1, 1918–1923.
- Limoubpratum, C., Shee, H., & Ahsan, K. (2015). Sustainable distribution through coopetition strategy. *International Journal of Logistics: Research and Applications*, 18(5), 424–441.
- Mahmoudi, M., & Parvizioman, I. (2020). Reusable packaging in supply chains: A review of environmental and economic impacts, logistics system designs, and operations management. *International Journal of Production Economics*, 228, 107730.
- Malhotra, M. K., & Grover, V. (1998). An assessment of survey research in POM: From constructs to theory. *Journal of Operations Management*, 16(17), 407–425.
- Malik, A., Sharma, P., Vinu, A., & Karakoti, A. (2022). Circular economy adoption by SMEs in the emerging markets: Towards a multilevel conceptual framework. *Journal of Business Research*, 142, 605–619.
- Malorgio, G., & Marangon, F. (2021). Agricultural business economics: The challenge of sustainability. *Agricultural and Food Economics*, 9, 6. <https://doi.org/10.1186/s40100-021-00179-3>
- Martindale, W., Finnigan, T., & Needham, L. (2013). Current concepts and applied research in sustainable food processing. In *Sustainable food processing* (pp. 9–38). <https://doi.org/10.1002/9781118634301.ch02>

- Mattas, K., Tsakiridou, E., Karelakis, C., Lazaridou, D., Gorton, M., Filipović, J., Hubbard, C., Saidi, M., Stojkovic, D., Tocco, B., & Tregear, A. (2022). Strengthening the sustainability of European food chains through quality and procurement policies. *Trends in Food Science & Technology*, 120, 248–253.
- Miah, J. H., Griffiths, A., McNeill, R., Poonaji, I., Martin, R., Morse, S., Yang, A., & Sadhukhan, J. (2015). Creating an environmentally sustainable food factory: A case study of the lighthouse project at Nestlé. *Procedia CIRP*, 26, 229–234.
- Miemczyk, J., Johnsen, T., & Macquet, M. (2012). Sustainable Purchasing and Supply Management: A structured literature review of definitions and measures at the dyad, supply chain and network levels. *Supply Chain Management: An International Journal*, 17(5), 1–20.
- Migliore, M., Talamo, C., & Paganin, G. (2020). Circular economy and sustainable procurement: The role of the attestation of conformity. In *Strategies for circular economy and cross-sectoral exchanges for sustainable building products* (pp. 159–173). Springer.
- Moktadir, M. A., Rahman, T., Rahman, M. H., Ali, S. M., & Paul, S. K. (2018). Drivers to sustainable manufacturing practices and circular economy: A perspective of leather industries in Bangladesh. *Journal of Cleaner Production*, 174, 1366–1380.
- Molin, E., Martin, M., & Björklund, A. (2021). Addressing sustainability within public procurement of food: A systematic literature review. *Sustainability*, 13, 13395.
- Molina-Besch, K., Wikström, F., & Williams, H. (2019). The environmental impact of packaging in food supply chains: Does life cycle assessment of food provide the full picture? *The International Journal of Life Cycle Assessment*, 24, 37–50.
- Nath, T. (2013). Managing risks in agricultural supply chain in India (Unpublished doctoral thesis).
- Neuhold, M. (2022, February). *Why the circular economy is transforming traditional logistics*. EY. https://www.ey.com/en_us/consulting/circular-economy-viable-opportunities-for-logistics
- Ojo, E. M., Mbohwa, C., & Akinlabi, E. T. (2015). *Sustainability: Competitive advantage?* Proceedings of the 2015 International Conference on Operations Excellence and Service Engineering Orlando, Florida, USA, 10–11 September 2015.
- Parwez, S. (2013). Food supply chain management in Indian agriculture: Issues, opportunities and further research. *African Journal of Business Management*, 14(8), 572–581.
- Perotti, S., Prataviera, B. L., & Melacini, M. (2022). Assessing the environmental impact of logistics sites through CO2eq footprint computation. *Business Strategy and the Environment*, 1–16. <https://doi.org/10.1002/bse.2976>
- Piyathanavong, V., Garza-Reyes, J., & Kumar, V. (2019). The adoption of operational environmental sustainability approaches in the Thai manufacturing sector. *Journal of Cleaner Production*, 220, 507–528.
- Qaiser, F. H., Ahmed, K., Sykora, M., Choudhary, A., & Simpson, M. (2017). Decision support systems for sustainable logistics: A review and bibliometric analysis. *Industrial Management & Data Systems*, 117(1), 1376–1388.
- Rathinamoorthy, R. (2019). Circular fashion. In S. S. Muthu (Ed.), *Circular economy in textiles and apparel* (pp. 13–48). Woodhead Publishing.
- Reike, D., Vermeulena, W. J. V., & Witjes, S. (2018). The circular economy: New or refurbished as CE 3.0?—Exploring controversies in the conceptualization of the circular

- economy through a focus on history and resource value retention options. *Resources, Conservation and Recycling*, 135, 246–264
- Rizos, V., Behrens, A., Van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., Flamos, A., Rinaldi, R., Papadelis, S., Hirschnitz-Garbers, M., & Topi, C. (2016). Implementation of circular economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers. *Sustainability*, 8(11), 1212
- Roehrich, J., Hoejmose, S. U., & Overland, V. (2017). Driving green supply chain management performance through supplier selection and value internalisation: A self-determination theory perspective. *International Journal of Operations & Production Management*, 37(4), 489–509.
- Russell, S. (2014). *Everything you need to know about agricultural emissions*. World Resources Institute. <https://www.wri.org/insights/everything-you-need-know-about-agricultural-emissions>
- Saada, R. (2020). Green transportation in green supply chain management. In T. Bányai & I. Kaczmar (Eds), *Green supply chain: Competitiveness and sustainability*. <https://doi.org/10.5772/intechopen.93113>
- Saroja, R. (2014). Green logistics & its significance in modern day systems. *International Review of Applied Engineering Research*, 4(1), 89–92.
- Sartal, A., Bellas, R., Mejías, A. M., & García-Collado, A. (2020). The sustainable manufacturing concept, evolution and opportunities within Industry 4.0: A literature review. *Advances in Mechanical Engineering*, 12(5), 1–17.
- Sbihi, A., & Eglese, R. (2007). Combinatorial optimization and green logistics. *Annals of Operations Research*, 175(1), 159–175.
- Schmid, N., & Kutzner, M. (2021). *Procurement in a circular economy-Benefits beyond sustainability*. Deloitte Publication. <https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/strategy-operations/deloitte-ch-en-procurement-in-a-circular-economy.pdf>
- Schönhart, M., Penker, M., & Schmid, E. (2008). *Sustainable local food production and consumption: Challenges for implementation and research*. 8th European IFSA Symposium, 6–10 July 2008, Clermont-Ferrand (France).
- Seb. (2021). *The circular economy: How closing the loop can upgrade procurement*. <https://spp.earth/challenges/the-circular-economy-how-closing-the-loop-can-upgrade-procurement/>
- 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.
- Silva, J. G. D. (2016). *Food losses and waste: A challenge to sustainable development*. <https://museudoamanha.org.br/en/food-losses-and-waste-challenge-sustainable-development>
- Silva, N., & Pålsson, H. (2022). Industrial packaging and its impact on sustainability and circular economy: A systematic literature review. *Journal of Cleaner Production*, 333, 130165.
- Sousa-Zomer, T. T., Magalhães, L., Zancul, E., & Cauchick-Miguel, P. A. (2018). Exploring the challenges for circular business implementation in manufacturing companies: An empirical investigation of a pay-per-use service provider. *Resources, Conservation & Recycling*, 135, 3–13.

- Srivastava, S. K. (2007). Green supply chain management: A state of the art literature review. *International Journal of Management Review*, 9(1), 53–80.
- Sudeeptha, I., & Galahitiyawwe, N. K. (2020, December). *The impact of stakeholder pressure on the adoption of green practices by manufacturing firms*. Conference session presented at 7th International Conference on Business Management (ICoBM), Lahore, Pakistan.
- Tengberg, A., & Torheim, S-I. B. (2007). The role of land degradation in the agriculture and environment nexus. In M. V. K. Sivakumar & N. Ndiang'ui (Eds.), *Climate and land degradation* (pp. 267–283). Springer. https://doi.org/10.1007/978-3-540-72438-4_14
- Tetra Pak. (2019). *Consumer environmental trends report*. <https://www.tetrapak.com/content/dam/tetrapak/publicweb/my/en/sustainability/tetra-pak-consumer-environmental-trends.pdf>
- Thiebault, C., & Tonda, E. (2018). *Building circularity into our economies through sustainable procurement*. UN. https://wedocs.unep.org/bitstream/handle/20.500.11822/26599/circularity_procurement.pdf?isAllowed=y&sequence=1
- Tikkanen, I. (2014). Procurement and consumption of local and organic food in the catering of a rural town. *British Food Journal*, 116(3), 419–430.
- Vasiliasukas, A. V., Zinkeviciute, V., & Simonyte, E. (2013). Implementation of the concept of green logistics referring to it applications for road freight transport enterprises. *Business: Theory and Practice*, 14(1), 43–50.
- Velenturf, A. P., Archer, S. A., Gomes, H. I., Christgen, B., Lag-Brotons, A. J., & Purnell, P. (2019). Circular economy and the matter of integrated resources. *Science of The Total Environment*, 689, 963–969.
- Vienazindiene, M., Tamulienė, V., & Zaleckienė, J. (2021). Green logistics practices seeking development of sustainability: Evidence from Lithuanian transportation and logistics companies. *Energies*, 14(22), 7500.
- Walker, A. M., Opferkuch, K., Roos Lindgreen, E., Raggi, A., Simboli, A., Vermeulen, W. J., Caeiro, S., & Salomone, R. (2021). What is the relation between circular economy and sustainability? Answers from frontrunner companies engaged with circular economy practices. *Circular Economy and Sustainability*, 1–28. <https://doi.org/10.1007/s43615-021-00064-7>
- Walker, H., Miemczyk, J., Johnsen, T. E., & Spencer, R. (2012). Sustainable procurement: Past, present and future. *Journal of Purchasing and Supply Management*, 18(4), 201–206.
- Wang, L., & Yang, M. (2008). Green packaging design on the principle of 3R. *Packaging Engineering*, 29, 162–165.
- WBCSD. (2018). *Our global food system is unsustainable, unequal, destabilizing and unhealthy*. <https://www.wbcsd.org/Programs/Food-and-Nature/Food-Land-Use/FReSH/News/Our-global-food-system-is-unsustainable-unequal-destabilizing-and-unhealthy>
- Wunderlich, S. M., & Martinez, M. (2018). Conserving natural resources through food loss reduction: Production and consumption stages of the food supply chain. *International Soil and Water Conservation Research*, 6(4), 331–339.
- Xiang, L. (2014). Operations management of logistics and supply chain: Issues and directions. *Discrete Dynamics in Nature and Society*, 2014, 1–7.

- Zanten, H. H. E. van., Ittersum, M. K. van., & De Boer, I. J. M. (2019). The role of farm animals in a circular food system. *Global Food Security*, 21, 18–22. <https://doi.org/10.1016/j.gfs.2019.06.003>
- Zhong, R., Xu, X., & Wang, L. (2017). Food supply chain management: Systems, implementations, and future research. *Industrial Management & Data Systems*, 117(9), 2085–2114. <https://doi.org/10.1108/IMDS-09-2016-0391>
- Zsidisin, G. A., & Siferd, S. P. (2001). Environmental purchasing: A framework for theory development. *European Journal of Purchasing & Supply Management*, 7, 61–73.