Journal of Digital Economy 2 (2023) 303–316

Contents lists available at ScienceDirect

Journal of Digital Economy

journal homepage: www.keaipublishing.com/en/journals/journal-of-digital-economy

The future of the food supply chain: A systematic literature review and research directions towards sustainability, resilience, and technology adoption

I-Hsuan Su *, Lin Wu, Kim Hua Tan

Nottingham University Business School, UK

ARTICLE INFO

Keywords:
Food supply chain
Resilience
Digital technology
Sustainability
Systematic literature review

ABSTRACT

In recent years, our food supply chain facing various disruptions shows a need for higher resilience and sustainability. To better prepare for future uncertainties the food supply chain may encounter, it is imperative to understand the status quo of the food supply chain resilience literature, which focuses on deploying digital technology and integrating sustainability in supply chain management. Motivated by this, our study critically reviews the literature on food supply chain resilience against different types of disruptions, identifies research gaps, and provides a reference for the food supply chain to respond to uncertainties more effectively through digital technology and sustainability integration. To fulfil this objective, we perform a systematic literature review of academic journal articles from 2010 to 2020. Our study is novel in investigating different potential strategies to respond to various disruptions, emphasising the role of digital technologies and sustainability. The findings complement existing literature on supply chain resilience and serve as guides to supply chain practitioners facing disruptions. In addition, we investigate possible ways of adopting and optimising digital technologies to enhance food supply chain resilience and indicate areas where a sustainable future can be achieved through a more resilient food supply chain powered by digital innovations.

1. Introduction

Sustainability, or sustainable development, is the mode of development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). This definition, broad as it is, calls for attention to the present and our shared future. Building on this concept, the United Nations (UN) has proposed the Sustainable Development Goals (SDGs), which consist of 17 global goals with 169 specific targets, as a guiding framework to achieve a sustainable future. Our study focuses on SDG2 on Zero Hunger through the global food supply chain lens. Unfortunately, more people are suffering from food insecurity in recent years, and the unpredicted COVID-19 has made the condition even worse. The most affected areas during the COVID-19 are food supply chains and the poorest (Lancet, 2020), despite the increase in food banks in countries such as the US and the UK (Fenner and Cernev, 2021).

It is evident that the current food supply chain needs to be more resilient to reach SDG2, which aims to help ensure food access to all and resilient food systems. Research on supply chain resilience has flourished over the past decades with significant achievements. For

* Corresponding author.
E-mail addresses: ihsuan.su@nottingham.ac.uk (I.-H. Su), Lin.Wu@nottingham.ac.uk (L. Wu), Kim.Tan@nottingham.ac.uk (K.H. Tan).

https://doi.org/10.1016/j.jdec.2024.03.001
Received 3 November 2023; Received in revised form 17 March 2024; Accepted 17 March 2024

instance, supply chain resilience strategies have been proposed and tested in various contexts, including alternate inventory, enhancing security, encouraging fund supply, postponement, building relationships with suppliers, demand forecasting, and information sharing (Chopra and Sodhi, 2004). A resilient supply chain can mitigate risks and reconstruct the supply chain after experiencing disruptions. Despite significant achievements, the sudden outbreak of the COVID-19 pandemic in late 2019 and the massive disruptions it caused to the global supply chain warns that our supply chain is yet to be resilient. For instance, according to Hobbs (2020), food suppliers could not sell their food products to restaurants and pubs because of the lockdown measures countries had to impose. At the same time, at the other end of the food supply chain, customers showed panic buying behaviours out of fear and anxiety about food shortages. Consequently, food distribution was interrupted by a lack of food for some and food waste for others. Driven by this shocking fact, our study aims to shed light on the following research question:

What is the status quo of the food supply chain resilience literature? What are opportunities that can enhance food supply chain resilience in the future?

Our study focuses on the food supply chain for three main reasons. First, food plays a vital role in the daily lives of human beings (Sandell et al., 2016). The nature of food products is different from other consumer goods such as electronics, as it concerns the life and health of humankind and other living creatures, without which we cannot develop a promising future. This corresponds to what SDG 2 and its sub-targets advocate. Food is essential to human existence. Unexpected events that undermine food availability have a much bigger effect than those that disrupt supply chains for manufacturing items. If a supply chain disruption prevents customers from having their dishwasher, car, or grill delivered, they could find it inconvenient or mildly bothersome, but people will quickly learn about any threat to food supply (Hobbs, 2021). Second, the current food supply chain shows an urgent need for improvement in resilience and sustainability. The existing food supply chain needs to be more resilient when facing uncertainties such as agricultural shortages, which result in hunger and inequality (Cernev and Fenner, 2020). Food distribution needs to be fairer; some people have more than they need, and others need help to meet their basic needs. For instance, the UK wasted 9.5 million tonnes of food in 2018 (Lordslibrary, 2021), while over 8 million people in other parts of the world live in hunger (WHO, 2018). Third, the future is full of uncertainties, and a resilient food supply chain is critical to responding to unpredictable disruptions and reducing global catastrophic risks for humanity (Cernev and Fenner, 2020). Thus, sustainable food systems can help maintain food security and are productive and resilient to climate change and natural disasters (Fanzo et al., 2021). It is essential to ensure food access and quality to all, including people experiencing poverty and the vulnerable, by having resilient food production systems when disruptions happen so that people can live healthier lives (Vogliano et al., 2021). Therefore, we adopt a systematic literature review approach to review the existing literature comprehensively and critically on supply chain resilience under different disruptions and propose future research directions based on the gaps in the literature. Specifically, identified articles over 11 years (2010–2020) have been grouped into three categories based on the type of disasters they looked at, natural disasters such as the Thai flood in 2011, pandemics such as COVID-19 in 2020, and human factors such as the financial crisis in 2009. The literature review findings will contribute to a sustainable and better future by providing directions for future research in the field of supply chain resilience, especially on the food supply chain, to face future uncertainties.

2. Literature review

2.1. Food supply chain

Food supply chain design and management involves controlling food products and processes simultaneously along the entire food supply chain "from farm to fork" in terms of quality (1), safety (2), sustainability (3), and logistical efficiency (4). (Manzini and Accorsi, 2013). Risks are significantly less bearable in food supply chain when risk factors could jeopardise the safety and quality of food products and consequently the health of consumers (Marucheck et al., 2011). Therefore, food quality and safety are important issues that many studies were discussing. When it comes to food supply chain, sustainability is another topic that cannot be neglected. For the food supply to keep up with the projected 9.6 billion people on the planet by 2050, it will need to rise by almost 70% from its current levels. The largest obstacle to global food security is food waste, with developing nations accounting for 20–30% of all food waste that happens during the post-harvest phase of the food supply chain (Krishnan et al., 2020). Therefore, some researchers sought to uncover operational and resource inefficiencies present in the food supply chain and offers a framework for revamping the food supply chain to enhance environmental sustainability through environmental impact assessment (Krishnan et al., 2020). Logistical efficiency is another important issue in food supply chain. Food supply chain resilience is one of the important topics in this issue.

2.2. Food supply chain resilience

Supply chain resilience is difficult to define precisely; terms like robustness, adaptability, transformability, recovery, and reorientation are sometimes used (Hobbs, 2021). Supply chain risk management perspectives deal with logistics-related uncertainty, while organisational perspectives highlight an organization's internal capacity for adaptation (Ponomarov and Holcomb, 2009). An ecological (systems) perspective highlights a system's ability to absorb change, while a psychological perspective concentrates on control, coherence, and connectedness in responding to an exogenous shock. Food is necessity for human survival. Unexpected occurrences that affect the availability of food has a significantly greater impact than those that interrupt supply systems for manufacturing goods. Customers may find it inconvenient or moderately annoying if they can't have a dishwasher, car, or grill delivered because of a supply chain interruption, but the public will rapidly become aware of any threat to the availability of food (Hobbs, 2021). Therefore, food supply chain resilience is essential to human lives. Food supply chain resilience can be defined as "The ability of a food system and its units at multiple levels, over time, to provide sufficient, appropriate, and accessible food to all, in the face of various and even unforeseen

disturbances" (Tendall et al., 2015, p. 19). Recent research about food supply chain resilience mainly focuses on how food supply chain recovered after being disrupted by COVID-19 pandemic (Thilmany et al., 2021; Mu et al., 2021). Few research referred to have a systematic literature review discussing food supply chain resilience. Therefore, in order to fill in this research gap, this study aims to conduct a systematic literature review about food supply chain resilience.

3. Methodology

This study conducted a systematic literature review and broadly reviewed related studies of enhancement of supply chain resilience under emergent incidents over the last eleven years, from 2010 to 2020. This will be presented in more detail through the following sections.

Table 1
Journals and numbers of papers for related research (2010–2020).

Journal	numbers of articles
International Journal of Production Economics	10
Canadian Journal of Agricultural Economics	5
Food security	4
International Journal of Operations & Production Management	4
Applied Economic Perspectives and Policy	3
Science of the Total Environment	3
Sustainability	3
International Journal of Disaster Risk Reduction	2
Journal of Environmental Studies and Sciences	2
The Journal of Pleasant Studies	2
Transportation Research Part E	2
Trends in Food Science & Technology	2
International Journal of Production Research	2
African Studies Review	1
Agricultural and Resource Economics Review	1
Agriculture and Human Values	1
American Journal of Agricultural Economics	1
Annals of Operations Research	1
Asian Agricultural Research	1
China agricultural economic review	1
Cogent Engineering	1
Computers & Industrial Engineering	1
Discrete Dynamics in Nature and Society	1
Environment Systems and Decisions	1
Food Quality and Safety	1
Foods	1
International Journal of Food and Agricultural Economics	1
International Journal of Hospitality Management	1
International Journal of Humanities and Social Science	1
International Journal of Physical Distribution & Logistics Management	1
International Journal of Quality & Reliability Management	1
International Journal of Supply and Operations Management	1
Journal of Agriculture, Food Systems, and Community Development	1
Journal of Cleaner Production	1
Journal of Enterprising Communities: People and Places in the Global Economy	1
Journal of Humanitarian Logistics and Supply Chain Management	1
Journal of Regional Science	1
Journal of Service Management	1
Malaysian Journal of Economic Studies	1
Management of Environmental Quality	1
Marine Policy	1
Problems and Perspectives in Management	1
Rural Society	1
Socio-Economic Planning Sciences	1
Soft Computing	1
Supply Chain Management	1
Sustainable Production and Consumption	1
Technological Forecasting & Social Change	1
The International Journal of Justice and Sustainability	1
The International Review of Retail, Distribution and Consumer Research	1
Transportation Journal	1
Transportation Research Interdisciplinary Perspectives	1
Total	83

3.1. Journal and article selection

Table 1 shows journals and numbers of articles for related research on supply chain resilience under some emergent incidents (2010–2020). This time frame was chosen since several events, including the COVID-19 pandemic, floods, tsunamis, etc, disrupted the world economy. Therefore, it will be valuable to explore the studies during this period. This paper reviewed related literature about enhancing supply chain resilience under some emergent incidents in four popular business and management publication databases: Emerald Intelligence, ABI/Inform, ScienceDirect, and Business Source Premier. We searched for titles, abstracts, and full texts by using the keywords "food supply chain resilience," "food systems resilience," and "supply chain resilience" along with "pandemic," "COVID-19", "flood," "earthquake," "drought," "financial crisis," "Brexit," "natural disaster," "nuclear disaster," "tsunami," "typhoon," "hurricane," "cyclone." After screening the abstracts, 83 articles were obtained. This research does not guarantee that it will cover all the related articles on supply chain resilience under emergent incidents. However, we found various collections of representative articles by using this method. The number of articles published in each journal is listed in Table 1. We found out that a significant number of articles were published in 2020, which was 48, and nearly one-eighth of the pieces have been published in the International Journal of Production Economics. Fig. 1 shows a tremendous increase in the number of articles published in 2020. It indicates that researchers pay more attention to related topics in 2020. The reason for this is that many researchers have investigated the related issue of the COVID-19 pandemic.

3.2. Classification scheme

All 83 papers were reviewed and classified based on four dimensions: topics, data, regions, and contributions. The issues can be classified into pandemics, natural disasters, and the human factor. The pandemic means the articles investigate supply chain resilience under the pandemic. Natural disaster means research discovering the supply chain resilience under natural disasters such as earthquakes, cyclones, drought, tsunamis, and floods. Human factor means the articles investigate the related topic under incidents caused by the human element, such as financial crisis, nuclear disaster, and Brexit.

This study classified data into five groups: no data, survey, case study, secondary data, and experiment. No data means the article is entirely descriptive and it does not use any empirical evidence. Surveys are used as a practical method to collect data. Case studies show specific cases related to supply chain resilience. Secondary data papers use data from databases such as firm statistics. This study also includes studies that use experiments to investigate the related topic. Research contributions demonstrate the value of the articles. This study classified contributions into three groups: proof description, idea application, and idea building. Proof description means the pieces are conceptual to describe supply chain resilience. Idea application means the articles use existing approaches to investigate the related topic. Idea building means the articles attempt to develop a new approach to explore the related topic.

3.3. Findings and discussion

In this section, the results across eight dimensions were discussed: types of topics, regions, data, contributions, data collection ways and types of topics, strategies, findings to the disruptions, and food supply chain resilience and technology.

3.3.1. Topics

The numbers of related articles by research field are shown in Fig. 2. The most frequent areas are pandemics (more than 45 papers). The most frequent sites are natural disasters (more than 25 papers). The less frequent areas are human factor (only 9 papers). The reason for this is that the COVID-19 pandemic in 2020 has raised researchers' attention to investigate this area. This situation shows that COVID-19 significantly impacts the food supply chain. Many studies also examine the supply chain for natural disasters because of many outbreaks of earthquake, droughts, and floods. In 2019, more papers have been published in the human factor category.

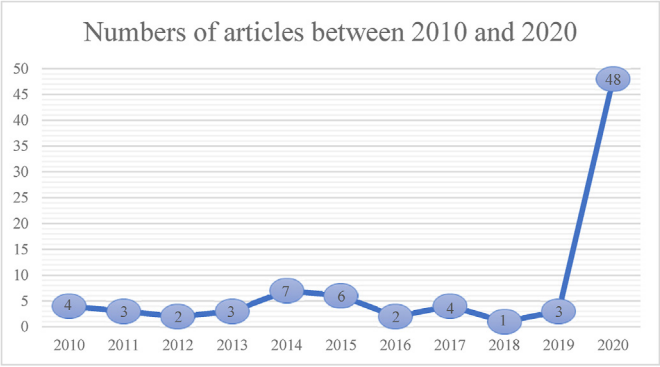

Fig. 1. Numbers of related articles (2010–2020).

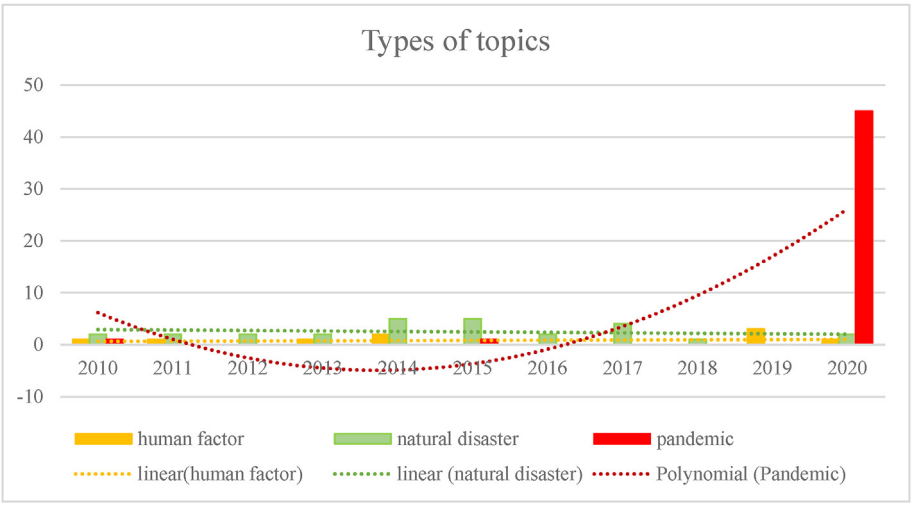

Fig. 2. Time and topics relationship.

3.3.2. Regions

The rate of increase rate of related articles by different regions is shown in Fig. 3 from 2010 to 2020. The figure shows that global issues have the highest increase rate (2600%). The next highest rate of research is in America (700%). The highest increase rate is in Oceania (−100%). More researchers focus on global issues than any other region in 2020. Therefore, international problems are becoming more and more aware by researchers.

3.3.3. Data

Fig. 4 shows data used in the related papers. No data articles have 29 papers, which is the most significant proportion. The second is the case study papers, which have 26 papers. There are fewer experiment papers, which are only 6 papers. The increase rate of case studies is the highest. The second-highest increase rate is no data research. However, no matter which kind of data collection method, there is an increase in 2020 because of the outbreak of the COVID-19 pandemic. In addition, more papers are applying the case study approach to investigate their research.

3.3.4. Contributions

Fig. 5 shows the relationship between contributions and time. Most studies used existing approaches to apply in the research, such as statistics, which are 43 papers. Second, most studies used descriptions to investigate the related topic without data, which are 26 papers. Only some studies used the new approach to explore associated issues, which resulted in 14 pieces. Studies that used the existing method fluctuated before 2020, with a significant increase in 2020. There are not many papers without using data before 2020. However, there is a substantial increase in 2020. In 2020, most studies applied an existing approach to their research.

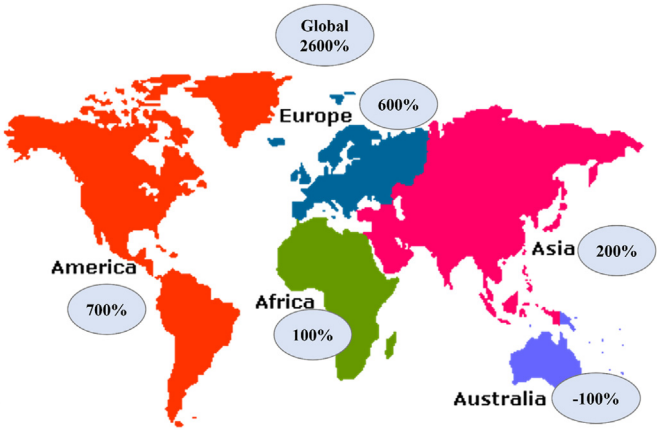

Fig. 3. Regions and increase rate of study.

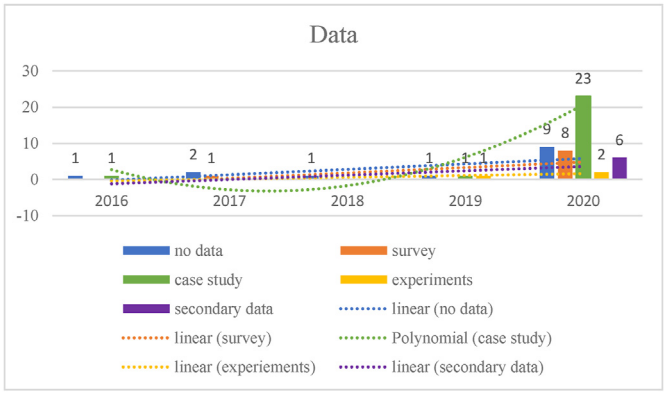

Fig. 4. Data and time relationship.

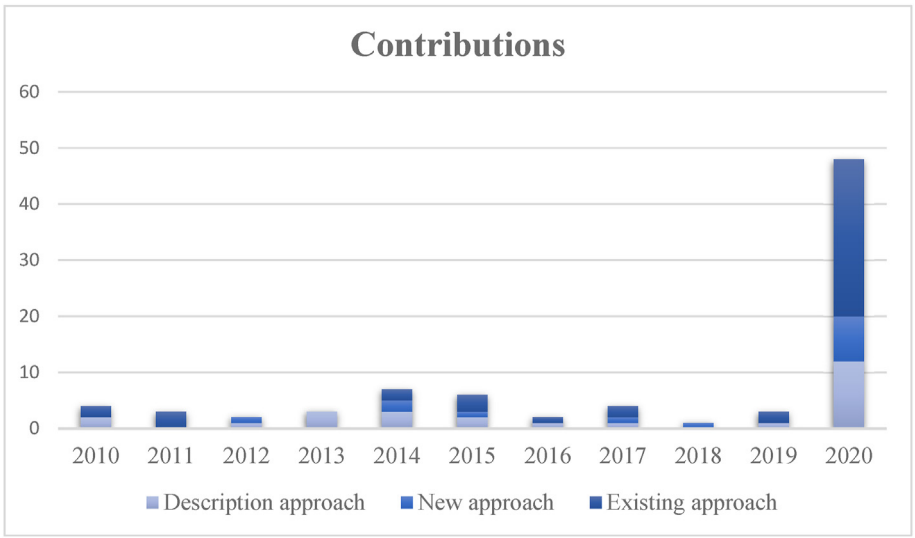

Fig. 5. Contribution and time relationship.

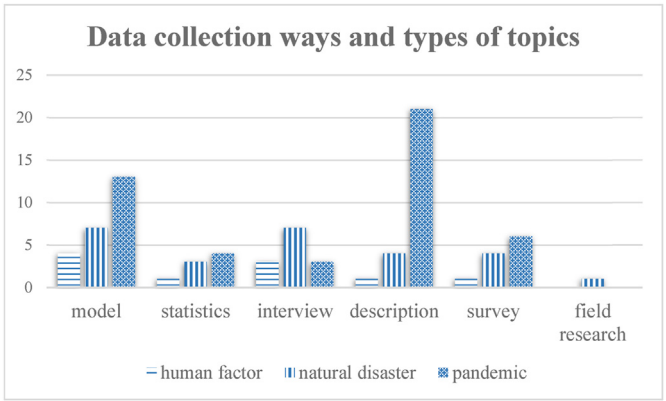

Fig. 6. Data collection ways and types of topics.

3.3.5. Data collection ways and types of topics

Fig. 6 shows the different data collection methods used in other topics. The figure shows that topics in the pandemic use more descriptions, surveys, and models for data collection. The topic of natural disasters uses more interviews and field research than any

other topic. Regarding the topic of human factors, it uses more models and interviews as ways of doing research.

3.3.6. Abilities to reduce risks

Fig. 7 shows the primary abilities used in three different topics. The topic of natural disasters mainly uses the power of visibility. Visibility means the knowledge of "being perceived by the eye or mind" (Jüttner and Maklan, 2011). In the pandemic, "collaboration" has been used as a primary ability to deal with the disruptions. Collaboration refers to "work with another or others on a joint project" (Jüttner and Maklan, 2011). In terms of the area of human factors, four primary abilities have been used: flexibility, velocity, visibility, and collaboration. The definition of flexibility is "being able to bend easily without breaking" (Peck, 2005). Velocity refers to the ability to have "speed of motion, action, or operation, rapidity and swiftness" (Christopher and Peck, 2004).

3.3.7. Theory

This section briefly introduces the theory that has been used in 83 papers. Nearly 0.5% of the documents mentioned the concept of theory. These articles adopted different theories in their studies. Hendry et al. (2019) used dynamic capabilities to manage the data collection and analysis process to build how the participants are experiencing the supply chain environment by sensing the changing climate (Brexit), seizing the opportunities, and transforming organisational capabilities. Roscoe et al. (2020) adopted strategic contingency theory by using two vital conditions to match the strategic fit such as companies adopting intangible resources: management time to collect information and reduce the supply chain instability, for instance, and companies adopting tangible resources (new supply chain facilities) and intangible resources such as management time to reduce the adverse effects of supply chain risks. Ruel and El Baz (2023) deployed a Resource-based view (RBV) by using physical capital resources, human capital resources, and organisational capital resources to improve firms' performance. In addition, they also adopted organisational information processing theories by enhancing information processing to reduce supply chain uncertainties. Gunessee and Subramanian (2020) applied Behavioural decision theory (BDT) in their study by conceptualising ambiguity. They explained how understanding behavioural and non-behavioural antecedents enables us to cope with disruptions such as the Thai flood in 2011 and the Covid-19 pandemic. This theory describes how people make decisions (Gunessee and Subramanian, 2020).

3.4. Strategies for the disruptions

3.4.1. For three different topics

3.4.1.1. Natural disaster. Natural disasters topic: the publications, including earthquakes, cyclones, floods, and drought, discuss several natural disasters. Problems that most face are food store access and low food productivity. The potential solutions may be utilising alternative suppliers or routes and alternative food quality standards.

3.4.1.2. Human factor. Several reasons result in emergent incidents of human factors such as Brexit, nuclear disaster, and financial crisis. The literature indicated that tariffs are the most common problem. The possible solution in the selected papers may be generating new supply sources and developing new markets.

3.4.1.3. Pandemic. Food security is the main problem in pandemic topics. The potential solution is to use blockchain to enhance food traceability. It can help improve data transparency to provide better food quality to customers. Some studies offer solutions to

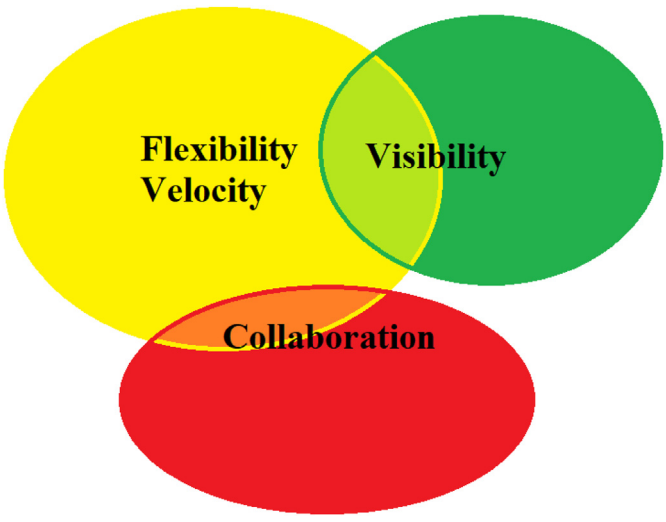

Fig. 7. Main abilities that have been used in different topics.

disruptions, such as destroying a specific production region. Reconstructing the supply chain network can be a potential solution to this problem. The supplier should move some of the production to different areas and prevent manufacturing the products in the same region (Haraguchi and Lall, 2015). Other studies address the use of flexibility to deal with the disruption of recession, such as purchasing products from cheaper sources or strengthening the power of bargaining prices to negotiate with suppliers (Jüttner and Maklan, 2011). In addition, collaborating with other supply chain parties helps solve the recession problem (Jüttner and Maklan, 2011).

Table 2 shows the research findings, approach application, and approach building. It is a helpful way to guide researchers keen to investigate supply chain resilience under some emergent incidents. It also separated the emergent incidents into three parts: natural disasters, human factors, and pandemics. It organised the approach of the studies that have been used so far. Table 2 also shows some studies that developed a new approach. We only organised some representative papers from the three different emergent incidents because of the length of the study.

In summary, although many studies investigate food supply chain resilience, the current food supply chain still needs to be resilient enough, such as unstable food supply and insecure food quality. Therefore, it is essential to investigate this issue to build a more resilient food supply chain to respond to unknown disruptions.

4. Future directions

4.1. For three different topics

4.1.1. Natural disaster

Overall, existing literature recommends responding to the disruptions by reconstructing the food supply chain network and finding alternative food suppliers. More systematic discussions are needed on how to rebuild the supply chain network. Therefore, "How does the supply chain reconstruct the supply chain network after the incidents happened?" is an important research question that future studies must address.

Future researchers can reconsider the dispatching routes and redesign the transportation network by designing a mathematical model to reconstruct the supply chain network. For example, Hasani and Khosrojerdi (2016) used a mixed integer, non-linear model to create a robust and flexible supply chain network. The network focused on electro-medical device transportation. Alikhani et al. (2021) also redesigned the retail supply chain after a disaster by adopting a two-stage stochastic optimisation framework. Therefore, future studies can use these studies to design a flexible food supply chain network. In addition, future researchers can also cooperate with policymakers when facing natural disasters to achieve good effectiveness and resilience (Riddell et al., 2018).

4.1.2. Human factor

Currently, studies in this category mainly discuss three issues: Brexit, the financial crisis, and the nuclear disaster. Regarding Brexit, research focused on the condition of the build-up to Brexit (Hendry et al., 2019). Studies of the financial crisis and nuclear disaster make efforts to discuss how the supply chain reacts to the problem (Kumar and Havey, 2013; Jüttner and Maklan, 2011). However, few studies examine the post-Brexit era and how supply chains should respond to the new changes. As a result, research questions such as "What is the role of resilience in helping supply chains to respond to the post-Brexit risks?", "How can future research help identify the behavioral antecedents of incidents, and how can resilience allow supply chains to prepare before these incidents happen?" should receive more attention from future studies.

Future researchers should also consider making a standard operating procedure for disruptions. When a disruption occurs, the system should be alerted to adopt the approach to face the disruption to mitigate the consequences of risks. For example, by conducting in-depth interviews, Scholten et al. (2014) developed a disaster management process to mitigate disruption risks. Hale and Moberg (2005) also indicated the importance of disaster preparedness. They adopted a management disaster process for making the site location safe. Therefore, future research can consider developing supply chain disaster management processes and frameworks, particularly for the food supply chain for disaster preparedness.

4.1.3. Pandemic

In the pandemic category, most studies discussed the problems of food security. Because of the pandemic, more and more customers choose to use online shopping instead of purchasing goods in physical stores (Hobbs, 2020). In addition, labour shortages due to travel restrictions have yet to be solved (Hobbs, 2020). Therefore, some potential research questions to be addressed include "How can supply chain resilience help customers and suppliers ensure food security?", "How can supply chain resilience enhance the quality of online shopping?" and "How can problems of labour shortages be solved by a resilient supply chain?". Researchers also indicated that food security issues need to use some methods to interact with communities and make the community participants engage in a growing future challenges scenario (Bonatti et al., 2018).

Modern information technology, such as Blockchain and the Internet of Things (IoT), can help ensure food safety through improved supply chain traceability. In terms of enhancing the quality of online shopping, adopting Blockchain or IoT can help prevent data loss and ensure data safety thanks to reduced risks of intermediaries' interventions (Min, 2019). Further, using blockchain can also enhance the quality of online shopping and help keep online users safe on the Internet. Regarding labour shortages, many jobs, such as loading or unloading cargo, can be replaced by robots, which can ease the stress of labour shortages, at least in the short run.

To respond to the uncertainties in the future, new sources of vulnerability need to be recognised (Hamilton et al., 2020). Academic researchers need to collaborate with policymakers and other stakeholders and co-develop risk identification, mitigation, and recovery methods.

Table 2
The representative study of finding, approach application, and approach building.

Research areas	Specific findings	Theory or approach application	Theory or approach building
Natural disaster	The leading indicators of the disaster impacts are insecure food, job losses, and low milk productivity (Chari and Ngcamu, 2017).	Apply fault three analysis by identifying and quantifying the risks (Kumar and Havey, 2013)	Develop an optimisation way that separates the problem into sub-components, and has a solution to these sub-components, then combines to build complete solutions (Zheng and Ling, 2013).
	Drought makes short-term impacts on the beef supply chain face an increase in feed costs (Countryman et al., 2016)	Apply Ordinary Least Square regression analysis to investigate the impact that Zimbabwe's dairy industry has faced from the disaster (Chari and Ngcamu, 2017).	Develop a framework that can improve the disaster relief supply chain management and will be helpful in the operations of the relief supply chain (Madu and Kuei, 2014).
	Countries that are easier to have flood disaster needs to consider local risks as part of industrial development (Haraguchi and Lall, 2015)	Apply quantitative and qualitative methods to investigate in-country transportation risks in the Nepal earthquake (Baharmand et al., 2017).	Develop a non-linear bi-objective optimisation framework for using an effective supply chain network (Rezaei et al., 2020).
	The current condition of the supply chain implies that when one of the supply chain participants is disrupted, it will affect the whole supply chain (Abe, 2014).	Apply fuzzy ranking criteria to find the solutions to the problem (Zheng and Ling, 2013).	Develop a stochastic supply chain model for supply chains in disasters (Fahimnia et al., 2017)
	Provide new perspectives on long and short food chains by analysing the resilience during the flood in Queensland, Australia (Smith et al., 2016).	Apply a supply chain management hierarchy framework to analyse the problems from many perspectives (Matsuo, 2015).	Develop a mathematical model that can help logistics operations in response to natural disasters (Afshar and Haghani, 2012)
	Find a strong collaboration between the state government and long-chain in Australia, except civil society-based long chains (MacMahon et al., 2015).	Apply three different stage models of disaster resilience, readiness, response, and recovery to structure the research on the wine supply chain (Forbes and Wilson, 2018).	Build a framework by adopting BWM and TOPSIS to evaluate the food systems (Grida et al., 2020).
	Despite some positive examples of flexible use of food supply chain resilience, some challenges still exist (Smith and Lawrence, 2014).	Apply a system dynamics simulation to study a cheese supply chain during COVID-19 (Zhu and Krikke, 2020).	Develop a supply chain decision-making framework by adopting behavioural decision theory (Gunessee and Subramanian, 2020).
Human factor	The financial crisis has had a substantial impact on the supply chain industry. Consumers received the most significant loss in the supply chain (Xiao, 2010).	Apply integer programming to model and formulate a supply chain network (Nakamura et al., 2019).	Develop a framework for reducing supply chain risks from geographic disruptions (Roscoe et al., 2020).
	Despite some positive examples of flexible use of food supply chain resilience, some challenges still exist (Smith and Lawrence, 2014).	Apply dynamic capabilities to help sense the supply chain context (Hendry et al., 2019).	
	Brexit may disrupt the supply chain network because of the trading from non-partnership countries (Nakamura et al., 2019).	Apply strategic contingency theory by identifying tangible resources and intangible resources in companies (Roscoe et al., 2020)	
	The Fukushima nuclear disaster has changed the food safety regulation and customers' shopping behaviour (Bachev and Blvd, 2014).		Develop propositions for companies to mitigate risks when facing a financial crisis (Blome and Schoenherr, 2011)
	It is essential to have vertical and horizontal collaboration between supply chain participants to face the disruptions (Hendry et al., 2019).		
	The results show that there are more positive effects than adverse effects on the supply chain in the Great East Japan Earthquake (Todo et al., 2015)		Identify supply chain capabilities to mitigate disruptions (Jüttner and Maklan, 2011).
Pandemic	Indicate that local and regional food systems companies are flexible and connected to supply chain actors, making them react quickly with a targeted approach (Thilmany et al., 2021).	Apply a system dynamics model to show the possible impact of a pandemic on the USA's food system (Huff et al., 2015).	Develop a model of supply chain flexibility that shows how companies and stakeholders value keeping flexibility through the supply chain (Chenarides and Richards, 2021).
	The analysis pointed out that agricultural access has improved during the pandemic (S. Gray and R, 2020).	Apply a simulation-based methodology to observe and predict a pandemic's short-term and long-term effects on the supply chain (Ivanov and Dolgui, 2020a).	Develop a production recovery model by adopting a mathematical modeling approach for the essential item under COVID-19 (Paul and Chowdhury, 2021).
		Apply a novel dataset from a large online grocery to observe the effect on stockouts and price (Mahajan and Tomar, 2020).	Develop a simulation model of a public distribution network with three different circumstances to demonstrate the disturbances in the food supply chain (Singh et al., 2020).
			Develop a viable supply chain to investigate the relationship between resilience and viability (Ivanov and Dolgui, 2020b).

(*continued on next page*)

Table 2 (*continued*)

Research areas	Specific findings	Theory or approach application	Theory or approach building
		Apply a holistic approach to analyse the causes and impacts of the food systems during the COVID-19 pandemic (Giudice et al., 2020)	
		Apply the structural equation model to analyse how supply chain risk management reduces the impacts of COVID-19 disruptions (Ruel and El Baz, 2023)	
	The analysis indicated that food prices relied on the areas and the period where they were traded (dePaulo Farias and deAraújo, 2020).		
	Indicate that the disruptions caused by the COVID-19 pandemic are dynamic and complicated (Amjath-Babu et al., 2020).		
	The results show that the early stage of COVID-19 has no significant food loss waste (Aldaco et al., 2020).		
	Show that customers' shopping behaviour has changed to use more online shopping (Hobbs, 2020).		
	The pandemic resulted in a loss of purchasing power of customers on food security (Béné, 2020).		
	Provide a view of the results of the future food supply chain under the COVID-19 pandemic (Touil et al., 2019).		
	Provide a lens for facing disruptions in the supply chain in the future (Mollenkopf et al., 2021).		
	To reduce some risks caused by COVID-19, this study provides suggestions such as increasing safety stock (Zhu and Krikke, 2020).		
	Indicate that the disruptions caused by the COVID-19 pandemic are dynamic and complicated (Amjath-Babu et al., 2020).		

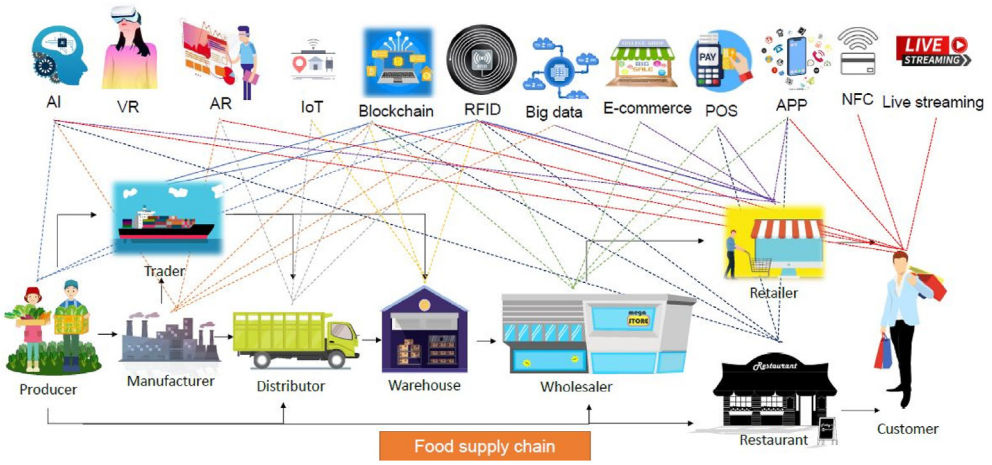

Fig. 8. Technologies adopted in food supply chain.

4.2. Theory

As mentioned above, only 0.5% of the reviewed studies used management and organisational theories to understand the phenomena of interest. Although the research topics are relatively practical, theory is still an essential element of the research, and theory advancement should still be part of the research objectives. Therefore, further study can use more relevant theories, such as organisational information processing theory, dynamic capabilities view, stakeholder theory, etc., or theories from other disciplines, to better illustrate the nature of supply chain resilience, and make novel contributions to these theories.

For instance, organisational information processing theory can serve as an excellent theoretical lens through which the role of resilience in reducing ambiguity can be understood (Galbraith, 1974). By using two different types of information processes, namely, to share more information between supply chain participants to reduce information biases and to decrease information sources for decision-making, companies and supply chains can take timely actions in times of disruptions through standardised information formats (Wang et al., 2013). To reach these aims, information technologies can be integrated with research on supply chain resilience, and this will be explained in more detail in the following section.

4.3. Technology

Food supply chain practitioners can adopt technologies to help them respond to supply chain disruptions. The current pandemic has also facilitated some uses of technology (Moriarty and Honnery, 2021). Fig. 8 illustrates the potential strategies to adopt in the food supply chain. Technology has changed in various food-related industries (Hearn et al., 2014). All food supply chain participants can use blockchain and radio-frequency identification (RFID) in the food tracking system. Food suppliers and customers were concerned about food security issues during the pandemic. This system can help ensure food safety by providing detailed information on how the food is manufactured and transported. Food producers can use artificial intelligence (AI) to predict growth volume and optimise harvesting and growth, which also helps reduce food waste (Van Klompenburg et al., 2020). For manufacturers, AI can help control packaging quality and expiry date to reduce food waste (Biscuit People, 2023). Big data analytics can help manufacturers enhance product design and production by making sales statistics. Augmented reality (AR) can be employed to prevent harmful training from involving employees in engaging it by simulating tests and statistics so that it can reduce labour costs (Forbes, 2023). One of the most severe effects of the pandemic on the food supply chain is labour shortages caused by the high infection rate of the disease and lockdown measures taken.

In such circumstances, using AR in food manufacturing can help reduce the need for people temporarily. For distributors, AR can help validate an item pick by verifying the image of the object stored in the database. IoT can help distributer and warehouse operators automatically reorder supplies when the inventory needs replenishment (Eames, 2023). Regarding wholesalers, point of sale (POS) can be used to predict the volume of products and applied in the cashier system to enhance the effectiveness of monitoring inventory levels. Wholesalers can also use e-commerce and applications (apps) to sell food products online. During the pandemic, customers tend to shift to online shopping, and e-commerce platforms and applications can help food companies or individual sellers meet the changing requirements of consumers on time. Retailers can use AI to reduce energy consumption and CO2 generation to keep food safe. Big data helps retailers understand and predict customer preferences, enhancing customer loyalty. For outlets such as restaurants, AI, such as robot waiters and waitresses, can help maintain social distancing during the pandemic, thus ensuring safety and consumer experience. Finally, AI and AR can help end customers use scans and services in supermarkets, preventing direct contact with supermarket employees and maintaining social distancing during the pandemic. Customers also use the APP to compare retailers' prices when shopping and use contactless payment to check out. In summary, modern information technologies can be used in any node of the food supply chain in all types of disruptions and help improve the resilience of the entire supply chain.

However, among the reviewed studies, only very few have investigated information technology's effect on food supply chain

resilience. Therefore, future research should focus on this trend and systematically study the role of information technologies in enhancing food supply chain resilience.

4.4. Sustainability

Surprisingly, sustainability is not a popular topic in the studies we reviewed. Thilmany et al. (2021) indicated that the local food supply chain is more flexible. Goodman et al. (2009) pointed out that the local food supply chain is more ecological and sustainable. However, they could have brought the connection to a better depth in the discussions. As suggested in the Triple-Bottom-Line (3BL) (Elkington, 1998), sustainability has three dimensions: economic, environmental, and social. For economic sustainability, local food supply chains, compared with their global counterparts, can reduce costs in transportation and communications.

Regarding the environment, local supply chains are more environmentally friendly due to short transportation distances and less food waste. From a social perspective, local food supply chains can nurture the prosperity of the local community by providing employment opportunities for local people. Adopting the local can thus prevent more people from hunger and ensure a more resilient food production system when disruptions happen, as well as achieve the SDGs. In addition, it can also enhance the company's image as a responsible business. Therefore, future researchers should consider sustainability in their studies, especially as a critical outcome of a resilient supply chain and a continuous development process that leads us to a better future.

5. Conclusion

Using a systematic literature review method, this study critically reviewed academic journal articles from 2010 to 2020 on food supply chain resilience in different disruption types. We classified the articles using topics, regions, data, and contributions, data collection ways and types of topics, and strategies, and found that the pandemic is the most frequently discussed topic of all three; global issues are the most popular areas to explore; no data articles and using existing approach articles are tremendous. Due to the outbreak of the COVID-19 pandemic at the end of 2019, more papers appeared discussing this issue, and the number of articles saw a significant increase in 2020. This study also summarised critical findings of each type of disruption, including natural disasters, human factors, and pandemics, and these findings provide future researchers with a reference on the status quo of the current literature and directions forward.

Second, future research directions are proposed based on our review. In sum, the directions are classified into five groups for three types of disruptions (natural disaster, human factor, and pandemic): theory, technology, and sustainability. In terms of natural disasters, this study suggests that future studies specifically explain how the food supply chain can be reconstructed and provide specific strategies to secure alternative suppliers. In human factor disruptions, we recommend that future research establish a standard operating procedure to prepare for risks and disruptions. In terms of the pandemic, future research can use technological ways to deal with disruptions. This study also suggests adopting theory in future research and further stresses the importance of theoretical contributions. In terms of technology, we briefly discuss the types of technologies that can be used in the food supply chain to enhance resilience in different circumstances and point out where they can be used and how, which contributes to digital economy by adopting digital technologies to improve food supply chain resilience and food supply chain can soon be recovered from the disruptions. In terms of sustainability, this study recommends that future research integrate it as both a process of achieving a better future for all and as an outcome of a resilient food supply chain.

Despite the contributions our study makes, it has limitations. The critical limitation of this study is that we reviewed papers on the food supply chain and were exposed to different types of disruptions based on our research objectives. More articles on supply chain resilience that should have been included may provide more insights. We also limited our review to the food supply chain and the time span of 2010–2020. In addition, our study only included certain types of disruptions. Future literature review studies on similar topics should consist of more recent journal publications as well as more types of disruptions to generate more comprehensive findings.

CRediT authorship contribution statement

I-Hsuan Su: Methodology, Formal analysis, Data curation, Conceptualization. **Lin Wu:** Supervision. **Kim Hua Tan:** Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Abe, S., 2014. Impact of the Great Thai floods on the international supply chain. Asian Pac. Econ. Lit. 55 (3), 147–155 [online]. https://search.informit.org/doi/10.3316/informit.554974232560094.

Afshar, A., Haghani, A., 2012. Modeling integrated supply chain logistics in Real-time Large-Scale disaster Relief operations. Soc. Econ. Plann. Sci. 46 (4), 327–338. https://doi.org/10.1016/j.seps.2011.12.003 [online].

Aldaco, R., Hoehn, D., Laso, J., Margallo, M., Ruiz-Salmón, J., Cristobal, J., Kahhat, R., Villanueva-Rey, P., Bala, A., Batlle-Bayer, L., Fullana-i-Palmer, P., Irabien, A., Vazquez-Rowe, I., 2020. Food waste management during the COVID-19 outbreak: a Holistic climate, economic and Nutritional approach. Sci. Total Environ. 742, 140524. https://doi.org/10.1016/j.scitotenv.2020.140524 [online].

Alikhani, R., Torabi, S.A., Altay, N., 2021. Retail supply chain network design with concurrent resilience capabilities. Int. J. Prod. Economics 234 (2021), 108042. https://doi.org/10.1016/j.ijpe.2021.108042 [online].
Amjath-Babu, T.S., Krupnik, T.J., Thilsted, S.H., McDonald, A.J., 2020. Key indicators for monitoring food system disruptions caused by the COVID-19 pandemic: insights from Bangladesh towards effective response. Food Secur. 12 (4), 761–768.
Bachev, H., Blvd, T., 2014. Implications of fukushima nuclear disaster for Japanese agri-food chains. Int. J. Food Agric. Econ. 2 (1), 95–120.
Baharmand, H., Comes, T., Lauras, M., 2017. Managing in-country transportation risks in humanitarian supply chains by logistics service providers: insights from the 2015 Nepal earthquake. Int. J. Disaster Risk Reduc. 24 (March), 549–559. https://doi.org/10.1016/j.ijdrr.2017.07.007 [online].
Béné, C., 2020. Resilience of local food systems and links to food security – a review of some important concepts in the context of COVID-19 and other shocks. Food Secur. 12 (4), 805–822.
Biscuit people, 2023. The packaging industry's secret: how AI packaging quality control are cleaning up the mess. https://www.biscuitpeople.com/magazine/post/the-packaging-industrys-secret-how-AI-packaging-quality-control-are-cleaning-up-the-mess. (Accessed 18 December 2023).
Blome, C., Schoenherr, T., 2011. Supply chain risk management in financial crises - a multiple case-study approach. Int. J. Prod. Economics 134 (1), 43–57.
Bonatti, M., Schlindwein, I., Lana, M., Bundala, N., Sieber, S., Rybak, C., 2018. Innovative educational tools development for food security: engaging community voices in Tanzania. Futures 96 (November 2017), 79–89. https://doi.org/10.1016/j.futures.2017.11.008 [online].
Cernev, T., Fenner, R., 2020. The importance of achieving foundational sustainable development goals in reducing global risk. Futures, 102492. https://doi.org/10.1016/j.futures.2019.102492 [online] 115 (November 2019.
Chari, F., Ngcamu, B.S., 2017. An assessment of the impact of disaster risks on dairy supply chain performance in Zimbabwe. Cogent Engineering 4 (1), 1–15. https://doi.org/10.1080/23311916.2017.1409389 [online].
Chenarides, J., Richards, T., 2021. Covid-19 and food supply chain. Appl. Econ. Perspect. Pol. 43 (1), 270–279.
Chopra, S., Sodhi, M.M.S., 2004. Managing risk to avoid: supply-chain breakdown. MIT Sloan Manag. Rev. 46 (1), 53–61.
Christopher, M., Peck, H., 2004. Building the resilient supply chain. Int. J. Logist. Manag. 15 (2), 1–13.
Countryman, A.M., Paarlberg, P.L., Lee, J.G., 2016. Dynamic effects of drought on the U.S. Beef supply chain. Agricultural and resour. Economics Rev. 45 (3), 459–484.
dePaulo Farias, D., deAraújo, F.F., 2020. Will COVID-19 affect food supply in distribution centers of Brazilian regions affected by the pandemic? Trends Food Sci. Technol. 103, 361–366. https://doi.org/10.1016/j.tifs.2020.05.023 [online].
Eames, S., 2023. IoT lets machines order their own parts. https://www.digitalcommerce360.com/2020/01/20/iot-lets-machines-order-their-own-parts/. (Accessed 18 December 2023).
Elkington, J., 1998. Cannibals with forks: the triple-bottom-line of the 21st century. Stoney Creek. New Society Publishers.
Fahimnia, B., Jabbarzadeh, A., Ghavamifar, A., Bell, M., 2017. Supply chain design for efficient and effective blood supply in disasters. Int. J. Prod. Economics 183, 700–709. https://doi.org/10.1016/j.ijpe.2015.11.007 [online].
Fanzo, J., Bellows, A.L., Spiker, M.L., Thorne-Lyman, A.L., Bloem, M.W., 2021. The importance of food systems and the environment for nutrition. Am. J. Clin. Nutr. 113 (1), 7–16.
Fenner, R., Cernev, T., 2021. The implications of the covid-19 pandemic for delivering the sustainable development goals. Futures, 102726. https://doi.org/10.1016/j.futures.2021.102726 [online] 128 (July 2020.
Forbes, 2023. The benefits of augmented reality for employee training. https://www.forbes.com/sites/forbesbusinesscouncil/2021/02/12/the-benefits-of-augmented-reality-for-employee-training/?sh=41763ac366d6. (Accessed 18 December 2023).
Forbes, S.L., Wilson, M.M.J., 2018. Resilience and response of wine supply chains to disaster: the christchurch earthquake sequence. Int. Rev. Retail Distrib. Consum. Res. 28 (5), 472–489. https://doi.org/10.1080/09593969.2018.1500931 [online].
Galbraith, J.R., 1974. Organization design: an information processing view. Interfaces 4 (3), 28–36.
Giudice, F., Caferra, R., Morone, P., 2020. COVID-19, the food system and the circular economy: challenges and opportunities. Sustainability 12 (19), 1–15.
Goodman, D., Cruz, S., Goodman, M.K., Food, A., New, N., 2009. Alternative Food Newtworks. Elsevier Inc.
Gray, S., R, 2020. Agriculture, transportation, and the COVID-19 crisis. Canadian J. Agric. Econ. 68, 239–243.
Grida, M., Mohamed, R., Zaied, A.N.H., 2020. Evaluate the impact of COVID-19 prevention policies on supply chain aspects under uncertainty. Transp. Res. Interdiscip. Perspect. 8, 100240. https://doi.org/10.1016/j.trip.2020.100240 [online].
Gunessee, S., Subramanian, N., 2020. Ambiguity and its coping mechanisms in supply chains lessons from the covid-19 pandemic and natural disasters. Int. J. Operations and Prod. Management 40 (7/8), 1201–1223.
Hale, T., Moberg, C.R., 2005. Improving supply chain disaster preparedness: a decision process for secure site location. Int. J. Phys. Distrib. Logist. Manag. 35 (3), 195–207.
Hamilton, H., Henry, R., Rounsevell, M., Moran, D., Cossar, F., Allen, K., Boden, L., Alexander, P., 2020. Exploring global food system shocks, scenarios and outcomes. Futures, 102601. https://doi.org/10.1016/j.futures.2020.102601 [online] 123 (June 2019.
Haraguchi, M., Lall, U., 2015. Flood risks and impacts: a case study of Thailand's floods in 2011 and research questions for supply chain decision making. Int. J. Disaster Risk Reduc. 14 (January 2012), 256–272. https://doi.org/10.1016/j.ijdrr.2014.09.005 [online].
Hasani, A., Khosrojerdi, A., 2016. Robust global supply chain network design under disruption and uncertainty considering resilience strategies: a parallel memetic algorithm for a real-life case study. Transportation res. Part E: Logist. Transport Rev. 87, 20–52. https://doi.org/10.1016/j.tre.2015.12.009 [online].
Hearn, G., Collie, N., Lyle, P., Choi, J.H.J., Foth, M., 2014. Using communicative ecology theory to scope the emerging role of social media in the evolution of urban food systems. Futures 62, 202–212. https://doi.org/10.1016/j.futures.2014.04.010 [online].
Hendry, L.C., Stevenson, M., MacBryde, J., Ball, P., Sayed, M., Liu, L., 2019. Local food supply chain resilience to constitutional change: the Brexit effect. Int. J. Operations and Prod. Management 39 (3), 429–453.
Hobbs, J.E., 2020. Food supply chains during the COVID-19 pandemic. Canadian J. Agric. Econ. 68 (2), 171–176.
Hobbs, J.E., 2021. Food supply chain resilience and the COVID-19 pandemic: what have we learned? Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie 69 (2), 189–196.
Huff, A.G., Beyeler, W.E., Kelley, N.S., McNitt, J.A., 2015. How resilient is the United States' food system to pandemics? J. Environmental Studies and Sciences 5 (3), 337–347.
Ivanov, D., Dolgui, A., 2020a. OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: managerial insights and research implications. Int. J. Prod. Economics [online] (August), 107921. https://doi.org/10.1016/j.ijpe.2020.107921.
Ivanov, D., Dolgui, A., 2020b. Viability of intertwined supply networks: extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. Int. J. Prod. Res. 58 (10), 2904–2915.
Jüttner, U., Maklan, S., 2011. Supply chain resilience in the global financial crisis: an empirical study. Supply Chain Manag. 16 (4), 246–259.
Krishnan, R., Agarwal, R., Bajada, C., Arshinder, K., 2020. Redesigning a food supply chain for environmental sustainability–An analysis of resource use and recovery. J. Clean. Prod. 242, 118374.
Kumar, S., Havey, T., 2013. Before and after disaster strikes: a relief supply chain decision support framework. Int. J. Prod. Economics 145 (2), 613–629. https://doi.org/10.1016/j.ijpe.2013.05.016 [online].
Lancet, 2020. Will the COVID-19 pandemic threaten the SDGs? [online]. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7462553/. (Accessed 28 October 2021).
Lordslibrary, 2021. Food waste in the UK [online]. https://lordslibrary.parliament.uk/food-waste-in-the-uk/[24October2021.
MacMahon, A., Smith, K., Lawrence, G., 2015. Connecting resilience, food security and climate change: lessons from flooding in queensland, Australia. J. Environmental Studies and Sciences 5 (3), 378–391.
Madu, C.N., Kuei, C.H., 2014. Disaster relief supply chain quality management (DRSCQM). Int. J. Qual. Reliab. Manag. 31 (9), 1052–1067.
Mahajan, K., Tomar, S., 2020. COVID-19 and supply chain disruption: evidence from food markets in India†. American J. Agric. Econ. 103 (1), 1–18.
Manzini, R., Accorsi, R., 2013. The new conceptual framework for food supply chain assessment. J. food engineering 115 (2), 251–263.

Marucheck, A., Greis, N., Mena, C., Cai, L., 2011. Product safety and security in the global supply chain: issues, challenges and research opportunities. J. operations management 29 (7–8), 707–720.
Matsuo, H., 2015. Implications of the tohoku earthquake for toyota's coordination mechanism: supply chain disruption of automotive semiconductors. Int. J. Prod. Economics. 161, 217–227.
Min, H., 2019. Blockchain technology for enhancing supply chain resilience. Bus. Horiz. 62 (1), 35–45. https://doi.org/10.1016/j.bushor.2018.08.012 [online].
Mollenkopf, D.A., Ozanne, L.K., Stolze, H.J., 2021. A transformative supply chain response to COVID-19. J. Serv. Manag. 32 (2), 190–202.
Moriarty, P., Honnery, D., 2021. The risk of catastrophic climate change: future energy implications. Futures 128 (March).
Mu, W., van Asselt, E.D., Van der Fels-Klerx, H.J., 2021. Towards a resilient food supply chain in the context of food safety. Food Control 125, 107953.
Nakamura, K., Yamada, T., Tan, K.H., 2019. The impact of Brexit on designing a material-based global supply chain network for asian manufacturers. Management of environmental quality: an. Int. J. 30 (5), 980–1000.
Paul, S.K., Chowdhury, P., 2021. A production recovery plan in manufacturing supply chains for a high-demand item during COVID-19. Int. J. Phys. Distrib. Logist. Manag. 51 (2), 104–125.
Peck, H., 2005. Drivers of supply chain vulnerability: an integrated framework. Int. J. Phys. Distrib. Logist. Manag. 35 (4), 210–232.
Ponomarov, S.Y., Holcomb, M.C., 2009. Understanding the concept of supply chain resilience. The international j. logistics management 20 (1), 124–143.
Rezaei, M., Afsahi, M., Shafiee, M., Patriksson, M., 2020. A Bi-objective optimization framework for designing an efficient fuel supply chain network in post-earthquakes. Comput. Ind. Eng. 147 (October 2019), 106654. https://doi.org/10.1016/j.cie.2020.106654 [online].
Riddell, G.A., vanDelden, H., Dandy, G.C., Zecchin, A.C., Maier, H.R., 2018. Enhancing the policy relevance of exploratory scenarios: generic approach and application to disaster risk reduction. Futures 99 (November 2017), 1–15. https://doi.org/10.1016/j.futures.2018.03.006 [online].
Roscoe, S., Skipworth, H., Aktas, E., Habib, F., 2020. Managing supply chain uncertainty arising from geopolitical disruptions: evidence from the pharmaceutical industry and Brexit. Int. J. Operations and Prod. Management 40 (9), 1499–1529.
Ruel, S., El Baz, J., 2023. Disaster readiness' influence on the impact of supply chain resilience and robustness on firms' financial performance: a COVID-19 empirical investigation. Int. J. Production Res 61 (8), 2594–2612.
Sandell, M., Mikkelsen, B.E., Lyytikäinen, A., Ojansivu, P., Hoppu, U., Hillgrén, A., andLagström, H., 2016. Future for food education of children. Futures 83, 15–23. https://doi.org/10.1016/j.futures.2016.04.006 [online].
Scholten, K., Scott, P.S., Fynes, B., 2014. Mitigation processes - antecedents for building supply chain resilience. Supply Chain Manag. 19 (2), 211–228.
Singh, S., Kumar, R., Panchal, R., Tiwari, M.K., 2020. Impact of COVID-19 on logistics systems and disruptions in food supply chain [online] Int. J. Prod. Res. 59 (7), 1–16. https://doi.org/10.1080/00207543.2020.1792000.
Smith, K., Lawrence, G., 2014. Flooding and food security: a case study of community resilience in rockhampton. Rural Soc. 23 (3), 216–228.
Smith, K., Lawrence, G., MacMahon, A., Muller, J., Brady, M., 2016. The resilience of long and short food chains: a case study of flooding in queensland, Australia. Agric. Hum. Val. 33 (1), 45–60. https://doi.org/10.1007/s10460-015-9603-1 [online].
Tendall, D.M., Joerin, J., Kopainsky, B., Edwards, P., Shreck, A., Le, Q.B., Krütli, P., Grant, M., Six, J., 2015. Food system resilience: defining the concept. Global Food Secur. 6, 17–23.
Thilmany, D., Canales, E., Low, S.A., Boys, K., 2021. Local food supply chain dynamics and resilience during COVID -19. Appl. Econ. Perspect. Pol. 43 (1), 86–104.
Todo, Y., Nakajima, K., Matous, P., 2015. How do supply chain networks affect the resilience of firms to natural disasters? Evidence from the great east Japan earthquake. J. Reg. Sci. 55 (2), 209–229.
Touil, A., Echchatbi, A., Charkaoui, A., 2019. Managing food supply chains post COVID-19: a perspective. Int. J. Supply Oper. Manag. 6 (1), 30–50.
Van Klompenburg, T., Kassahun, A., Catal, C., 2020. Crop yield prediction using machine learning: a systematic literature review. Comput. Electron. Agric. 177, 105709.
Vogliano, C., Murray, L., Coad, J., Wham, C., Maelaua, J., Kafa, R., Burlingame, B., 2021. Progress towards SDG 2: Zero hunger in melanesia – a state of data scoping review [online] 29 (October 2020 Global Food Secur., 100519. https://doi.org/10.1016/j.gfs.2021.100519.
Wang, E.T., Tai, J.C., Grover, V., 2013. Examining the relational benefits of improved interfirm information processing capability in buyer-supplier dyads. MIS Q. 149–173.
WCED, 1987. Our Common Future. Oxford University Press, Oxford.
WHO, 2018. Global hunger continues to rise, new UN report says [online]. https://www.who.int/news/item/11-09-2018-global-hunger-continues-to-rise—new-un-report-says [24October2021].
Xiao, S., 2010. Welfare change of China's cotton supply chain under the shock of financial crisis. China Agric. Econ. Rev. 2 (1), 94–106.
Zheng, Y.J., Ling, H.F., 2013. Emergency transportation planning in disaster relief supply chain management: a cooperative fuzzy optimization approach. Soft Comput. 17 (7), 1301–1314.
Zhu, Q., Krikke, H., 2020. Managing a sustainable and resilient perishable food supply chain (PFSC) after an outbreak. Sustainability 12 (12), 1–11.