Journal of Business Research 135 (2021) 1–18

Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

Impact of information hiding on circular food supply chains in business-to-business context

Sachin Kumar Mangla [a,b], Gülmüş Börühan [c], Pervin Ersoy [c], Yigit Kazancoglu [c], Malin Song [d,*]

[a] Jindal Global Business School, O P Jindal Global University, Haryana, India
[b] Plymouth Business School, University of Plymouth, United Kingdom
[c] Business School, Department of Logistics Management, Yasar University, Universite Cad., No: 35, Bornova, Izmir 35500, Turkey
[d] Collaborative Innovation Center for Ecological Economics and Management, Anhui University of Finance and Economics, Anhui Bengbu, 233030, PR China

ARTICLE INFO

Keywords:
Circular food supply chain
Meat industry
Knowledge hiding
Traceability
Transparency

ABSTRACT

This study has analyzed food supply chains from the circular economy viewpoint with a focus on knowledge hiding. In this paper, we examine the practice of hiding knowledge among stakeholders, in which dimension, what this knowledge is and whether there are differences among specific groups of stakeholders. This is applied to distributors, producers, consumers, retailers, suppliers and farmers working within the meat industry in Turkey. It shows how information hiding affects the traceability of food supply chains and circularity in the meat industry. Three different theories have been examined in this paper. Stakeholder theory helps to analyze traceability of food supply chains among stakeholders; the theory of industrial symbiosis aims to achieve an efficient circular food supply chain through 9R (refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover) strategies by adopting traceability; the information theory is a key enabler to coordinate traceability from farm to fork to support a circular food supply chain. By using the theoretical lens, this paper sets out proposals for policymakers and managers in food supply chains to ensure traceability and transparency to achieve circular economy. Although some prior studies address knowledge hiding, information hiding hasn't been examined with traceability and transparency dimensions in Circular Food Supply Chain (CFSC) in B2B business. This study attempts to fill this gap in the literature, improve theoretical understanding with our proposed framework and validating the impact of information hiding and reveal where knowledge is mostly hidden in terms of circular economy, stakeholders and 9Rs in the meat industry. A proposed framework for managers and policymakers based on a circular economy can bring social, economic and environmental benefits for the red meat industry in Turkey. Additionally, it offers a framework and recommendations for other countries and industries for possible adoption.

1. Introduction

The distance between the food producer and consumer has increased because of globalization in the food trade. Moreover, safety and quality concerns, origin fraud and food chain integrity throughout the entire supply chain have become more challenging (Aung and Chang, 2014). Awareness of civil society about the role of business in sustainability has increased (Bateman et al., 2017). Consumers now believe that traceability in a food supply chain is vital to verify food quality and safety. As consumers are more conscious about their health and risks related with consumption of food, food organizations need to give more attention to sustainability issues to increase the trust and loyalty of their customers (Mishra et al., 2018). Beside consumers, non govermental organisations (NGOs), investors, policy makers and even the companies' own employees are also forcing markets into more efficient management of environmental resources through the whole food suply chain (Iakovou et al., 2016; Bateman et al., 2017). For this reason, a traceability system is needed to get information from the beginning of the food supply chain, from the origin of the food to the last destination (Peres et al., 2007) that has a direct affect on food supply chain decisions. Traceability enables companies to minimize waste, helping to retain ecological and economic sustainability (Fassam and Dani, 2017; Pappa et al., 2018).

The Food and Agriculture Organization (FAO) estimates that nearly

* Corresponding author.
E-mail addresses: sachin.kumar@plymouth.ac.uk, sachinmangl@gmail.com, smangla@jgu.edu.in (S. Kumar Mangla), gulmus.boruhan@yasar.edu.tr (G. Börühan), pervin.ersoy@yasar.edu.tr (P. Ersoy), yigit.kazancoglu@yasar.edu.tr (Y. Kazancoglu), songml@aufe.edu.cn (M. Song).

https://doi.org/10.1016/j.jbusres.2021.06.013
Received 30 January 2021; Received in revised form 31 May 2021; Accepted 3 June 2021
Available online 16 June 2021

1.3 million tons of food in the world is lost or wasted annually; approximately half of vegetable and fruit production is wasted before it reaches consumers (FAO, 2011). Nearly 30% of food is wasted in the post-harvest stage of the food chain in developing countries. This situation causes serious economic, environmental and social problems (FAO, 2013a; 2013b; Halloran et al., 2014) and therefore, is the most challenging issue for global food security (Krishnan et al., 2020). For this reason, food loss and waste management are some of the most important issues to be tackled throughout the world (Garcia-Garcia et al., 2017). Adapting to a circular economy where we can exchange by-products and use waste is needed; this can reduce food waste and food loss (Batista et al., 2018). Contrary to linear economy, which is relied on "take-make-waste", the focal point in the circular economy is to protect resources (Van Buren et al., 2016). The key parameters of circular economy are reducing emmissions and consumption (Junnila et al., 2018).

To exchange, sell or transfer any waste and by-products, synergistic collaborations of stakeholders are crucial (Cimren et al., 2011). According to Ferguson and Ketzenberg (2006), if the product lifetime is short, the benefits of information sharing will be highest; a focus on product perishability can strengthen the relationship between a perishable product supply chain and information sharing. However, some of the supply chain members prefer to keep their knowledge to themselves during supply chain interaction. They ignore how knowledge hiding can harm performance of the supply chain.

In current literature there are many studies discussing the antecedent and results of knowledge hiding (Samuel et al., 2011; Andreeva and Kianto, 2012; Connelly et al., 2012; Shih et al., 2012; Connelly et al., 2019; Fang, 2017; Fong and Slotta, 2018; Butt and Ahmad, 2019) However, focusing on knowledge hiding within supply chain management is very limited (Labafi, 2017; Pérez-Salazar et al., 2019); most of these are about buyer–supplier relationships (Yeşil and Hırlak, 2013; Butt and Ahmad, 2019; Singh, 2019). Therefore, application of traceability throughout the supply chain and understanding the reason for information hiding from farm to end user among all stakeholders within a FSC (food supply chain) have become vital issues to achieve an efficient circular food supply chain. To fill the gap in existing literature, the following research questions are raised:

RQ1: What is the impact of information hiding on the circular food supply chain within the scope of B2B?

RQ2: What is the impact of information hiding in the meat industry within the scope of tracebility dimensions?

RQ3: What is the impact of information hiding in the meat industry within the scope of 9R strategy?

To answer these questions, this study seeks to establish a conceptual framework that focuses on the impact of information hiding between stakeholders in the circular food chain. Especially, since traceability is so essential for perishable products throughout the food supply chain. For this reason, we aim to analyze the red meat sector, a promising area in an emerging country where waste and losses are high. Turkey is the focus of study. There has not been enough study into the area of circular FSCs. We need to identify how to retrieve food waste produced in the meat industry and how to transform this wastage to other by-products to enable them to be used in other chains as valuable inputs (Sgarbossa and Russo, 2017).

The aim of this paper is to shed light on the effect of information hiding among stakeholders in the context of traceability of a circular food system in the meat sector. As far as we know, it will be one of the initial studies to focus on determining the effect of information hiding on circularity of a food supply chain, especially through food traceability systems. The emphasis of this contribution is on evaluating the process from the social, economic and environmental perspectives while making sufficient use of company resources by recovering waste in the FSC.

This study builds on the stakeholder theory which proposes that companies provide externalities that impact both internal and external stakeholders of companies (Sarkis et al., 2011). The theory of industrial symbiosis is based on collaboration between supply chain members and information theory which suggests collecting information between suppliers and buyers is essential to minimize environmental information asymmetry (Hu et al., 2016).

In summary, the novelty of this paper is two-fold. First, this paper focus on information hiding that is not well studied in the literature and has come into prominence with transparency in food supply chain. Second, preliminary framework is suggested and focus group study was conducted to evaluate the big picture of food supply chain, measure the contribution of each stakeholder to achieve circular FSC and validate the impact of information hiding in circular FSC.

The remainder of this paper begins with a literature review. In the literature section, a theoretical background is initially presented. The relationships among circular food supply chain, information hiding and traceability are investigated. Then, knowledge hiding in circular FSCs and 9R strategies in circular FSCs are discussed. In the third part, the effect of information hiding on the traceability of circular FSCs is examined and accordingly a proposed framework is suggested to fill the identified gap in present literature about the topic. Then, a focused group study is conducted to find out the effect of information hiding among all SC stakeholders during traceability in a circular FSC in the meat sector. In the last part, analysis and results are presented; a discussion, implications and conclusion complete the paper.

2. Literature review

2.1. Theoretical background

Extant research examining circular economy and green supply chain management (GSCM) is based on a spectrum of theoretical reasoning, such as resource-based view, institutional theory, resource dependency theory, social network theory, diffusion of innovation theory etc. (Liu et al., 2018).

Liu et al. (2018) conducted a literature review to identify theories from GSCM and the circular economy (CE). According to their study, stakeholder theory and the theory of industrial symbiosis are both used in CE and GSCM studies and advance both topics. Information theory also has a significant potential for CE studies (Liu et al., 2018). Therefore, this study proposes a framework based on all three theories.

Stakeholder theory has been considered as one of the most robust theories in considering sustainability issues such as circular economy principles. (Sarkis et al., 2011). A stakeholder is any individual or group that can influence or be influenced by reaching the organization's objectives (Freeman, 1984). Stakeholder theory proposes that companies provide externalities that impact on internal and external stakeholders of companies. Stakeholders force companies to decrease negative effect and increase positive effect of these externalities (Sarkis et al., 2011). Companies can appreciate and understand added value of circular economy initiatives with the help of these pressures. Jakhar et al. (2019) state that pressure from many stakeholders creates a positive impact on innovative capabilities in a circular environment. Suppliers, distributors, customers, employees and local communities are also important for eco-innovation (Freeman, 1999). Stakeholder theory is also used as a main contributor on research related to sustainability performance (Rezaee, 2016). This study involves interaction with different stakeholders who take part in the FSC all SC members, non-SC stakeholders such as NGOs (non-governmental organizations), private institutions, government etc. in order to provide a circular FSC. Stakeholder theory is suitable for this study for analyzing traceability in a FSC comprising of different stakeholders.

Apart from stakeholder theory, with regard to circular economy, the theory of industrial symbiosis (TIS) is widely used. TIS is defined as the merging of different industries in a collective approach to gain competitive advantage while exchanging materials, water, energy and by-products (Chertow, 2000). Hence, this theory is based on collaboration among supply chain partners (Hu et al., 2016). Collaboration is also the key driver of circular supply chains (De Angelis et al., 2017) and

it should be applied to relationships between partners within a circular economy framework. The main objective of industrial symbiosis is to produce more while spending less on energy and resources; this is a vital issue for companies sharing by-products or waste with each other. It is an effective way of obtaining zero levels of waste (Mantese and Amaral, 2018). In industrial symbiosis, every supply chain member should be in a collaboration to determine the quality of waste and to develop suitable incentives to deal with it (Yenipazarli, 2019). Based on this theory, collaboration is the key driver of this study; the aim is to achieve circular economy by using 9R strategies with a traceability approach in a meat supply chain.

Information sharing is essential for coordination of a supply chain. Moreover, collaboration between the supply chain members is needed to integrate a circular economy perspective into the SCM (supply chain management). Throughout the chain, defining aims and an equal distribution of information to all partners are also important (Pan et al., 2015; Xiao et al., 2016). Managers need to communicate with stakeholders to share the organization's environmental performance with those stakeholders outside of the company. However, it is not easy to do this because of lack of current knowledge about materials, products and processes that flow through the supply chain. Different supply chain members, frequently suppliers, may keep back information about their environmental performance and its probable effect on the customer. This is called information asymmetry (Sarkis et al., 2011).

Information theory involves information asymmetry as a main principle. Collecting information between suppliers and buyers is essential to reduce environmental information asymmetry. Information asymmetries between CE actors and their stakeholders - consumers, government and NGOs - increase complexities, uncertainty and risk in this CE system. Material flows and availability, by-products and their costs also have the same information asymmetries (Liu et al., 2018). Greater interaction is needed to reduce information asymmetry (Simpson, 2010). Another reason for information asymmery is distance between the supply chain partners. Supply chains have now become more globally oriented. In a FSC, the distance between suppliers and consumers has also been extending due to globalization. Hence, sharing information and meeting international environmental regulatory requirements is a challenging issue for organisations. Information theory is essential for this study to achieve coordination for traceability in the FSC and also to enable a circular FSC.

2.2. Circular food supply chain, information hiding, traceability

In a FSC, the main difference from other supply chains is in the processing and handling of foodstuffs. The flow of the process starts with raw materials, continues with the product and lastly reaches the consumer. When dealing with food, the main concerns for customers are timeliness and quality of raw materials and products (Apaiah et al., 2005). In the FSC, keeping food in good quality conditions is significantly important. The quality of food depends on how well food is kept safe and how it is handled at every touch point (Connelly et al., 2019).

Another important factor in FSCs is reducing food waste. In studies on FSCs, many researchers focus on avoiding food waste and increasing farmer's income through food safety measures and sustainable food chains (Zhu et al., 2018). Minimizing food waste is important to make a FSC sustainable. Designing and managing the supply chain is related to food waste generation (Butt et al., 2020). Sustainable FSC processes can be improved by effective information flow activities related to information sharing, traceability and transparency. In the food supply chains transparency refers to giving information for consumers where the food is produced and distributed, tracebility refers to information availability of the products at each stage of supply chain (Schmutz et al., 2018).

Efficient food traceability systems are important to track food quality, food safety and food risks; these tools are vital for effective food supply chain management (Manzini and Accorsi, 2013). Food traceability is a part of the logistics chain which covers activities such as storage, transfer and information flow; FSC practice also covers product check, safety and security control as well as up-down tracking of the supply chain (Connelly et al., 2019). Traceability in supply chain processes and systems plays an important role in food waste management. Additionally, long or complicated supply chains may cause food waste (Balaji and Arshinder, 2016). FSC traceability is especially important for easy deterioration foods like meat, milk, dairy products etc. because it's difficult to provide consistent quality products (Pant et al., 2015).

Coordination of a supply chain covers traceability and sustainability; these provide a combination of transparency. Many researchers have emphasized that supply chain transparency is not only related to "truth" but is also related to providing correct information to the correct members (Egels-Zandén et al., 2015). This benefit can help stakeholders to increase supply chain sustainability (Dingwerth and Eichinger, 2010; Fung, 2013). Sharing all information with stakeholders without any loss, delay or distortion improves transparency in supply chains (Beulens et al., 2005). Supply chain transparency reduces information asymmetries (Bartley, 2007; Doorey, 2011) and increases coordination between companies and suppliers (Egels-Zandén et al., 2015). This process can be managed effectively if information is shared and presented among all users/members (Mol, 2015). Transparency in FSCs is vital for food quality, safety standards, supply chain governance mechanism, information flow between supply chain members, flow exchange, information integration and achieving overall transparency within the organization (Pant et al., 2015). It is generally assumed that a FSC includes five main elements covering consumers, food companies, food standards (like quality and safety), information systems and governments. In this structure, government plays an important role to set rules, arrange agreements between supply chain members and increase supply chain transparency (Trienekens et al., 2012). Additionally, the government manages product standards, quality and safety specifications as well as transparency network standards. A transparent information flow enhances product integration, process integration and resources; these in turn enrich the desired characteristics of the product, improve production process and ensure that resource specifications are met (Sharma et al., 2019).

Managing information directly related to information sharing is important; if companies hide information related to top-down processes in the supply chain, this may increase supply chain vulnerability. Similarly, Butt and Ahmad (2019)'s developed model showed that hiding knowledge between company members or between companies can lead to supply chain isolation and supply chain vulnerability (Butt et al., 2020). Additionally, similar work by different researchers has suggested that knowledge hiding in buyer–seller relations or within the supply chain directly affected friendly relationships, supply chain outcomes and systematic information flow (Singh, 2019; Yeşil and Hırlak, 2013).

2.3. Knowledge hiding and knowledge hiding in circular FSCs

Knowledge is information which is used during the process of making decisions and solving problems (Kankanhalli et al., 2005). Since knowledge creation is not a stable process, social interaction between partners and organizations should be provided (Becerra-Fernandez and Sabherwal, 2001). Therefore, knowledge sharing is needed to enhance the capabilities of companies while addressing unexpected problems throughout the whole SC; it improves responsiveness and organizational innovation. (Blome et al., 2014). All SC members become as strong as the weakest member because of shared knowledge (Pandey et al., 2020). Samuel et al. (2011) indicate that knowledge management is also a vital element of supply chain management, especially crucial for a multilayered distribution channel. According to the results of many studies, cooperation throughout the supply chain provides an increase in environmental and economic performance of supply chains. In circular logistics, supply chain knowledge sharing is an important factor to establish collaborative relationships and to enable sustainability (Dora,

Table 1
The 9R framework of circular economy.

Refuse (R0)	It means rejecting the product or using it with the same function but in a different product (Morseletto, 2020). This extends usage of an existing product; this is important for the circular supply chain. Final products and returns are some examples of refuse.
Rethink (R1)	Rethink refers to using products more intensively or sharing products with others (Potting et al. (2017) including leasing, renting or sharing. Rethink may always have characterized CE, because to make something more circular requires rethinking it, to some extent.
Reduce (R2)	Reduce refers to reducing usage of natural resources, inputs, energy, raw materials and waste (Morseletto, 2020) This is important for circular food supply chains to reduce energy, water, raw material consumption and pollution.
Reuse (R3)	Reuse can be defined as after the first cycle of a product which is in good condition and in the same physical conditions, the second, third or further use of the original product takes place (Jawahir and Bradley, 2016). Using an original product with similar functions many times e.g. pellets, packages etc.
Repair (R4)	Repair is defined as fix, restore and maintenance of broken or faulty products; it can be used again with its original function or operations (Potting et al. 2017; Charter and Gray, 2008). Repairs correct product defects (damages or decay) in a product, restoring it to increase durability or serviceability or usable conditions (Morseletto, 2020; Den Hollander et al., 2017). In other words, repair is related to corrective maintenance (Den Hollander et al., 2017) e.g. machines or equipment.
Refurbish (R5)	Refurbishing means updating, modernizing or restoring an old item/product. It is related to part replacement or light manufacturing (Ferguson and Souza, 2010). Certain parts of the product are changed and offered to the market again with specified quality, safety or working standards e.g. equipment, pallets.
Remanufacture (R6)	In remanufacturing, some parts of the old product are used in a new product. It's also defined as second-life production. In remanufacturing, parts of the old products are used in a new product with the same function (Morseletto, 2020; Van Buren et al., 2016). In this process used products are reused without losing their functionality (Jawahir and Bradley, 2016) e.g. automobiles, feed for animal etc.
Repurpose (R7)	In this process, certain parts of the product or the whole product are used for a different purpose or with a different function in a different product. In the repurpose phase, products are used in different functions (Morseletto, 2020). In this process products have different functionality and a different identity e.g. box-vase, pallet-furniture etc.
Recycle (R8)	This process involves a chemical transformation when products are transformed into raw material. Products converted into raw materials can be used for many products as an input. This process plays an important role for CE by minimizing waste and landfill. Recycling adds value for products with longer life time duration e.g. plastics, glasses, boxes
Recover (R9)	Recovery refers to certain products that cannot be recycled and remain as waste i.e. evaluated as a source of energy or biomedical components. Recovery involves collecting products at the end of their life time, disassembling, sorting and cleaning them to become part of the new system (Ghisellini and Ulgiati, 2020).

2019).

The circular economy and sustainability measures provide economic, social and environmental benefits to customers and stakeholders (León-Bravo et al., 2017; Seuring and Müller, 2008). A circular economy and sustainability play vital roles in the food industry when dealing with higher food demand and higher costs with higher energy consumption (The State of Food and Agriculture, 2013). The sustainable FSC is based on "doing more and better with less" (UN, 2017).

In a circular economy, waste and resources must be minimized; resources are kept in the economy by extending the product life cycle by either re-use or some other strategies to provide further value (Dora, 2019). However, in many industries, particularly the food sector, many by-products cannot be processed properly within a company plant; this situation thus provides an opportunity for collaboration with other companies and establishment of an eco-industrial network (Farooque et al., 2019; Talay et al., 2018). Additionally, circular economy-based sustainability is related to food waste minimization (Närvänen et al., 2020) and improved 9R strategy (refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover) performance (Govindan and Hasanagic, 2018); better use is made of resources with maximum value at different stages (Bag et al., 2018; Patwa et al., 2020). There is an increasing focus by businesses on exploring better resource and process efficiency at different stages of production and consumption to promote the principles of a circular economy.

Circular economy-based sustainability also facilitates safe and high-quality foods (Beske et al., 2014). Safety, high-quality food production and minimizing waste are directly related to business collaboration and circular economy integration. Innovation investments, business collaborations, data collection and data sharing are a requirement for CE (Preston, 2012). Supply chain integration and supply chain collaboration with extended responsibilities to members are vital for successful CE implementation (Leising et al., 2018). Supply chain collaboration can be classified as internal or external collaboration (Kache and Seuring, 2014). Internal and external supply chain collaboration can be extended as horizontal and vertical integration (Simatupang and Sridharan, 2002). Integration of a company's different functions are defined as internal collaboration; collaboration between companies or companies and their partners is known as external collaboration (Vickery et al., 2003). Horizontal collaboration occurs between companies and their competitors while vertical collaboration occurs between companies and their suppliers or their customers (Coderoni and Perito, 2020). Sharing information and knowledge with internal and external partners is significant for supply chains

Zhao et al. (2011) highlight that internal and external integration can be achieved with information systems, data sharing and process integration; these provide significant internal and external integration. System integration and collaboration are very important for transparency. Transparency is a very effective tool for internal and external collaboration. Similarly, Boström et al., (2015) show the importance of transparency for collaborative working and solving problems effectively with information visibility. Information visibility is important for improving supply chain sustainability, managing production or process related risks and providing sustainable collaboration (Gardner et al., 2019). Traceability provides tracking of all processes starting from origin to life story of the product (Cheng and Simmons, 1994). Additionally, traceability is directly related to the provision of information (Opara and Mazaud, 2001).

In the FSC traceability is related to origin of the product, genetic situation of the product, origin of the inputs, physical location of the product, process visibility, ingredients of the product (disease and pest tests) and accessibility of reference standards related to the product (Moe, 1998). Efficient use of resources, production methods in a clear manner according to standards, plus transparency and traceability at every production stage are very important for both CE food traceability and circular food traceability. On the other hand, if processes are not transparent and visible, there may be problems with many issues such as food safety, production safety, resource utilization, compliance with standards, product originality, food security or food traceability; there may be too much information hiding at every stage of the food supply chain.

However, some companies are not willing to share real information; they hide information related to the origin or history of the product, price, quality, safety issues and associated guarantees. The reason for that is to mislead consumers about the environmental benefits of a product, service or environmental practices of a company; the aim is to increase the eco-friendly image of the company rather than dwell on any negative impact on the environment.

According to Connelly et al. (2012), "knowledge hiding is an

Table 2
9R Strategies for Circular Food Supply Chain.

Supplier	Farmers	Processor /Manufacturer	Distributor / Wholesaler	Retail	Consumer
Reuse (pallets, packaging)	Reuse (pallets, packaging, water)	Reuse (packaging, pallets)	Refuse (final product, returns, transport methods)	Refuse (final product)	Refuse (final product)
Recycle (energy, bio-gas etc.)	Recycle (energy, bio-gas, plastic)	Recycle (used oils, energy, food packaging materials, plastics)	Reduce (energy, pollution, damage and spoilage)	Reduce (damage and spoilage, inaccurate forecasting, pollution, energy, water)	Rethink (unused products, plastic and glass bottles)
Remanufacture (feed for animals)	Recover (water, cowpat)	Recover (raw materials, water)	Repair (equipment and machines)	Repair (equipment, machines)	Reduce (pollution, cost)
Refurbishing (equipment, pallets)	Rethink (leasing, renting, sharing)	Remanufacture (packaging, feed, plastics)	Refurbish (equipment and machines)	Refurbish (equipment, machines, return product package)	Reuse (final product, by-product, cardboard, glass, plastics, container)
Reduce (energy, water consumption, raw material, pollution)	Reduce (energy, water consumption, raw material, pollution)	Rethink (leasing, renting, sharing)	Recycle (plastics, cardboard, food packaging materials)	Recycle (plastics, food packaging materials, cardboard)	Repurpose (boxes, pallets, final product, by-products)
Repurpose (by-products, water)	Remanufacture (surplus feed, biobased products)	Reduce (energy, water consumption, raw material, pollution)			Refurbish (final product)
	Repurpose (by-products, water	Repair (equipment, machines, components, production line)			Recycle (unused products, plastics, glass, paper)
		Refurbish (equipment, machines)			
		Repurpose (ingredients, by-products, water)			
		Refuse (raw material, final product)			

intentional attempt by an individual to hide or withhold knowledge that is demanded by another person". It is also vital to understand the differences between knowledge sharing and knowledge hiding. It is not possible to evaluate knowledge hiding as just an absence of sharing, it is an intentional attempt. According to Connelly et al., (2012), it may be assumed that knowledge hiding and sharing are opposites of each other; however, there can be two conceptually distinct constructs. For instance, Ford and Staples (2008) state that knowledge hiding and sharing can happen at the same time when partners are willing to share unimportant information with each other but also keep other crucial information confidential.

In a FSC, a company may try to get information from the SC members about available by-products and food waste that can be used as input resources for fertilizers, organic compost, energy, production of packaging etc. Information hiding at this stage prevents transfer and exchange of information about the usability of food waste, sources and available by-products held by internal and external stakeholders (Batista et al., 2019).

2.4. 9R strategies in circular food supply chain

The increase in the global population is rising demand for food, water, and energy and thus accessing natural resources is creating stress (Bag et al., 2021). The circular economy and environment should be integrated for resource efficiency. Waste production, fresh water production, energy and carbon footprints should be integrated with the circular economy and business models (Sharma et al., 2019). Additionally, the circular economy and sustainability should be implemented with the circular FSC. In a linear FSC, waste is sent to landfill but in the circular FSC the main purpose is to re-evaluate all waste for recycling, refurbishing, reusing etc. for zero-waste purposes (Farooque et al., 2019). In the circular FSC, food waste and by-products from the production phase may occur; food waste reuse or avoiding surplus in the consumption phase are based on a consumer's competence and skill. Nowadays food related wastes are utilized as by-products in resource recovery like bio-energy, electric energy or cleaning water by using innovative technological devices (Papargyropoulou et al., 2014, Bourlakis et al., 2014). By using innovative and appropriate techniques, different types of animal related processing wastes can be recovered to produce different types of bio-energy products like bio-gas, bio fuel etc. (Sharma et al., 2019). Similarly, agricultural wastes can also be converted to different types of products such as wood, bio-chemical feedstock or energy (EMF and McKinsey Company, 2012).

Collaborations with customers and suppliers during the food supply chain process may extend product life and usage by adding maximum value as 9R. Table 1 explains the importance of 9R strategies for the circular food chain and circular economy. The recoveries that can be made in all processes are shown in detail.

Food supply chains may involve a large amount of food loss in both quality and quantity (Aktas et al., 2018; Sharma, et al., 2018), a large amount of solid waste (Hoornweg et al., 2013), high water and energy consumption (Morone et al., 2019). Specifically, food loss is very high in the meat industry. Approximately 60–70% of a slaughtered carcass forms meat waste by-product; 40% of these are edible and 20% inedible (Bhaskar et al., 2007). Another important issue is water consumption in meat processing. 24% of fresh water usage in the entire food and beverage industry is due to the meat industry (Bustillo-Lecompte et al., 2016); meat processing activities need between 2.5 and 40 m^3 water for a single meat production.

In the circular FSC, using all resources optimally, remanufacturing, refurbishing, reusing and recycling products within biological or technical cycles are very important for recovering nutrients from food processing stages and for the creation of value from waste (Mirabella et al., 2014; Krishnan, et al., 2020). Also, increasing the nutritional power of food from waste is important for a product's shelf-life extension (Cavaliere and Ventura, 2018). These types of products are defined as value added products or waste to value products (Aschemann-Witzel and Peschel, 2019); they are very important in a circular FSC, transforming waste to value added products (Bhatt et al., 2018). In all these processes and sustainable use of products is dependent on upstream and downstream information sharing (Krumme and Melkonyan, 2019). The integration of processes in a circular FSC can reduce losses and waste. Dora (2019) emphasizes that sharing information and knowledge while collaborating with supply chain members may increase value of

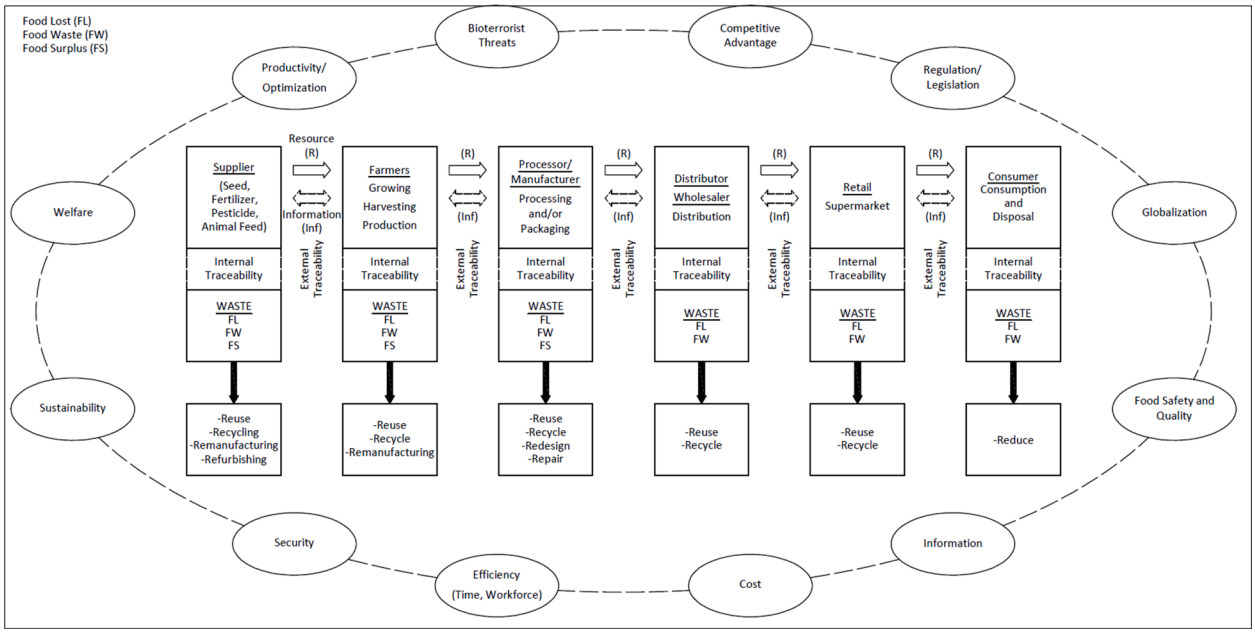

Fig. 1. Proposed Framework for Circular Food Supply Chain with Traceability Dimensions.

recycling and reusing waste. Table 2 shows the 9R processes in detail with some examples.

3. Proposed framework

As can be seen in Fig. 1, our proposed framework aims to focus on the impact of information hiding and traceability among stakeholders in the circular food supply chain. As mentioned before, a traceability system is needed to get information from the beginning of the food supply chain, from the origin of the food to the last destination for more efficient management of environmental resources through the whole food suply chain (Iakovou et al., 2016; Bateman et al., 2017). For this reason, it should be noticed that this figure is surrounded with traceability dimensions. Furthermore, stakeholder theory refers that companies provide externalities that impact on internal and external stakeholders of the companies. Stakeholders force companies to diminish the negative effect and increase the positive effect of these externalities. In this model, food waste, food lost or food surplus occurs in each stage of food supply chain. As the the theory of industrial symbiosis explains the role of collaboration among supply chain partners by exchanging recourses such as materials, water, energy and by-products, it can give insight to each stakeholder to use 9R strategies to achieve circular economy. By this way, companies can understand the value of circular economy initiatives. Finally, in the light of information theory, collecting information between CE actors and their stakeholders should be essential to reduce environmental information asymmetry in circular food supply chain.

In this section, the tracebility dimensions are explained in detail and proposed framework has been presented accordingly.

Sustainability: Sustainability and environmental impact potential of the product directly affect a company's competitive advantage. Information visibility about product sustainability plays an important role in making competitive advantage and profit in the market. Product sustainability is related to tracking ability, history and location of the food product, ISO certification and ethics (Olsen and Borit, 2013). Information hiding about the sustainability of the product, how environmentally friendly it is or presenting misinformation negatively affects the image and profitability of the company in the long run. The loss caused by Volkswagen's incorrect emission values is an example of this.

Welfare: Nowadays, customers request more information about welfare of the animals, animal nutrition, slaughter method in Islamic countries etc. In some cases, consumers demand direct control of animal welfare, its health, feed supply and food safety (Madec et al., 2001). For this reason, information about the welfare of animal life or the sustainability of the product should not be hidden from customers; it should be shared transparently.

Productivity Optimization: Traceability of real time data and information at all times gives flexibility, allowing continual review and optimization of the production methods. Improved traceability and allowing customers to access updated data improves effective and efficient production systems and warranty food security for consumers (Huang and Yang, 2009). Information hiding, as it blocks access to accurate and on time information, directly affects the efficient management of products, production processes and producers. Efficient management systems enable traceability of the product, current information and allow consumers access to comprehensive information about products; this is so important for a business (Thomsson and Sylvia, 2005). Optimizing process and traceability of the food system minimizes batch size, batch mixing and ensures sufficient quantity availability (Thakur et al., 2010).

Bioterrorist Threats: Disease and pest traceability, covering the epidemiology of pests and biotic hazards (Thomsson and Sylvia, 2005), are potential threats; each link in the chain for designing and implementing a feed and food traceability has to be monitored (ISO 22005, 2007). In a FSC, traceability of the product and standardization of the process and procedures on food security for consumers (Huang and Yang, 2009) are required. The use of standard language for information sharing not only increases traceability and transparency but is also important for inventory, shipping, receiving and transportation operations in the supply chain (Ruiz-Garcia et al, 2010). Hiding food information from consumers or companies can occur; this may involve the shipping process, product specification, slaughterhouse, meat weight, bone weight, carcasses, breaks about cold chains, temperature deviations, human contamination, shipping documents of the meat or bioterrorism during the transfer process. These increase food risks and reduce trust in food safety policy (Ruiz-Garcia et al, 2010; Thakur et al., 2010).

Competitive Advantage: Hiding information through the chain from employees or suppliers directly affects the company's competitive advantage (Hernaus et al., 2019). Knowledge hiding often occurs

between managers and senior managers; this hiding directly affects a manager's innovative skills and the employee's commitment to the company, vital for supply chain competitiveness (Butt, 2019). This practice also affects a company's long-term coordination and collaboration among supply chain members, reducing the company's competitiveness in the long term (Lotfi et al., 2013).

Regulation/Legislation: The increasing importance of food safety, security and quality encourages all members in the supply chain to adopt traceability and transparency from farm to fork (Connelly et al., 2019). Regulations and legislation play an important role in food traceability and transparency. Trust in the food produced and the company itself are important for reducing a consumer's risk. When the risk increases, consumer trust is also affected (Wognum et al., 2011). With globalization, food safety and biodiversity have gained importance, especially legal regulations and governmental practices and standards brought to food have increased the importance of food tracebility and information visibility (Vermeulen, 2015).

Information visibility and food traceability positively effect demand and competitive advantage. Effective food control systems and food regulations have a major influence on food traceability and securing consumers; the alternative is customer insecurity and fraudulent foods (Kassahun et al., 2014). A main concern in the world is developing legislations and new standards for food quality, food traceability and food transparency (Althoff and Petersen, 2004). Hiding information in this process negatively affects both the company's reputation and the customer's trust. This may cause the company to make financial losses and can seriously damage its competitive advantage. In addition, companies that do not comply with rules and regulations are subject to penalties.

Globalization: Globalization has meant the linking of producers and consumers with other major players- industrial personnel, farming communities, NGOs and stakeholders; this adds to the challenges in this global environment. Since the nineteenth century, the food market has been affected by globalization. Relationship between farmers and consumers turned into a complex integration of actors which comprises many stakeholders (Paciarotti and Torregiani, 2020).

Furthermore, with globalization of the food market, free trade policies have improved inspections of food origin, safety and quality, health and nutritional properties as well as ethical issues in efforts to achieve sustainable food production. In these conditions, maintenance of transparency between parties is vital (Bhat and Jõudu, 2019). All partners in the FSC should not be reluctant to share information. Otherwise, information hiding will cause uncertainty, information asymmetry in the FSC and more difficulty in monitoring overall food safety (Validi et al., 2014).

Food Safety and Quality: Globalization of the food supply chain has also drawn attention to food-related safety and quality issues, leading to a demand for more information about horizontal and vertical food supply chains. In particular, perishable products such as fish, milk and meat may pass through lots of stages before coming to the customer. Perishable products are also affected by environmental conditions such as light, humidity, temperature etc. Food quality and safety is also affected by handling conditions at every stage throughout the food supply chain. According to many industrial professionals, safety is the most vital part of ensuring quality due to its impact on human health. To ensure food safety, complete product and process related information from all stages of the food supply chain is necessary without loss, delay or distortion. Many companies have started to take precautions to standardize every process of the FSC from farm to fork in order to meet the legal requirements demanded by the public and governments. Taking precautions involves responsive measures to gain quality certification such as HACCP (hazard analysis and critical point control), GAP (good agriculture standard), ISO22000 (food safety management standard, QS (food safety production licence) and ISO9000 (quality system certification) (Trienekens and Zuurbier, 2008). Information hiding between partners will lower the product quality and hinder 'detect and respond' procedures in the system. Moreover, it will be more difficult to understand the reasons for food safety deficiencies, to manage product recalls, to meet safety standards and regulations (Kher et al., 2010) and to minimize risks (Goldsmith and Bender, 2004). Reducing waste and spoilage is also impossible without sharing information.

Information: It is clear that companies need straightforward information to monitor the entire food supply chain, reinforced by a traceability system. The aim of this system is to provide transparency and visibility of information between partners (Bhat and Jõudu, 2019). It requires all partners in the FSC - involving agriculture and feed producers, manufactures, retailers etc – from a sourcing perspective working with green suppliers whose materials and processes are environmentally friendly (Zhu et al.,2020), also the final destination of products. Vertical cooperation can also help to reduce food loss and carbon emissions. Stakeholders can make an investment in technologies to decrease food loss and deterioration with the help of backward and forward integration (Huang et al. 2018). If all stakeholders in the FSC are in harmony with a sustainable approach, coordination of the companies will be better (Carter and Rogers, 2008). Limited knowledge of human resources and professional staffs cause lack of information and knowledge about product development, new technologies, innovations and legal requirements (Sebők et al., 2020). Information hiding in this system can reduce food safety, increase contamination issues, generate product recalls, encourage food waste and loss and increase costs.

Cost: Companies using traceability systems have three main primary objectives- facilitate traceback for food quality and safety; differentiate and market foods with undetectable quality attributes and improve supply management. These objectives enable companies to lower costs associated with distribution systems, recall products and increase sales (Golan et al., 2004). If safety hazards are hidden and any detection is not made, it will cause major economic loss and disruption in this system. Furthermore, a reduction in product quality may cause both direct economic losses because of high return rates and other indirect losses such as damaging corporate reputation (Aung and Chang, 2014).

Efficiency (time, workforce): Efficiency improvements, better production and cost reduction can be achieved by internal and external information sharing systems. If we don't put data into the system or information is hidden from other partners or organisations in the FSC, human errors will occur somewhere down the line. Furthermore, information is needed to determine the required time to identify all the movements of food through the entire FSC. Information hiding can cause reduced efficiency, an increase in human errors, food safety concerns and quality deficiencies in the production and packaging process or during transportation between companies (Marucheck et al., 2011).

Security: The FAO describes food security as "when all people, at all times, have social, economic and physical reach to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (McCarthy et al., 2018). The main requirement for food security is the ability to monitor the product from all stages of farm-to-fork (McCarthy et al., 2018). This needs traceability. Such a system records feed, food and all other ingredients throughout the procurement, production and distribution stages. Furthermore, knowing the origin of raw materials, processing plants, manufacturers, distributors and their routes, transfer points, distribution centres handling systems, packaging materials and retailers will provide effective traceability (Popper, 2007). In this system, communication between supply chain stakeholders is essential and will provide a complete farm to fork flow. Otherwise, information hiding will damage the balance between production and consumption, lower profits and increase food waste. Information hiding prevents transparency across stakeholders and reduces the efficiency of logistic operations, consequently generating a threat to human life.

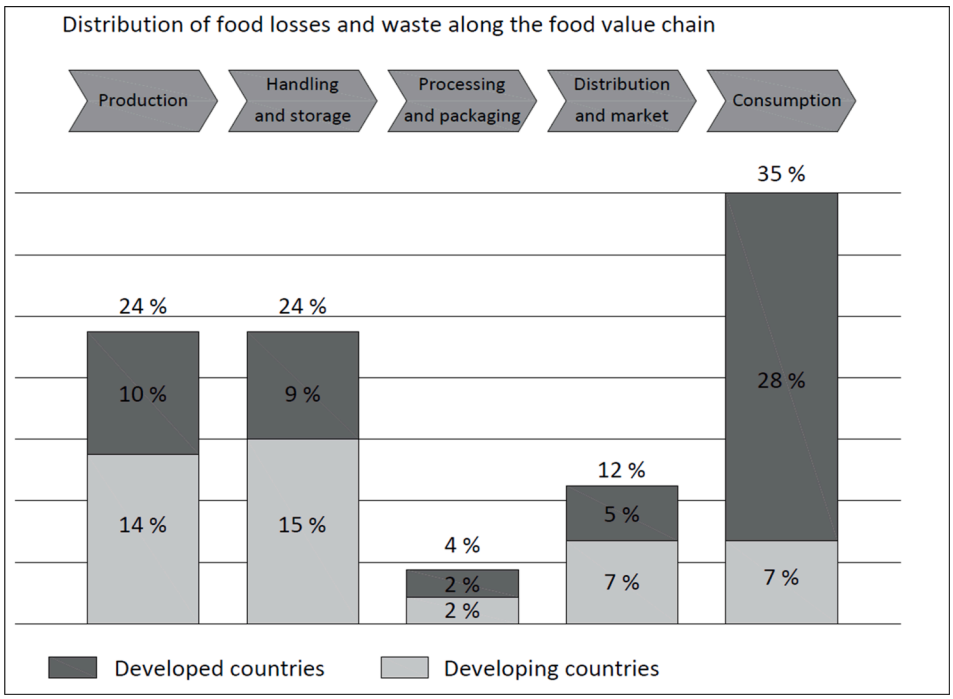

Fig. 2. Distribution of Food Losses and Waste along the Food Value Chain.

4. Case study

4.1. Meat industry in Turkey

Food loss and food waste are closely related to food production, food accessibility and food keeping conditions. According to the Food and Agriculture Organization of the United Nations (FAO), approximately one-third of food produced for consumption is lost or wasted. This is almost 1.3 million tons of food per year in the world (FAO, 2011). According to FAO's 2013 report, Turkey has lost or wasted 18 billion tons of food annually. This represents 20% of all products. Food loss and waste is a huge problem for countries and should be managed from the economic, social and environmental perspectives.

Food is wasted at all stages of a supply chain from production to consumption in systems all around the world (as seen in Fig. 2). The main stages of food loss and waste in food products can be divided into seven categories - pre-harvesting, harvesting, storage, transport and logistics, processing and packaging, retailing and consumption (FAO, 2018).

The reasons for food loss and waste include poor storage and transport conditions, poor harvesting schedule and timing, lack of optimized storage conditions, poor packaging conditions, lack of planning, lack of temperature and humidity control, long waiting process, long shipping process, lack of purchase planning and lack of proper display (FAO, 2018).

The meat industry can get ahead of the FSC since the meat processing industry produces large volumes of animals for slaughter. For this reason, waste in the industry is also high. The slaughtered animal produces wastes such as skin, bones, blood, tendons, contents of the gastrointestinal tract and internal organs (Sgarbossa and Russo, 2017). Some by-products like blood, feet, fatty tissues and bone are disposed of in Turkey. These by-products can be used as a raw material in other industries like biodiesel, feed for animals etc. (Kayikci et al., 2019).

The supply chain of meat generally consists of six members - farmer, processor, manufacturer, wholesaler, retailer and consumer; the meat circular chain covers slaughtering, blood, bone and waste, blood meal and bone meal and finally animal feeding. Slaughtering houses play an important role in the flow of information between upstream and downstream members. Supply chain transparency facilitates information flow within these facilities and between stakeholders (Gandino et al., 2009; Bosona and Gebresenbet, 2013).

Lack of transparency in the meat industry affects safety, trust of consumers and quality perceptions. Hiding information about production process, origin of the product, quality and safety conditions directly affects local, regional and global competitiveness and consumer trust (Brom, 2000). Hiding information about animals - where they feed, when and how they are treated (Shanahan et al., 2009; Voulodimos et al., 2010) - or information about meat processing like cutting and mixing processes (Mousavi et al., 2005; Donnelly et al., 2009), product standards, transportation and storage standards directly affects a firm's corporate image and customers' trust. Integrating supply chain systems to reduce information hiding is very difficult in a meat supply chain.

There are many stakeholders taking part in the process, a process consisting of many stages with many different stakeholders at each stage; this combines to negatively affect collaboration and common information sharing standards. Identification of each members' role and sub-role in the food supply chain and collaboration with partners maximize food waste recovery.

4.2. Focus group

In this part of the study, a focus group study was conducted to investigate and validate the impact of information hiding among stakeholders during traceability in the circular food chain. The focus group was convened in order to observe diverse experiences and to gain greater understanding on the topic of the study by allowing experts free rein to engage in open discussion; this was designed to provide a higher degree of spontaneity (Hennink, 2014). Focus group studies especially used when there is little or no information about the research. This method is useful for researchers to help for a study on a large scale. In this way, it was tried to reveal the reasons of information hiding and which stakeholders, which Rs and which dimensions they were in. There is limited studies adressed information hiding and dimensions for this reason the most suitable method for the study was the focus group, which is one of the qualitative research methods. In addition, this method was used in this research in order to get up-to-date information

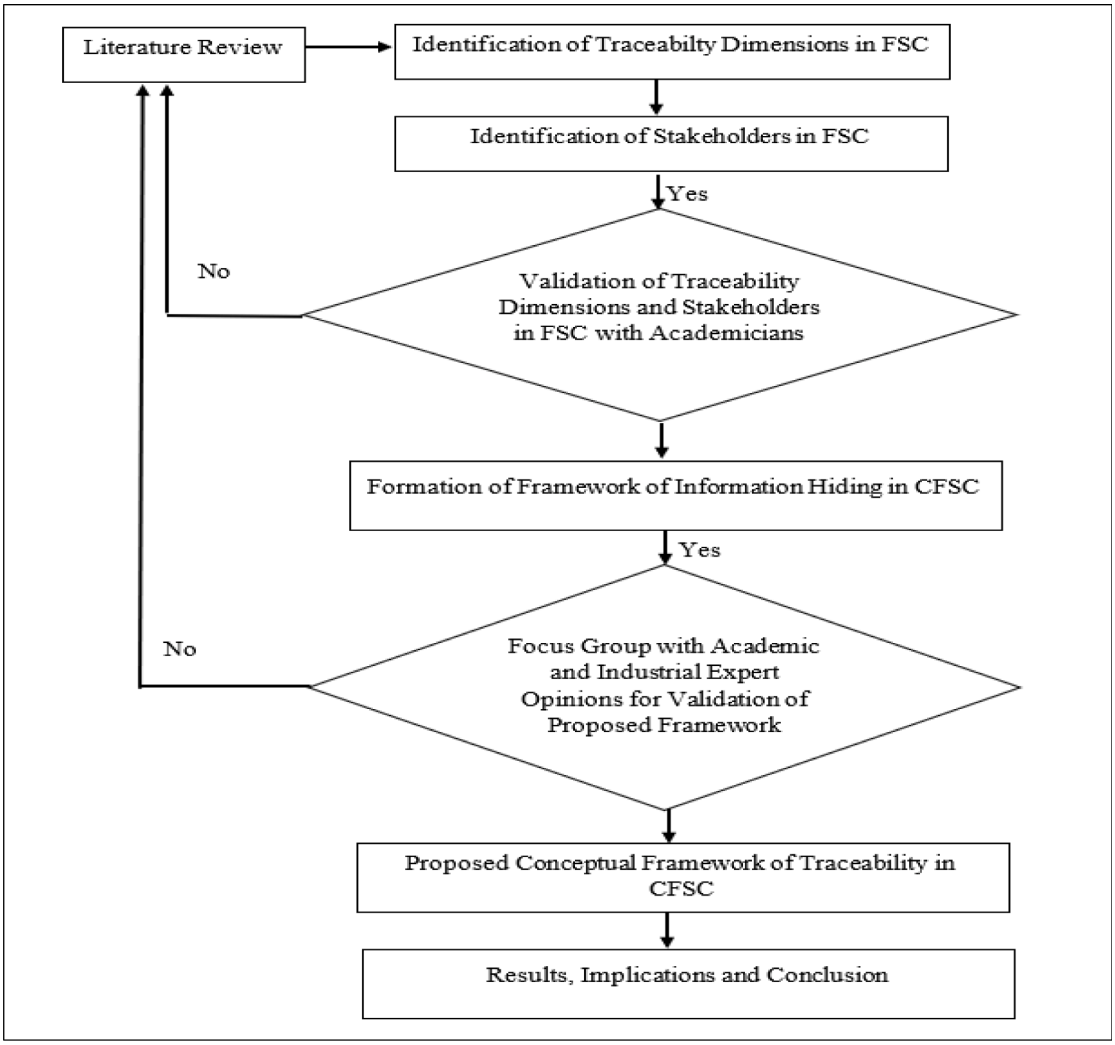

Fig. 3. The flow of the study.

from the industry and to combine real life situations with theory.

Data was collected from the focus group held in August 2020; September 2020 and October 2020 by bringing 10 experts together in each meeting; their areas of expertise are in circular economy/sustainability in the meat industry. The duration of focus group sessions were approximately 90–150 min, including a short break. In addition to 30 experts from meat industry, information sheets were sent to 6 consumers as a last member of food supply chain. Data was collected from an adult consumer sample ranging in age from 25 to 45. At the end, we reached 36 stakeholders totally. The sample size was decided by saturation which refers to the point at which researchers has gained sufficient information from the industry (Kvale, 1996). This focus group meant that a purposive sampling technique was used; this is not a representative technique like random sampling. Random sampling techniques are based on sample size; confidence levels in such techniques are high when used in quantitative studies. However, a purposive sampling technique is more suited to qualitative research when rich information is needed to select groups of people that are experienced in the related topic (Patton, 2002).

Before conducting the focus group, four academicians with extensive knowledge on the topic came together on an online platform to discuss the dimensions of traceability and confirm the framework. After confirmation of the framework, the focus group was held in İzmir. Within the scope of purposive sampling, the industrial experts were invited to the focus group. Each of the experts has at least five years work experience in the field of sustainability and circular economy in the meat industry. The moderators were researchers from logistics departments of universities. Their fields of study are circular food supply chain, sustainability and food waste. At the beginning of the each focus group, the procedure of the session was explained to all participants. The open-ended questions were asked randomly to the participants. The assistant documented observation of the group discussion. The focus group discussions were digitally recorded.

Detailed information about the experts from the meat industry is shown in Appendix Table A1 and the flow of the study is shown in Fig. 3.

5. Analysis and results

We applied the ANOVA (analysis of variance) test in order to reveal whether there is a difference between the groups in terms of knowledge hiding, in which stakeholder, in which Rs strategies and in which dimensions it may be hidden. The main purpose of ANOVA is to determine clearly the impact of each factor on traceability within the meat supply chain.

For the normality test, one of the assumptions of ANOVA analysis, the Kolmogorov-Smirnov and the Shapiro-Wilk Test values were conducted. Both values are greater than 0.05; it can therefore be said that the data met the normality condition and are normally distributed.

The second point to be examined is the homogeneity of variances. From the assumptions of the variance analysis, the homogeneity of the

Table 3
Test of homogeneity of variances.

	Levene Statistic	df1	df2	Sig.
Distributor	3,270	9	140	,001
Producer	1,070	9	140	,389
Consumer	,148	9	140	,998
Retailer	,633	9	140	,767
Supplier	1,461	9	140	,168
Farmer	,374	9	140	,946

Table 4
Knowledge Hiding among Stakeholders.

(I) Stakeholders		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Producer	Consumer	,3667	,1442	,115	-,047	,780
	Retailer	,2147	,1390	,636	-,184	,613
	Distributor	1,0227*	,1463	,000	,603	1,442
	Supplier	,2080	,1366	,650	-,184	,600
	Farmer	,4227*	,1339	,022	,039	,807
Distributor	Producer	−1,0227*	,1463	,000	−1,442	-,603
	Consumer	-,6560*	,1473	,000	−1,078	-,234
	Retailer	-,8080*	,1422	,000	−1,216	-,400
	Supplier	-,8147*	,1398	,000	−1,216	-,414
	Farmer	-,6000*	,1372	,000	-,994	-,206
Farmer	Producer	-,4227*	,1339	,022	-,807	-,039
	Consumer	-,0560	,1350	,998	-,443	,331
	Retailer	-,2080	,1293	,594	-,579	,163
	Distributor	,6000*	,1372	,000	,206	,994
	Supplier	-,2147	,1268	,537	-,578	,149

* The mean difference is significant at the 0.05 level.

group variances could not be provided as shown in Table 3. (for the distributor (P = 0.001) since p < 0.005). ANOVA analysis is a robust enough procedure to provide significant results even with not normal distributed samples and heterogenous variance assumptions (Baumert and de Obesso, 2021). Therefore, it can be concluded that it would be more correct to use one of the non-parametric multiple comparison tests.

The Games-Howell post-hoc test is one non-parametric technique used for comparing combinations of groups. This test is used especially for testing unequal variances and sample sizes. The Games-Howell test is used for comparing all combination group differences when the equal variances are not assumed. This test shows the differences between group means and whether the differences between means are statistically significant or not.

When the differences between the means are examined in Table 4, it can be said that the most basic problems regarding the hiding of information are caused by the distributor. According to the results of the analysis, it can be said that the distributor ($p < 0.000$) generally hides information from all stakeholders (producer $\bar{x}_i$-$\bar{x}_j = -1.0227, p < 0.000$; consumer $\bar{x}_i$-$\bar{x}_j = -0.6560,\ p < 0.000$, retailer $\bar{x}_i$-$\bar{x}_j = -0.8080,\ p < 0.000$; supplier $\bar{x}_i$-$\bar{x}_j = -0.8147, p < 0.000$; farmer $\bar{x}_i$-$\bar{x}_j = -0.6000, p < 0.000$) or does not provide correct information.

Secondly, the other stakeholders with little or no information sharing are the producer (producer and farmer, $\bar{x}_i$-$\bar{x}_j = 0.4227, p < 0.000$; producer and distributor $\left(\bar{x}_i - \bar{x}_j = 1.0227, p < 0.000\right)$ and farmer (farmer and producer, $\bar{x}_i$-$\bar{x}_j = -0.4227, p < 0.000$; farmer and distributor $\bar{x}_i$-$\bar{x}_j = 0.6000, p < 0.000$). It can be said that most information is hidden among these three stakeholders. (Detailed tables are given in the appendix, Table B1).

Secondly, we examined where most information is hidden. According to Table 5, stakeholders hide most information in terms of competitive advantage, information, safety, quality, bioterrorist threats, efficiency, growth and sustainability dimensions. (Detailed tables are given in the appendix, Table C1).

When data is analyzed from a circular economy perspective (social, economic and environmental), the dimensions in which information hidden is at a maximum in terms of social, economic and environmental dimensions are shown in Table 5.

From the social perspective, the dimensions in which hiding knowledge is greatest are information ($\bar{x}_i$-$\bar{x}_j = -1.3067, p < 0.000$); sustainability ($\bar{x}_i$-$\bar{x}_j = -0.7433,\ p < 0.000$); growth ($\bar{x}_i$-$\bar{x}_j = 0.9833,\ p < 0.000$) and bioterrorist threats ($\bar{x}_i$-$\bar{x}_j = 1.1167, p < 0.000$)

From the environmental perspective, the dimensions in which knowledge is hidden most are information ($\bar{x}_i$-$\bar{x}_j = -1.1767,\ p < 0.000$); growth ($\bar{x}_i$-$\bar{x}_j = 1.1133, p < 0.000$) and bioterrorist threats ($\bar{x}_i$-$\bar{x}_j = 1.2467, p < 0.000$).

From the economic perspective, the dimensions where knowledge is hidden most are efficiency ($\bar{x}_i$-$\bar{x}_j = 0.9767,\ p < 0.000$); competitive advantage ($\bar{x}_i$-$\bar{x}_j = 0.9467,\ p < 0.000$); growth ($\bar{x}_i$-$\bar{x}_j = 1.6767,\ p < 0.000$); optimization ($\bar{x}_i$-$\bar{x}_j = 0.8800,\ p < 0.000$) and bioterrorist threats ($\bar{x}_i$-$\bar{x}_j = 1.8100, p < 0.000$).

When data is analyzed from the circular economy perspective, the Rs strategies in which information is most hidden in terms of social, economic and environmental dimensions are shown in Table 6.

From the social perspective, the Rs strategy with most hidden knowledge is refuse (R0), ($\bar{x}_i$-$\bar{x}_j = -1.473, p < 0.000$).

From the environmental perspective, the Rs strategy with most hidden knowledge is refuse (R0), ($\bar{x}_i$-$\bar{x}_j = -1.367, p < 0.000$).

There is no significant difference between the economic dimension and Rs strategies in terms of mean differences. In this case, it can be said that information is not hidden from an economic perspective at the Rs

Table 5
Knowledge hiding among the dimensions and circular economy.

(I) Groups		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Social	Information	−1,3067*	,2101	,000	−2,035	-,578
	Sustainability	-,7433*	,1925	,015	−1,410	-,076
	Growth	,9833*	,1479	,000	,468	1,499
	Bioterrorist Threats	1,1167*	,1366	,000	,637	1,596
Environmental	Information	−1,1767*	,2119	,000	−1,912	-,442
	Growth	1,1133*	,1504	,000	,589	1,638
	Bioterrorist Threats	1,2467*	,1394	,000	,758	1,736
Economic	Effiiciency	,9767*	,2177	,002	,220	1,733
	Competitive Advantage	,9467*	,2027	,001	,240	1,654
	Growth	1,6767*	,1939	,000	,997	2,356
	Optimization	,8800*	,2535	,049	,002	1,758
	Bioterrorist Threats	1,8100*	,1855	,000	1,157	2,463

* The mean difference is significant at the 0.05 level.

Table 6
Knowledge Hiding among the Rs and Dimensions.

(I) Groups		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Social	R0	−1,473*	,2755	,001	−2,471	-,476
	R1	-,496	,3167	,924	−1,655	,663
	R2	-,207	,2934	1,000	−1,274	,861
	R3	-,629	,3182	,737	−1,794	,536
	R4	,171	,2170	1,000	-,596	,938
	R5	-,029	,2305	1,000	-,849	,791
	R6	,293	,2798	,997	-,721	1,308
	R7	,123	,3116	1,000	−1,024	1,269
	R8	-,477	,3045	,923	−1,595	,640
	R9	,149	,3399	1,000	−1,101	1,399
Environmental	R0	−1,367*	,2768	,002	−2,367	-,366
	R1	-,389	,3178	,987	−1,551	,773
	R2	-,100	,2947	1,000	−1,171	,971
	R3	-,522	,3193	,901	−1,690	,645
	R4	,278	,2188	,985	-,494	1,050
	R5	,078	,2321	1,000	-,747	,902
	R6	,400	,2812	,961	-,618	1,418
	R7	,229	,3128	1,000	-,919	1,378
	R8	-,371	,3057	,988	−1,491	,750
	R9	,256	,3410	1,000	-,997	1,508
Economic	R0	-,767	,3053	,396	−1,844	,311
	R1	,211	,3429	1,000	−1,014	1,436
	R2	,500	,3215	,932	-,641	1,641
	R3	,078	,3443	1,000	−1,153	1,308
	R4	,878	,2538	,050	-,001	1,756
	R5	,678	,2653	,364	-,245	1,600
	R6	1,000	,3092	,101	-,093	2,093
	R7	,829	,3382	,437	-,383	2,041
	R8	,229	,3317	1,000	-,956	1,415
	R9	,856	,3644	,503	-,454	2,165

* The mean difference is significant at the ,05 level.

level.

When data is analyzed in terms of Rs, it can be seen that information is mostly hidden in R0. The aim of this study was to reveal which stakeholder hid knowledge, in which R, in which dimension and to what degree.

According to the analysis results, the stakeholders involved in most information being hidden are the distributor, farmer and producer. When information sharing among the stakeholders is analyzed, it is revealed that most information is hidden due to the distributor.

Similarly, when examined in terms of dimensions, stakeholders tend to hide knowledge about competitive advantage, information, safety, quality, bioterrorist threats, efficiency, growth and sustainability dimensions.

Finally, when we analyzed knowledge hiding between circular economy dimensions and Rs levels, we found that knowledge is mostly hidden in the refuse (R0) stage except from the economic perspective. There is no significant difference between the economic dimension and Rs in terms of mean differences. In this case, it can be said that information is not hidden from an economic perspective at the Rs level.

In this study, an attempt has been made to reveal where knowledge is mostly hidden in terms of circular economy, stakeholders and 9Rs in the meat industry.

6. Discussion

Food safety, quality and security issues have become more challenging now because the distance between the food producer to consumer is longer than ever before due to globalization of the food trade. For this reason, traceability of the food supply chain is vital to get information from the origin to the final destination of food products (Peres et al., 2007). In our study we have found that information is mostly hidden among the most important stakeholders; namely, producer, farmer and distributor in the meat industry.

Government regulations and legislation, competition in the food market, sustainability issues, aim of reducing cost, increasing efficiency and productivity, welfare of workers and animals plus reducing the effect of bioterrorist threats are all considered to be important dimensions of traceability for the efficient management of FSCs (Connelly et al., 2019). Moreover, collaboration among stakeholders, transparency and information are needed to manage the traceability of whole FSCs. In our study we have found that the highest knowledge hiding dimensions are competitive advantage, information, safety, quality, bioterrorist threats, efficiency, growth and sustainability. Firms especially hide information which affect their competitive advantage, sustainability and efficiency directly. The main reason for this situation may be due to losing customers, losing market share or government sanctions.

In a FSC, traceability systems will also help companies to achieve a circular FSC. If companies can get information from stakeholders about food waste and by-products through the FSC, they will use them as an

Table A1
Information on industrial experts.

Stakeholders	Position in the Company	Years in the Company	Work Experience	Age	Gender
Farmer 1	General Manager	25	25	65	Male
Farmer 2	Agriculture Engineer	8	15	42	Male
Farmer 3	General Manager	10	19	52	Male
Farmer 4	Agriculture Engineer	30	30	61	Male
Farmer 5	Agriculture Engineer	32	32	59	Male
Farmer 6	Agriculture Engineer	5	8	33	Female
Supplier 1	Food Engineer	1	5	31	Female
Supplier 2	General Manager	10	13	40	Male
Supplier 3	General Manager	6	19	51	Female
Supplier 4	Industrial Engineer	5	8	35	Female
Supplier 5	Agriculture Engineer	2	5	32	Male
Supplier 6	Production Manager	8	11	42	Male
Producer 1	General Manager	5	7	39	Male
Producer 2	Industrial Engineer	3	5	30	Female
Producer 3	Logistics Manager	4	9	35	Female
Producer 4	General Manager	5	18	53	Male
Producer 5	Logistics Specialist	10	10	35	Female
Producer 6	Logistics Specialist	3	5	30	Male
Distributor 1	Storage and Distribution Manager	5	8	34	Male
Distributor 2	Quality Improvement and Logistics Manager	2	6	39	Male
Distributor 3	Export Regional Manager	2	5	36	Male
Distributor 4	Regional Sales Manager	11	16	43	Male
Distributor 5	Quality Assurance manager	6	15	46	Male
Distributor 6	Food Engineer	3	6	33	Male
Retailer 1	Production Manager	14	22	49	Male
Retailer 2	Digital Marketing Communication Specialist	9	14	39	Male
Retailer 3	Key Account Specialist	3	20	47	Male
Retailer 4	Corporate Marketing and Communications Manager	2	6	37	Male
Retailer 5	R&D Engineer	7	11	37	Female
Retailer 6	Food Engineer	10	25	47	Female

Table B1
Knowledge hiding among the stakeholders.

Multiple Comparisons						
Dependent						
Variable: Games-Howell (I) Stakeholders	Data	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Producer	Consumer	,3667	,1442	,115	-,047	,780
	Retailer	,2147	,1390	,636	-,184	,613
	Distributor	1,0227*	,1463	,000	,603	1,442
	Supplier	,2080	,1366	,650	-,184	,600
	Farmer	,4227*	,1339	,022	,039	,807
Consumer	Producer	-,3667	,1442	,115	-,780	,047
	Retailer	-,1520	,1400	,887	-,554	,250
	Distributor	,6560*	,1473	,000	,234	1,078
	Supplier	-,1587	,1376	,859	-,554	,236
	Farmer	,0560	,1350	,998	-,331	,443
Retailer	Producer	-,2147	,1390	,636	-,613	,184
	Consumer	,1520	,1400	,887	-,250	,554
	Distributor	,8080*	,1422	,000	,400	1,216
	Supplier	-,0067	,1321	1,000	-,386	,372
	Farmer	,2080	,1293	,594	-,163	,579
Distributor	Producer	−1,0227*	,1463	,000	−1,442	-,603
	Consumer	-,6560*	,1473	,000	−1,078	-,234
	Retailer	-,8080*	,1422	,000	−1,216	-,400
	Supplier	-,8147*	,1398	,000	−1,216	-,414
	Farmer	-,6000*	,1372	,000	-,994	-,206
Supplier	Producer	-,2080	,1366	,650	-,600	,184
	Consumer	,1587	,1376	,859	-,236	,554
	Retailer	,0067	,1321	1,000	-,372	,386
	Distributor	,8147*	,1398	,000	,414	1,216
	Farmer	,2147	,1268	,537	-,149	,578
Farmer	Producer	-,4227*	,1339	,022	-,807	-,039
	Consumer	-,0560	,1350	,998	-,443	,331
	Retailer	-,2080	,1293	,594	-,579	,163
	Distributor	,6000*	,1372	,000	,206	,994
	Supplier	-,2147	,1268	,537	-,578	,149

* The mean difference is significant at the 0.05 level.

input in the chain as fertilizer, energy, organic compost, animal feed etc. Moreover, using 9R strategies will automatically contribute to the circular economy.

Our results show that from the circular economy perspective, most knowledge is hidden in sustainability, information, growth and bio-terrorist threats in the social perspective. From the environmental perspective, the dimensions with most knowledge hidden are information growth and bio-terrorist threats. From the economic perspective, the dimensions with most knowledge hidden are efficiency, competitive advantage, growth, optimization and bio-terrorist threats. When data was analyzed from the Rs, this showed that information is mainly hidden in the refuse stage. Most information is hidden in social and environmental perspectives and specifically at the refuse stage in the meat industry. Similarly, when evaluated in terms of circular economy, it can be seen that companies hide knowledge related to the customer and the environment. Again, the reason for this may be to avoid losing customers, to protect company reputation and to protect the company from government sanctions.

Information hiding is a problem for traceability and circularity of a food supply chain. In current literature, there are some studies that discuss perishable products and information sharing (Lusiantoro et al., 2018); information loss and information flow in food supply chains (Olsen and Aschan, 2010); information sharing and fresh food supply chains (Nakandala et al., 2017). There are other studies that examine traceability for sustainability (Garcia-Torres et al., 2019); food traceability (Ringsberg, 2014); information sharing in food traceability (Anica-Popa, 2012); traceability in food supply from safety and quality perspectives (Aung and Chang, 2014). Although there are studies related with our topic one by one, our study is unique to comprise all related topics together. We believe that evaluating information sharing with traceability dimensions and 9R strategies within circular FSC among all stakeholders will be promising area for the following studies. However, there is a lack of empirical studies to determine the effect of information hiding among stakeholders through traceability of food supply chains and direct integration in a circular economy. Conducting empirical research after the proposition of framework in the light of theoretical background will be guidance for the researchers.

This study is focused on the meat industy where waste and by-products are so high with many stakeholders involved. In this context, this study aims to fill the gap in the field of circular FSCs on how to retrieve food waste produced in the meat industry and how to convert this wastage to other by-products to enable them to be used in other chains as valuable inputs. To establish collaboration, information hiding should be prevented among stakeholders. Companies can exchange, sell or transfer by-products, reduce loss and waste with the use of 9R strategies. In this regard, the proposed framework of this study will shed light on future research in different industries and countries.

7. Research implications

This study focuses on the impact of information hiding among all stakeholders through traceability in circular FSCs. From a theoretical perspective, a managerial perspective and for the benefit of policy-makers, there are some implications that should be discussed as a

Table C1
Knowledge Hiding among the Dimensions and Circular Economy.

Multiple Comparisons						
Dependent						
Variable: Games-Howell (I) Groups	Data	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Social	Environmental	-,1300	,1840	1,000	-,767	,507
	Economic	-,6933	,2210	,123	−1,461	,074
	Quality	-,3400	,1911	,901	−1,002	,322
	Security	-,3167	,2024	,963	−1,019	,385
	Regulations	-,5267	,2058	,408	−1,240	,187
	Cost	-,4533	,1775	,411	−1,068	,162
	Effiiciency	,2833	,1779	,957	-,333	,900
	Information	−1,3067*	,2101	,000	−2,035	-,578
	Globalization	-,2567	,2106	,996	-,987	,474
	Competitive Advantage	,2533	,1592	,957	-,299	,806
	Sustainability	-,7433*	,1925	,015	−1,410	-,076
	Growth	,9833*	,1479	,000	,468	1,499
	Optimization	,1867	,2202	1,000	-,578	,951
	Bioterrorist Threats	1,1167*	,1366	,000	,637	1,596
Environmental	Social	,1300	,1840	1,000	-,507	,767
	Economic	-,5633	,2227	,429	−1,336	,210
	Quality	-,2100	,1930	,999	-,879	,459
	Security	-,1867	,2043	1,000	-,895	,522
	Regulations	-,3967	,2076	,843	−1,116	,323
	Cost	-,3233	,1796	,893	-,946	,299
	Effiiciency	,4133	,1800	,595	-,210	1,037
	Information	−1,1767*	,2119	,000	−1,912	-,442
	Globalization	-,1267	,2124	1,000	-,864	,610
	Competitive Advantage	,3833	,1615	,540	-,178	,944
	Sustainability	-,6133	,1944	,116	−1,287	,060
	Growth	1,1133*	,1504	,000	,589	1,638
	Optimization	,3167	,2219	,983	-,454	1,087
	Bioterrorist Threats	1,2467*	,1394	,000	,758	1,736
Economic	Social	,6933	,2210	,123	-,074	1,461
	Environmental	,5633	,2227	,429	-,210	1,336
	Quality	,3533	,2286	,966	-,440	1,146
	Security	,3767	,2382	,959	-,449	1,202
	Regulations	,1667	,2410	1,000	-,668	1,002
	Cost	,2400	,2174	,999	-,515	,995
	Effiiciency	,9767*	,2177	,002	,220	1,733
	Information	-,6133	,2447	,444	−1,461	,235
	Globalization	,4367	,2452	,901	-,413	1,286
	Competitive Advantage	,9467*	,2027	,001	,240	1,654
	Sustainability	-,0500	,2298	1,000	-,847	,747
	Growth	1,6767*	,1939	,000	,997	2,356
	Optimization	,8800*	,2535	,049	,002	1,758
	Bioterrorist Threats	1,8100*	,1855	,000	1,157	2,463

* The mean difference is significant at the 0.05 level.

result of this study.

From a theoretical perspective, a holistic framework is needed to identify the traceability system in a FSC, the possible effects of information hiding on the stakeholders and circularity of the chain. For this reason, this study is based on stakeholder theory, theory of industrial symbiosis and information theory. With respect to definition of Sarkis et al. (2011), stakeholder theory proposes that companies provide externalities and companies should increase positive effect of these externalities. In our proposed model, we can define these externalities as food waste, food lost and food surplus. Amount of waste and by products in meat industry is high. Hence, using 9R strategies is essential to converting these wastes and by-products to be used as valuable inputs in circular FSC. In line with this idea, the theory of industrial symbiosis also explains the role of exchanging resources such as materials, water, energy and by-products among supply chain partners. Furthermore, our empirical research results shows that information is among the highest knowledge hiding dimensions. However, as the information theory refers collecting information between CE actors and their stakeholders should be essential to reduce environmental information asymmetry in circular food supply chain. Moreover, traceability of the food supply chain is highly dependent on the collaboration and information sharing from the origin to the final destination of FSC.

For policy-makers, it is necessary to understand the role of information throughout the FSC to ensure the traceability and transparency required to achieve circular economy. It is obvious that providing food security, safety and prevention of food fraud is of utmost importance in a FSC. Furthermore, regulations and legislation play a vital role in food traceability and transparency. Many companies have started to take precautions to standardize every process of the FSC from farm to fork in order to meet the legal requirements demanded by the public and governments. Quality certification such as HACCP (hazard analysis and critical point control), GAP (good agriculture standard), ISO22000 (food safety management standard, QS (food safety production license) and ISO9000 (quality system certification) can be a way of measures for policy makers. For this reason, transparency and traceability of the FSC from farm to fork has become a vital issue. At that point, information is the backbone of this process. Unless policy-makers and governments prevent information hiding, they cannot guarantee transparency in any

FSC.

Our proposed framework will give the opportunity to policy-makers to understand where information hiding arises in the food supply chain, how it can be prevented, controlled and managed. In this respect, the key contribution of the proposed framework in this study is to be a road map for future policy-makers. Moreover, this framework can be a blueprint for management to find out how to measure the traceability in a FSC and how to manage it.

From the perspective of circular economy, this framework will help policy makers to reduce food waste. If information hiding is prevented among both internal and external stakeholder in the FSC, transparency will help to exchange or sell by-products and food waste or to establish collaboration to transform them into resources such as organic compost, fertilizer or energy. Moreover, food loss will be monitored and reduced throughout the FSC.

In the managerial dimension, dissemination of information is essential to integrate circular economy throughout the food supply chain. Information hiding between managers directly affects the innovative skills and employee's commitment to the company. Furthermore, this practice also negatively affects the long-term coordination among the partners in FSC, reduce the competitiveness in the long run. Furthermore, consumers are willing to get more information about every stage of FSC. Hence, food safety, security, quality and trust are important issues for reducing a consumer's risk. Preventing information hiding between managers and SC partners is essential to increase product quality, food safety, consumer trust and finally profitability and corporate image of the company.

To achieve economic, social and environmental sustainability, companies have to use circular economy initiatives. However, information hiding will hinder the implementation of circular economy and the three pillars of sustainability.

From the societal sustainability perspective, traceability is vital to provide food safety and security. Food organisations should be willing to collaborate and share information with their partners. If safety hazards are hidden or any detection cannot be made, it will directly affect the health of people and workers. Furthermore, a decrease in product quality will cause a corresponding increase in return rate; this directly influences economic losses and is responsible for indirect losses such as damaging corporate reputation. Furthermore, information about animal welfare and slaughter methods in Islamic countries are needed by customers and shouldn't be hidden. Moreover, developing transparency within the SC has a vital role in struggling with greenwashing which is a process of imposing a false impression or giving misleading information about how companies' products or services seems like socially and environmental friendly (Formentini, 2021).

With regard to economic sustainability, reducing food loss and waste (FLW) contributes to economic sustainability. Research shows that for every dollar invested in decreasing FLW, 14 dollars are saved in operating costs (Principato et al., 2019). Information hiding among food organisations throughout the FSC hinder various economic opportunities provided by 9R strategies.

From an environmental sustainability perspective, upstream and downstream information sharing is essential to reduce food losses and waste. Similarly, how much information is shared or hidden by supply chain members between businesses affects food losses and wastes (Lu et al., 2019).

Collaboration between food organisations will help them to re-evaluate all waste by using 9R strategies such as recycling, reusing, refurbishing, etc. to meet zero-waste targets. Energy saving, nutrient recovery, protecting natural resources and lowering greenhouse gas emissions can be achieved by transparency and traceability of the FSC.

By observing the benefits of traceability in a FSC, this framework will also help food organisations to realize how information hiding affects performance of a circular economy. This framework will provide guidance for organisations for tracing at every stage of the FSC to integrate sustainable solutions.

8. Conclusion

The increasing importance of food quality, safety and security encourages all members in the supply chain to maintain traceability and transparency from farm to fork. In order to provide efficient food traceability, information hiding should be eliminated among all stakeholders in the food supply chain; this includes seed, fertilizer, pesticide or animal feed suppliers, farmers, processors/manufacturers, distributors/wholesalers, retailers and finally consumers. Moreover, internal traceability within each stakeholder, external traceability among all stakeholders in the food supply chain and backward and forward vertical cooperation can all help to reduce carbon emissions, food deterioration and food loss (Huang et al. 2018), thus providing a more efficient circular FSC.

In this study, a conceptual framework is proposed to contribute to better understanding of how information hiding affects traceability in a FSC and circularity in the meat industry. Moreover, this study helps by examining all traceability dimensions involving sustainability, welfare, productivity/optimization, bioterrorist threats, competitive advantage, regulations/legislation, globalization, food safety and quality, information, cost, efficiency (time, workforce) plus security. A total of twelve categories related to traceability, achieving 9R strategies among stakeholders can be implemented by eliminating information hiding with internal and external integration. This can be a guide for the meat industry as well as for policy makers to achieve circular FSCs.

There are some limitations and suggestions for future research in this area. This study is based on both proposed framework and case study. To understand the differences between the groups, we also conducted empirical research. The need for a more empiricial research can be necessary on the variables. The proposed framework can be generalized for the wider food industry; subsequent results may vary in other sectors and countries. This proposed framework was conducted in Turkey and the main industry in this study was the meat industry. This proposed framework can be a guide for different industries or emerging economies since traceability and preventing information hiding are essential to achieve circular food supply chains. The proposed framework can be used in other emerging countries such as Brazil, China, India, Russia, South Korea, Mexico etc. by examining different traceability dimensions. The results can be compared in future research. Moreover, integration of this proposed framework with industry 4.0 can be a promising area for future studies. Furthermore, instead of looking at the role of information sharing to achieve circular food supply chain, information sharing can be seen a way of collaborative communication that increases trust, loyalty between business partners. Future research can be conducted with these and also new variables.

Funding

This work was supported by the National Natural Science Foundation of China (Grant Nos. 71934001, 71471001, 41771568, 71533004); the National Key Research and Development Program of China (Grant No. 2016YFA0602500); the Strategic Priority Research Program of Chinese Academy of Sciences (Grant No. XDA23070400).

Declaration of Competing Interest

The author declare that there is no conflict of interest.

Appendix A

See Tables A1, B1, C1.

References

Aktas, E., Sahin, H., Topaloglu, Z., Oledinma, A., Huda, A. K. S., Irani, Z., & Kamrava, M. (2018). A consumer behavioural approach to food waste. *Journal of Enterprise Information Management*. https://doi.org/10.1108/JEIM-03-2018-0051.

Althoff, G. S., & Petersen, B. (2004). Chain Quality Information System: Development of A Reference Information Model to Improve Transparency and Quality Management in Pork Netchains Along The Dutch-German Border. *Dynamics in Chains and Networks, 166*.

Andreeva, T., & Kianto, A. (2012). Does knowledge management really matter? Linking knowledge management practices, competitiveness and economic performance. *Journal of Knowledge Management, 16*(4), 617–636. https://doi.org/10.1108/13673271211246185.

Anica-Popa, I. (2012). Food traceability systems and information sharing in food supply chain. *Management & Marketing, 7*(4), 749.

Apaiah, R. K., Hendrix, E. M., Meerdink, G., & Linnemann, A. R. (2005). Qualitative methodology for efficient food chain design. *Trends in food science & technology, 16*(5), 204–214.

Aschemann-Witzel, J., & Peschel, A. O. (2019). How circular will you eat? The sustainability challenge in food and consumer reaction to either waste-to-value or yet underused novel ingredients in food. *Food Quality and Preference, 77*, 15–20.

Aung, M. M., & Chang, Y. S. (2014). Traceability in a food supply chain: Safety and quality perspectives. *Food control, 39*, 172–184. https://doi.org/10.1016/j.foodcont.2013.11.007.

Bag, S., Gupta, S., & Foropon, C. (2018). Examining the role of dynamic remanufacturing capability on supply chain resilience in circular economy. *Management Decision., 57*(4), 863–885. https://doi.org/10.1108/MD-07-2018-0724.

Bag, S., Pretorius, J. H. C., Gupta, S., & Dwivedi, Y. K. (2021). Role of institutional pressures and resources in the adoption of big data analytics powered artificial intelligence, sustainable manufacturing practices and circular economy capabilities. *Technological Forecasting and Social Change, 163*, Article 120420. https://doi.org/10.1016/j.techfore.2020.120420.

Balaji, M., & Arshinder, K. (2016). Modeling the causes of food wastage in Indian perishable food supply chain. *Resources, Conservation and Recycling, 114*, 153–167. https://doi.org/10.1016/j.resconrec.2016.07.016.

Bartley, T. (2007). Institutional emergence in an era of globalization: The rise of transnational private regulation of labor and environmental conditions. *American journal of sociology, 113*(2), 297–351. https://doi.org/10.1086/518871.

Bateman, A. H., Blanco, E. E., & Sheffi, Y. (2017). Disclosing and reporting environmental sustainability of supply chains. *Sustainable Supply Chains*, 119–144.

Batista, L., Bourlakis, M., Smart, P., & Maull, R. (2018). In Search of a Circular Supply Chain Archetype – A Content-Analysis Based Literature Review. *Production Planning & Control. Taylor & Francis, 29*(6), 438–451. https://doi.org/10.1080/09537287.2017.1343502.

Batista, L., Dora, M., Toth, J., Molnár, A., Malekpoor, H., & Kumari, S. (2019). Knowledge management for food supply chain synergies–A maturity level analysis of SME companies. *Production Planning & Control, 30*(10–12), 995–1004. https://doi.org/10.1080/09537287.2019.1582104.

Baumert, T., & de Obesso, M. D. L. M. (2021). Brand antiquity and value perception: Are customers willing to pay higher prices for older brands? *Journal of Business Research, 123*, 241–254. https://doi.org/10.1016/j.jbusres.2020.09.060.

Becerra-Fernandez, I., & Sabherwal, R. (2001). Organizational knowledge management: A contingency perspective. *Journal of Management Information Systems, 18*(1), 23–55. https://doi.org/10.1080/07421222.2001.11045676.

Beske, P., Land, A., & Seuring, S. (2014). Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature. *International Journal of Production Economics, 152*, 131–143. https://doi.org/10.1016/j.ijpe.2013.12.026.

Beulens, A. J., Broens, D. F., Folstar, P., & Hofstede, G. J. (2005). Food safety and transparency in food chains and networks Relationships and challenges. *Food control, 16*(6), 481–486. https://doi.org/10.1016/j.foodcont.2003.10.010.

Bhaskar, N., Modi, V. K., Govindaraju, K., Radha, C., & Lalitha, R. G. (2007). Utilization of meat industry by products: Protein hydrolysate from sheep visceral mass. *Bioresource technology, 98*(2), 388–394. https://doi.org/10.1016/j.biortech.2005.12.017.

Bhat, R., & Jõudu, I. (2019). Emerging issues and challenges in agri-food supply chain. In Sustainable food supply chains (pp. 23-37). Academic Press. https://doi.org/10.1016/b978-0-12-813411-5.00002-8.

Bhatt, S., Lee, J., Deutsch, J., Ayaz, H., Fulton, B., & Suri, R. (2018). From food waste to value-added surplus products (VASP): Consumer acceptance of a novel food product category. *Journal of Consumer Behaviour, 17*(1), 57–63. https://doi.org/10.1002/cb.1689.

Blome, C., Schoenherr, T., & Eckstein, D. (2014). The impact of knowledge transfer and complexity on supply chain flexibility: A knowledge-based view. *International Journal of Production Economics, 147*, 307–316. https://doi.org/10.1016/j.ijpe.2013.02.028.

Bosona, T., & Gebresenbet, G. (2013). Food traceability as an integral part of logistics management in food and agricultural supply chain. *Food control, 33*(1), 32–48. https://doi.org/10.1016/j.foodcont.2013.02.004.

Boström, M., Jönsson, A. M., Lockie, S., Mol, A. P. J., & Oosterveer, P. (2015). Sustainable and responsible supply chain governance: Challenges and opportunities. *Journal of Cleaner Production, 107*, 1–7. https://doi.org/10.1016/j.jclepro.2014.11.050.

Bourlakis, M., Maglaras, G., Aktas, E., Gallear, D., & Fotopoulos, C. (2014). Firm size and sustainable performance in food supply chains: Insights from Greek SMEs. *International Journal of Production Economics, 152*, 112–130. https://doi.org/10.1016/j.ijpe.2013.12.029.

Brom, F. W. (2000). Food, consumer concerns, and trust: Food ethics for a globalizing market. *Journal of Agricultural and Environmental Ethics, 12*(2), 127–139.

Bustillo-Lecompte, C., Mehrvar, M., & Quiñones-Bolaños, E. (2016). Slaughterhouse wastewater characterization and treatment: An economic and public health necessity of the meat processing industry in Ontario, Canada. *Journal of Geoscience and Environment Protection, 4*(4), 175–186. https://doi.org/10.4236/gep.2016.44021.

Butt, A. S. (2019). Determinants of top-down knowledge hiding in firms: An individual-level perspective. *Asian business & management, 1–21*. https://doi.org/10.1057/s41291-019-00091-1.

Butt, A. S., & Ahmad, A. (2019). Are there any antecedents of top-down knowledge hiding in firms? Evidence from the United Arab Emirates. *Journal of Knowledge Management, 23*, 1605–1627. https://doi.org/10.1108/jkm-04-2019-0204.

Butt, A. S., Ahmad, A. B., & Shah, S. H. H. (2020). Knowledge hiding in a buyer-supplier relationship: A pilot study. *Knowledge and Process Management*. https://doi.org/10.1002/kpm.1631.

Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: Moving toward new theory. *International journal of physical distribution & logistics management, 38*(5), 360–387. https://doi.org/10.1108/09600030810882816.

Cavaliere, A., & Ventura, V. (2018). Mismatch between food sustainability and consumer acceptance toward innovation technologies among Millennial students: The case of Shelf Life Extension. *Journal of Cleaner Production, 175*, 641–650. https://doi.org/10.1016/j.jclepro.2017.12.087.

Charter, M., & Gray, C. (2008). Remanufacturing and product design. *International Journal of Product Development, 6*(3–4), 375–392. https://doi.org/10.1504/IJPD.2008.020406.

Cheng, M. J., & Simmons, J. E. L. (1994). Traceability in manufacturing systems. *International Journal of Operations & Production Management, 14*(10), 4–16. https://doi.org/10.1108/01443579410067199.

Chertow, M. R. (2000). Industrial symbiosis: Literature and taxonomy. *Annu. Rev. Energy Environ., 25*, 313–337. https://doi.org/10.1146/annurev.energy.25.1.313.

Cimren, E., Fiksel, J., Posner, M. E., & Sikdar, K. (2011). Material flow optimization in by-product synergy networks. *Journal of Industrial Ecology, 15*(2), 315–332. https://doi.org/10.1111/j.1530-9290.2010.00310.x.

Coderoni, S., & Perito, M. A. (2020). Sustainable consumption in the circular economy. An analysis of consumers' purchase intentions for waste-to-value food. *Journal of Cleaner Production, 252*, Article 119870. https://doi.org/10.1016/j.jclepro.2019.119870.

Connelly, C. E., Černe, M., Dysvik, A., & Škerlavaj, M. (2019). Understanding knowledge hiding in organizations. *Journal of Organizational Behavior, 40*, 779–782. https://doi.org/10.1002/job.2407.

Connelly, C. E., Zweig, D., Webster, J., & Trougakos, J. P. (2012). Knowledge hiding in organizations. *Journal of Organizational Behavior, 33*(1), 64–88. https://doi.org/10.1002/job.737.

De Angelis, R., Howard, M., & Miemczyk, J. (2017). Supply Chain Management and the Circular Economy: Towards the Circular Supply Chain. *Production Planning & Control., 7287*(January), 1–13. https://doi.org/10.1080/09537287.2018.1449244.

Den Hollander, M. C., 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. https://doi.org/10.1111/jiec.12610.

Dingwerth, K., & Eichinger, M. (2010). Tamed transparency: How information disclosure under the global reporting initiative fails to empower. *Global Environmental Politics, 10*(3), 74–96. https://doi.org/10.1162/GLEP_a_00015.

Donnelly, K. A. M., Karlsen, K. M., & Olsen, P. (2009). The importance of transformations for traceability–a case study of lamb and lamb products. *Meat science, 83*(1), 68–73. https://doi.org/10.1016/j.meatsci.2009.04.006.

Doorey, D. J. (2011). The transparent supply chain: From resistance to implementation at Nike and Levi-Strauss. *Journal of Business Ethics, 103*(4), 587–603. https://doi.org/10.1007/s10551-011-0882-1.

Dora, M. (2019). Collaboration in a circular economy: Learning from the farmers to reduce food waste. *Journal of Enterprise Information Management, 1741–0398*. https://doi.org/10.1108/jeim-02-2019-0062.

Egels-Zandén, N., Hulthén, K., & Wulff, G. (2015). Trade-offs in supply chain transparency: The case of Nudie Jeans Co. *Journal of Cleaner Production, 107*, 95–104. https://doi.org/10.1016/j.jclepro.2014.04.074.

EMF (Ellen MacArthur Foundation), and McKinsey & Company. 2012. Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition.

Fang, Y. H. (2017). Coping with fear and guilt using mobile social networking applications: Knowledge hiding, loafing, and sharing. *Telematics and Informatics, 34*(5), 779–797. https://doi.org/10.1016/j.tele.2017.03.002.

FAO (2011), Global Food Losses and Food Waste – Extent, Causes and Prevention, Food and Agriculture Organization of the United Nations, Rome, available at: www.fao.org/docrep/014/mb060e/mb060e.pdf.

FAO (2013), "Food wastage footprint: impacts on natural resources – summary report", Rome, available at: www.fao.org/docrep/018/i3347e/i3347e.pdf (accessed September 12, 2020).

FAO (2013). Food Losses and Waste in Turkey, Country Report. Available at: http://www.fao.org/3/a-au824e.pdf.

FAO (2018). Gender and food loss in sustainable food value chains A guiding note. Food and Agriculture Organization of the United Nations, Rome, 2018. Available at: http://www.fao.org/3/I8620EN/i8620en.pdf.

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

Fassam, L., & Dani, S. (2017). A conceptual understanding of criminality and integrity challenges in food supply chains. *British Food Journal, 119*(1), 67–83. https://doi.org/10.1108/BFJ-07-2016-0314.

Ferguson, M. E., & Souza, G. C. (2010). Commentary on closed-loop supply chains. Closed loop supply chains: new developments to improve the sustainability of business practices. Taylor and Francis/CRC Press, Boca Raton, 1-6.

Ferguson, M. E., & Ketzenberg, M. E. (2006). Information sharing to improve retail product freshness of perishables. *Production and Operations Management, 15*(1), 57–73. https://doi.org/10.1111/j.1937-5956.2006.tb00003.x.

Fong, C., & Slotta, J. D. (2018). Supporting communities of learners in the elementary classroom: The common knowledge learning environment. *Instructional Science, 46*(4), 533–561. https://doi.org/10.1007/s11251-018-9463-3.

Ford, D. P., & Staples, D. S. (2008). What is knowledge sharing from the informer's perspective? *International Journal of Knowledge Management (IJKM), 4*(4), 1–20. https://doi.org/10.4018/jkm.2008100101.

Formentini, M. (2021). Sustainable Supply Chain Management. *Corporate Sustainability in Practice Springer, Cham., 207–223*. https://doi.org/10.1007/978-3-030-56344-8_12.

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Marshfield: Pittman.

Freeman, R. E. (1999). Divergent stakeholder theory. *Academy of Management Review, 24*(2), 233–236. https://doi.org/10.5465/amr.1999.1893932.

Fung, A. (2013). Infotopia: Unleashing the democratic power of transparency. *Politics & Society, 41*(2), 183–212. https://doi.org/10.1177/0032329213483107.

Gandino, F., Montrucchio, B., Rebaudengo, M., & Sanchez, E. R. (2009). On improving automation by integrating RFID in the traceability management of the agri-food sector. *IEEE Transactions on Industrial Electronics, 56*(7), 2357–2365. https://doi.org/10.1109/TIE.2009.2019569.

Garcia-Garcia, G., Woolley, E., Rahimifard, S., Colwill, J., White, R., & Needham, L. (2017). A methodology for sustainable management of food waste. *Waste and Biomass Valorization, 8*(6), 2209–2227. https://doi.org/10.1007/s12649-016-9720-0.

Garcia-Torres, S., Albareda, L., Rey-Garcia, M., & Seuring, S. (2019). Traceability for sustainability–literature review and conceptual framework. *Supply Chain Management: An International Journal, 24*(1), 85–106. https://doi.org/10.1108/SCM-04-2018-0152.

Gardner, T. A., Benzie, M., Börner, J., Dawkins, E., Fick, S., Garrett, R., & Wolvekamp, P. (2019). Transparency and sustainability in global commodity supply chains. *World Development, 121*, 163–177. https://doi.org/10.1016/j.worlddev.2018.05.025.

Ghisellini, P., & Ulgiati, S. (2020). Circular economy transition in Italy. Achievements, perspectives and constraints. *Journal of Cleaner Production, 243*, Article 118360. https://doi.org/10.1016/j.jclepro.2019.118360.

Golan, E. H., Krissoff, B., Kuchler, F., Calvin, L., Nelson, K. E., & Price, G. K. (2004). Traceability in the US food supply: economic theory and industry studies, Agricultural Economic Report Number 830. https://doi.org/10.22004/ag.econ.33939.

Goldsmith, P., & Bender, K. (2004). Ten conversations about identity preservation. *Journal on Chain and Network Science, 4*(2), 111–123. https://doi.org/10.3920/jcns2004.x046.

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

Halloran, A., Clement, J., Kornum, N., Bucatariu, C., & Magid, J. (2014). Addressing food waste reduction in Denmark. *Food Policy, 49*, 294–301. https://doi.org/10.1016/j.foodpol.2014.09.005.

Hennink, M. M. (2014). *Focus group discussions (understanding qualitative research)*. New York, USA: Oxford University Press.

Hernaus, T., Cerne, M., Connelly, C., Vokic, N. P., & Škerlavaj, M. (2019). Evasive knowledge hiding in academia: When competitive individuals are asked to collaborate. *Journal of Knowledge Management*. https://doi.org/10.1108/JKM-11-2017-0531.

Hoornweg, D., Bhada-Tata, P., & Kennedy, C. (2013). Environment: Waste production must peak this century. *Nature News, 502*(7473), 615.

Hu, Y., Lin, J., Cui, S., & Khanna, N. Z. (2016). Measuring urban carbon footprint from carbon flows in the global supply chain. *Environmental Science & Technology, 50*(12), 6154–6163. https://doi.org/10.1021/acs.est.6b00985.

Huang, E., & Yang, J. C. (2009). The integration of seafood traceability system for shrimp value chain systems. *International Journal of Computers, 3*(2), 201–210.

Huang, He, Y., Li, D. 2018. Pricing and inventory decisions in the food supply chain with production disruption and controllable deterioration. Journal of Cleaner Production, 180, 280-296. https://doi.org/10.1016/j.jclepro.2018.01.152.

Iakovou, E., Bochtis, D., Vlachos, D., & Aidonis, D. (Eds.). (2016). *Supply chain management for sustainable food networks*. Hoboken, NJ: John Wiley & Sons.

ISO. (2007). ISO 22005: 2007 Traceability in the feed and food chain–General principles and basic requirements for system design and implementation.

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

Jawahir, I. S., & Bradley, R. (2016). Technological elements of circular economy and the principles of 6R-based closed-loop material flow in sustainable manufacturing. *Procedia Cirp, 40*(1), 103–108. https://doi.org/10.1016/j.procir.2016.01.067.

Junnila, S., Ottelin, J., & Leinikka, L. (2018). Influence of reduced ownership on the environmental benefits of the circular economy. *Sustainability, 10*(11), 4077. https://doi.org/10.3390/su10114077.

Kache, F., & Seuring, S. (2014). Linking collaboration and integration to risk and performance in supply chains via a review of literature reviews. *Supply Chain Management, 19*, 664–682. https://doi.org/10.1108/scm-12-2013-0478.

Kankanhalli, A., Tan, B. C., & Wei, K. K. (2005). Contributing knowledge to electronic knowledge repositories: An empirical investigation. *MIS Quarterly, 21*(1), 113–143. https://doi.org/10.2307/25148670.

Kassahun, A., Hartog, R. J. M., Sadowski, T., Scholten, H., Bartram, T., Wolfert, S., & Beulens, A. J. M. (2014). Enabling chain-wide transparency in meat supply chains based on the EPCIS global standard and cloud-based services. *Computers and electronics in agriculture, 109*, 179–190. https://doi.org/10.1016/j.compag.2014.10.002.

Kayikci, Y., Ozbiltekin, M., & Kazancoglu, Y. (2019). Minimizing losses at red meat supply chain with circular and central slaughterhouse model. *Journal of Enterprise Information Management*. https://doi.org/10.1108/JEIM-01-2019-0025.

Kher, S. V., Frewer, L. J., De Jonge, J., Wentholt, M., Davies, O. H., Luijckx, N. B. L., & Cnossen, H. J. (2010). Experts' perspectives on the implementation of traceability in Europe. *British Food Journal, 112*(3), 261–274. https://doi.org/10.1108/00070701011029138.

Krishnan, R., Agarwal, R., Bajada, C., & Arshinder, K. (2020). Redesigning a food supply chain for environmental sustainability–An analysis of resource use and recovery. *Journal of Cleaner Production, 242*, Article 118374. https://doi.org/10.1016/j.jclepro.2019.118374.

Krumme, K., & Melkonyan, A. (2019). Research and Innovation Perspectives on Integrated Supply Chains in a Sustainable Economy. *Innovative Logistics Services and Sustainable Lifestyles Springer, Cham., 289–307*. https://doi.org/10.1007/978-3-319-98467-4_14.

Kvale, S. (1996). *Interviews—An Introduction to Qualitative Research Interviewing*. California: Sage.

Labafi, S. (2017). Knowledge hiding as an obstacle of innovation in organizations a qualitative study of the software industry. *AD-minister, 30*, 131–148. https://doi.org/10.17230/ad-minister.30.7.

Leising, E., Quist, J., & Bocken, N. (2018). Circular economy in the building sector: Three cases and a collaboration tool. *Journal of Cleaner Production, 176*, 976–989. https://doi.org/10.1016/j.jclepro.2017.12.010.

León-Bravo, V., Caniato, F., Caridi, M., & Johnsen, T. (2017). Collaboration for Sustainability in the Food Supply Chain: A Multi-Stage Study in Italy. *Sustainability, 9*(7), 1253. https://doi.org/10.3390/su9071253.

Liu, J., Feng, Y., Zhu, Q., & Sarkis, J. (2018). Green supply chain management and the circular economy. *International Journal of Physical Distribution & Logistics Management, 48*(8), 794–817. https://doi.org/10.1108/IJPDLM-01-2017-0049.

Lotfi, Z., Mukhtar, M., Sahran, S., & Taei Zadeh, A. (2013). Information sharing in supply chain management. In The 4th International Conference on Electrical Engineering and Informatics. https://doi.org/10.1016/j.protcy.2013.12.194.

Lu, Y., Gupta, A., Ketter, W., & Van Heck, E. (2019). Information transparency in business-to-business auction markets: The role of winner identity disclosure. *Management Science, 65*(9), 4261–4279. https://doi.org/10.1287/mnsc.2018.3143.

Lusiantoro, L., Yates, N., Mena, C., & Varga, L. (2018). A refined framework of information sharing in perishable product supply chains. *International Journal of Physical Distribution & Logistics Management, 48*(3), 254–283. https://doi.org/10.1108/IJPDLM-08-2017-0250.

Madec, F., Geers, R., Vesseur, P., Kjeldsen, N., & Blaha, T. (2001). Traceability in the pig production chain. *Revue Scientifique et Technique-Office International des Epizooties, 20*(2), 523–537.

Mantese, G. C., & Amaral, D. C. (2018). Agent-based simulation to evaluate and categorize industrial symbiosis indicators. *Journal of Cleaner Production, 186*, 450–464. https://doi.org/10.1016/j.jclepro.2018.03.142.

Manzini, R., & Accorsi, R. (2013). The new conceptual framework for food supply chain assessment. *Journal of food engineering, 115*(2), 251–263. https://doi.org/10.1016/j.jfoodeng.2012.10.026.

Marucheck, A., Greis, N., Mena, C., & Cai, L. (2011). Product safety and security in the global supply chain: Issues, challenges and research opportunities. *Journal of Operations Management, 29*(7–8), 707–720. https://doi.org/10.1016/j.jom.2011.06.007.

McCarthy, U., Uysal, I., Badia-Melis, R., Mercier, S., O'Donnell, C., & Ktenioudaki, A. (2018). Global food security–Issues, challenges and technological solutions. *Trends in Food Science & Technology, 77*, 11–20. https://doi.org/10.1016/j.tifs.2018.05.002.

Mirabella, N., Castellani, V., & Sala, S. (2014). Current options for the valorization of food manufacturing waste: A review. *Journal of Cleaner Production, 65*, 28–41. https://doi.org/10.1016/j.jclepro.2013.10.051.

Mishra, S., Singh, S. P., Johansen, J., Cheng, Y., & Farooq, S. (2018). Evaluating indicators for international manufacturing network under circular economy. *Management Decision, 57*(4), 811–839. https://doi.org/10.1108/MD-05-2018-0565.

Moe, T. (1998). Perspectives on traceability in food manufacture. *Trends in Food Science & Technology, 9*(5), 211–214. https://doi.org/10.1016/S0924-2244(98)00037-5.

Mol, A. P. (2015). Transparency and value chain sustainability. *Journal of Cleaner Production, 107*, 154–161. https://doi.org/10.1016/j.jclepro.2013.11.012.

Morone, P., Falcone, P. M., & Lopolito, A. (2019). How to promote a new and sustainable food consumption model: A fuzzy cognitive map study. *Journal of cleaner production, 208*, 563–574. https://doi.org/10.1016/j.jclepro.2018.10.075.

Morseletto, P. (2020). Targets for a circular economy. *Resources, Conservation and Recycling, 153*, Article 104553. https://doi.org/10.1016/j.resconrec.2019.104553.

Mousavi, A., Sarhadi, M., Fawcett, S., Bowles, S., & York, M. (2005). Tracking and traceability solution using a novel material handling system. *Innovative Food Science & Emerging Technologies, 6*(1), 91–105. https://doi.org/10.1016/j.ifset.2004.10.006.

Nakandala, D., Samaranayake, P., Lau, H., & Ramanathan, K. (2017). Modelling information flow and sharing matrix for fresh food supply chains. *Business Process Management Journal, 23*(1), 108–129. https://doi.org/10.1108/BPMJ-09-2015-0130.

Närvänen, E., Mattila, M., & Mesiranta, N. (2020). Institutional work in food waste reduction: Start-ups' role in moving towards a circular economy. *Industrial Marketing Management. (article in press)*. https://doi.org/10.1016/j.indmarman.2020.08.009.
Olsen, P., & Aschan, M. (2010). Reference method for analyzing material flow, information flow and information loss in food supply chains. *Trends in Food Science & Technology, 21*(6), 313–320. https://doi.org/10.1016/j.tifs.2010.03.002.
Olsen, P., & Borit, M. (2013). How to define traceability. *Trends in food science & technology, 29*(2), 142–150. https://doi.org/10.1016/j.tifs.2012.10.003.
Opara, L. U., & Mazaud, F. (2001). Food traceability from field to plate. *Outlook on Agriculture, 30*(4), 239–247. https://doi.org/10.5367/000000001101293724.
Paciarotti, C., & Torregiani, F. (2020). The logistics of the short food supply chain: A literature review. *Sustainable Production and Consumption*. https://doi.org/10.1016/j.spc.2020.10.002.
Pan, S. Y., Du, M. A., Huang, I. T., Liu, I. H., Chang, E. E., & Chiang, P. C. (2015). Strategies on implementation of waste-to-energy (WTE) supply chain for circular economy system: A review. *Journal of Cleaner Production, 108*, 409–421. https://doi.org/10.1016/j.jclepro.2015.06.124.
Pandey, S., Singh, R. K., Gunasekaran, A., & Kaushik, A. (2020). Cyber security risks in globalized supply chains: Conceptual framework. *Journal of Global Operations and Strategic Sourcing, 103–127*. https://doi.org/10.1108/JGOSS-05-2019-0042.
Pant, R. R., Prakash, G., & Farooquie, J. A. (2015). A framework for traceability and transparency in the dairy supply chain networks. *Procedia-Social and Behavioral Sciences, 189*, 385–394. https://doi.org/10.1016/j.sbspro.2015.03.235.
Papargyropoulou, E., Lozano, R., Steinberger, J. K., Wright, N., & bin Ujang, Z. (2014). The food waste hierarchy as a framework for the management of food surplus and food waste. *Journal of cleaner production, 76*, 106–115. https://doi.org/10.1016/j.jclepro.2014.04.020.
Pappa, I. C., Iliopoulos, C., & Massouras, T. (2018). What determines the acceptance and use of electronic traceability systems in agri-food supply chains? *Journal of Rural Studies, 58*, 123–135. https://doi.org/10.1016/j.jrurstud.2018.01.001.
Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.
Patwa, N., Sivarajah, U., Seetharaman, A., Sarkar, S., Maiti, K., & Hingorani, K. (2020). Towards a circular economy: An emerging economies context. *Journal of Business Research., 122*, 725–735. https://doi.org/10.1016/j.jbusres.2020.05.015.
Peres, B., Barlet, N., Loiseau, G., & Montet, D. (2007). Review of the current methods of analytical traceability allowing determination of the origin of foodstuffs. *Food Control, 18*, 228–235. https://doi.org/10.1016/j.foodcont.2005.09.018.
Pérez-Salazar, M. D. R., Aguilar-Lasserre, A. A., Cedillo-Campos, M. G., Juárez-Martínez, U., & Posada-Gómez, R. (2019). Processes and measurement of knowledge management in supply chains: An integrative systematic literature review. *International Journal of Production Research, 57*(7), 2136–2159. https://doi.org/10.1080/00207543.2018.1521530.
Popper, D. E. (2007). Traceability: Tracking and privacy in the food system. *Geographical review, 97*(3), 365–388. https://doi.org/10.1111/j.1931-0846.2007.tb00511.x.
Potting, J., Hekkert, M. P., Worrell, E., & Hanemaaijer, A. (2017). *Circular economy: measuring innovation in the product chain (No. 2544)*. PBL Publishers.
Preston, F. (2012). *A Global Redesign? Shaping the Circular Economy*. London: Chatham House.
Principato, L., Ruini, L., Guidi, M., & Secondi, L. (2019). Adopting the circular economy approach on food loss and waste: The case of Italian pasta production. *Resources, Conservation and Recycling, 144*, 82–89. https://doi.org/10.1016/j.resconrec.2019.01.025.
Rezaee, Z. (2016). Business sustainability research: A theoretical and integrated perspective. *J. Account. Lit., 36*, 48–64. https://doi.org/10.1016/j.acclit.2016.05.003.
Ringsberg, H. (2014). Perspectives on food traceability: A systematic literature review. *Supply Chain Management: An International Journal, 19*(5/6), 558–576. https://doi.org/10.1108/SCM-01-2014-0026.
Ruiz-Garcia, L., Steinberger, G., & Rothmund, M. (2010). A model and prototype implementation for tracking and tracing agricultural batch products along the food chain. *Food control, 21*(2), 112–121. https://doi.org/10.1016/j.foodcont.2008.12.003.
Samuel, K. E., Goury, M. L., Gunasekaran, A., & Spalanzani, A. (2011). Knowledge management in the supply chain: An empirical study from France. *The Journal of Strategic Information Systems, 20*(3), 283–306. https://doi.org/10.1016/j.jsis.2010.11.001.
Sarkis, J., Zhu, Q., & Lai, K. H. (2011). An organizational theoretic review of green supply chain management literature. *International Journal of Production Economics, 130*(1), 1–15. https://doi.org/10.1016/j.ijpe.2010.11.010.
Schmutz, U., Kneafsey, M., Kay, C. S., Doernberg, A., & Zasada, I. (2018). Sustainability impact assessments of different urban short food supply chains: Examples from London, UK. *Renewable Agriculture and Food Systems, 33*(6), 518–529. https://doi.org/10.1017/S1742170517000564.
Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production, 16*(15), 1699–1710. https://doi.org/10.1016/j.jclepro.2008.04.020.
Sebők, A., Varsányi, K., Parrag, V., Braun, S., Fricz, Á. S., & Casado, J. (2020). Elimination of Bottlenecks of Short Food Chains by Technological and Non-technological Innovations in Short Food Supply Chains. *Proceedings in Food System Dynamics*, 42–62. https://doi.org/10.18461/pfsd.2020.2006.
Sgarbossa, F., & Russo, I. (2017). A proactive model in sustainable food supply chain: Insight from a case study. *International Journal of Production Economics, 183*, 596–606. https://doi.org/10.1016/j.ijpe.2016.07.022.
Shanahan, C., Kernan, B., Ayalew, G., McDonnell, K., Butler, F., & Ward, S. (2009). A framework for beef traceability from farm to slaughter using global standards: An Irish perspective. *Computers and electronics in agriculture, 66*(1), 62–69. https://doi.org/10.1016/j.compag.2008.12.002.
Sharma, Y. K., Mangla, S. K., Patil, P. P., & Liu, S. (2019). When challenges impede the process: For circular economy-driven sustainability practices in food supply chain. *Management Decision, 57*(4), 995–1017. https://doi.org/10.1108/MD-09-2018-1056.
Sharma, Y. K., Yadav, A. K., Mangla, S. K., & Patil, P. P. (2018). Ranking the success factors to improve safety and security in sustainable food supply chain management using fuzzy AHP. *Materials Today: Proceedings, 5*(5), 12187–12196. https://doi.org/10.1016/j.matpr.2018.02.196.
Shih, S. C., Hsu, S. H., Zhu, Z., & Balasubramanian, S. K. (2012). Knowledge sharing—A key role in the downstream supply chain. *Information & Management, 49*(2), 70–80. https://doi.org/10.1016/j.im.2012.01.001.
Simatupang, T. M., & Sridharan, R. (2002). The Collaborative Supply Chain. *Journal of Logistics Management, 13*(1), 15–30. https://doi.org/10.1108/09574090210806333.
Simpson, D. (2010). Use of supply relationships to recycle secondary materials. *International Journal of Production Research, 48*(1), 227–249. https://doi.org/10.1080/00207540802415584.
Singh, S. K. (2019). Territoriality, task performance, and workplace deviance: Empirical evidence on the role of knowledge hiding. *Journal of Business Research, 97*, 10–19. https://doi.org/10.1016/j.jbusres.2018.12.034.
Talay, C., Oxborrow, L., & Brindley, C. (2018). How small suppliers deal with the buyer power in asymmetric relationships within the sustainable fashion supply chain. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2018.08.034.
Thakur, M., Wang, L., & Hurburgh, C. R. (2010). A multi-objective optimization approach to balancing cost and traceability in bulk grain handling. *Journal of Food Engineering, 101*(2), 193–200. https://doi.org/10.1016/j.jfoodeng.2010.07.001.
The State of Food and Agriculture. http://www.fao.org/publications/sofa/2013/en/. Accessed December 3, 2020).
Thomsson, M., & Sylvia, G. (2005). Seafood traceability in the United States: Current trends, system design, and potential application. *Comprehensive Reviews Food Science and Food Safety, 1*, 1–7.
Trienekens, J., & Zuurbier, P. (2008). Quality and safety standards in the food industry, developments and challenges. *International Journal of Production Economics, 113*(1), 107–122. https://doi.org/10.1016/j.ijpe.2007.02.050.
Trienekens, J. H., Wognum, P. M., Beulens, A. J., & van der Vorst, J. G. (2012). Transparency in complex dynamic food supply chains. *Advanced Engineering Informatics, 26*(1), 55–65. https://doi.org/10.1016/j.aei.2011.07.007.
UN, 2017. Goal 12: ensure sustainable consumption and production patterns. Available at: https://www.un.org/sustainabledevelopment/sustainable-consumption-production/ Accessed May 7, 2020.
Validi, S., Bhattacharya, A., & Byrne, P. J. (2014). A case analysis of a sustainable food supply chain distribution system—a multi-objective approach. *International Journal of Production Economics, 152*, 71–87. https://doi.org/10.1016/j.ijpe.2014.02.003.
Van Buren, N., Demmers, M., Van der Heijden, R., & Witlox, F. (2016). Towards a circular economy: The role of Dutch logistics industries and governments. *Sustainability, 8*(7), 647. https://doi.org/10.3390/su8070647.
Vermeulen, W. J. (2015). Self-governance for sustainable global supply chains: Can it deliver the impacts needed? *Business Strategy and the Environment, 24*(2), 73–85. https://doi.org/10.1002/bse.1804.
Vickery, S. K., Jayaram, J., Droge, C., & Calantone, R. (2003). The effects of an integrative supply chain strategy on customer service and financial performance: An analysis of direct versus indirect relationships. *Journal of Operations Management, 21*(5), 523–539. https://doi.org/10.1016/j.jom.2003.02.002.
Voulodimos, A. S., Patrikakis, C. Z., Sideridis, A. B., Ntafis, V. A., & Xylouri, E. M. (2010). A complete farm management system based on animal identification using RFID technology. *Computers and electronics in agriculture, 70*(2), 380–388. https://doi.org/10.1016/j.compag.2009.07.009.
Wognum, P. N., Bremmers, H., Trienekens, J. H., van der Vorst, J. G., & Bloemhof, J. M. (2011). Systems for sustainability and transparency of food supply chains–Current status and challenges. *Advanced engineering informatics, 25*(1), 65–76. https://doi.org/10.1016/j.aei.2010.06.001.
Xiao, Y., Zhang, H., & Basadur, T. M. (2016). Does information sharing always improve team decision making? An examination of the hidden profile condition in new product development. *Journal of Business Research, 69*(2), 587–595. https://doi.org/10.1016/j.jbusres.2015.05.014.
Yenipazarli, A. (2019). Incentives for environmental research and development: Consumer preferences, competitive pressure and emissions taxation. *European Journal of Operational Research, 276*, 757–769. https://doi.org/10.1016/j.ejor.2019.01.037.
Yeşil, S., & Hırlak, B. (2013). An empirical investigation into the influence of knowledge sharing barriers on knowledge sharing and individual innovation behaviour. *International Journal of Knowledge Management, 9*(2), 38–61. https://doi.org/10.4018/jkm.2013040103.
Zhao, X., Huo, B., Selen, W., & Yeung, J. H. Y. (2011). The impact of internal integration and relationship commitment on external integration. *Journal of Operations Management, 29*, 17–32. https://doi.org/10.1016/j.jom.2010.04.004.
Zhu, Z., Chu, F., Dolgui, A., Chu, C., Zhou, W., & Piramuthu, S. (2018). Recent advances and opportunities in sustainable food supply chain: A model-oriented review. *International Journal of Production Research, 56*(17), 5700–5722. https://doi.org/10.1080/00207543.2018.1425014.
Zhu, Q., Shah, P., & Sarkis, J. (2020). A paler shade of green: Implications of green product deletion on supply chains. *International Journal of Production Research, 58*(15), 4567–4588.

Sachin Kumar Mangla is working in the field of Green and Sustainable Supply Chain and Operations; Industry 4.0; Circular Economy; Decision Making and Modelling. He has a

teaching experience of more than five years in Supply Chain and Operations Management and Decision Making, and currently associated in teaching with various universities in UK, Turkey, India, China, France, etc. He is committed to do and promote high quality research. He has published/presented several papers in repute international/national journals and conferences (POMS, SOMS, IIIE, CILT – LRN, GLOGIFT). He is involved in couple of editorial responsibilties.. Currently, he is also involved in several research projects on various issues and applications of Circular economy and Sustainability. Among them, he is responsible for knowledge based decision model in "Enhancing and implementing knowledge based ICT solutions within high risk and uncertain conditions for agriculture production systems (RUC-APS)", European Commission RISE scheme, €1.3M.

Gülmüş Börühan is an Assistant Professor at Logistics Management Department in Yaşar University, Izmir, Turkey. Her main research interests include logistics service quality, retail management, e-commerce and food waste management. Dr. Börühan has published her works in journals such as the Asia Pacific Journal of Marketing and Logistics, Journal of Product and Brand Management, International Journal of Retail and Distribution Management.

Pervin Ersoy is an Assistant Professor in the Department of Logistics Management at Yasar University. Her research interests include, green supply chain management, green logistics, retail logistics, disaster and relief logistics. Dr. Ersoy has published her work in such journals as the Journal of Cleaner Production, Journal of Product and Brand Management, Sustainability and International peer–reviewed journals.

Yigit Kazancoglu is a Full Professor at Logistics Management Department and department chair in Yaşar University, Izmir, Turkey. He has MBA from Coventry University and PhD from Ege University. The subjects he is working on are; operations management, sustainability, circular economy, green supply chain management, with more than 70 articles in the SCI & SCI-E & SSCI & ESCI and SCOPUS indexed journals.

Malin Song is the professor at the Institute of Statistics and Applied Mathematics, Anhui University of Finance and Economics, He received the Ph.D. degree in Management from University of science and technology of China, Anhui, China, in 2011. In recent years, he has focused on research on data envelopment analysis, environmental economics, and statistics, with remarkable achievements, especially in environmental efficiency evaluation and applications. He has presided over and completed the project. Currently, he is presiding over significant brainstorming for research on topics in the philosophy and social science areas, under the mandate of the Ministry of Education of China. Since 2010, Prof. Song has published more than 100 papers on international SSCI and SCI journals as the first or corresponding author.