

Sustainability in Fresh Produce Supply Chain Management: A Comprehensive Review

Xianglan Jiang^{1,2,*}, Wenjing Shen³, Yuanchun Yu¹

¹ Management School, Sichuan University of Science & Engineering, Zigong 643000, China

² Decision Sciences Department, LeBow College of Business, Drexel University, Philadelphia, PA 19104, USA; School of Management and Economics, University of Electronic Science and Technology of China, Chengdu 611731, China

³ Decision Sciences Department, LeBow College of Business, Drexel University, Philadelphia, PA 19104, USA

*Corresponding Author

Keywords: Sustainability, Fresh produce, supply chain, literature review

Abstract: This paper presents a thorough evaluation of the current status of fresh produce supply chain management with a focus on sustainability. With the growing demand for fresh produce, there is a pressing need to incorporate sustainable practices throughout the supply chain to mitigate adverse effects on the environment and society while maintaining economic viability. The study systematically reviews 21 published papers between 2007 and 2022 that explore sustainable practices in the fresh produce supply chain. The publications are analyzed by annual publications, journal of publications, country or region of publications, methods of publications, and so on. The past four years have witnessed a remarkable surge in the number of related publications, with modeling emerging as the most prevalent method used, accounting for 71.43% of the studies. This literature review stands out as the first comprehensive analysis of sustainable fresh produce supply chain research during this period, offering valuable insights for future investigations in this field.

1. Introduction

The fresh produce sector presents abundant employment prospects and serves as a crucial income source for farmers. Additionally, fresh produce holds substantial importance in the global economy and serves as a major supplier for numerous food processing industries. As of late, there has been a marked rise in both academic and corporate attention towards sustainable supply chains within the industry [1]. Enterprises around the world are striving to achieve a balance between economic, environmental, and societal considerations [2]. Meeting the sustenance needs of an anticipated the world's population reaching 10 billion by 2050 poses a significant challenge for humanity [3], particularly concerning the fresh produce supply chain.

In recent times, there has been a mounting apprehension over the environmental, social, and economic impacts of the worldwide food system, with the fresh produce supply chain being no exclusion [4]. As the demand for fresh produce continues to surge, it has become imperative to introduce sustainable practices throughout the supply chain to mitigate adverse effects on the

environment and society while ensuring economic feasibility for producers and other stakeholders [5].

This review aims to provide an overview of current practices and trends in fresh produce supply chain management towards sustainability. It will explore the challenges and opportunities associated with implementing sustainable practices, and highlight examples of successful initiatives and strategies that have been employed in different regions around the world. By scrutinizing the present condition of fresh produce supply chain management and recognizing the domains that require enhancement, this review seeks to contribute to ongoing efforts to create a more sustainable food system.

This paper is organized as follows. Section 2 delineates the methodology employed in this research. Section 3 elucidates the findings and discussion. Section 4 presents the manage implications. Lastly, Section 5 furnishes the research's conclusions.

2. Methodology

We use NoteExpress to analyse the papers. The data used in the paper is from Web of Science data bases (WoS). We use the keyword of the title “fresh produce sustainable supply chain”, “sustainable fresh agri-product supply chain”, “sustainable fresh agriculture product supply chain”, “sustainable perishable food supply chain”, “sustainable fruit supply chain”, “sustainable perishable food supply chain” and “sustainable vegetable supply chain” to search the publications in the core database of WoS. Through removing duplication of articles and filtering unsuitable publications, at last it has 14 records. The retrieval time of this research is October 3, 2022.

3. Results and Discussion

Table 1: Literature on fresh produce sustainable supply chain

Authors	Country or Region	Method	Specific fields
Abbasian et al. [4]	Multiple (Iran, USA)	Model	Diary supply chains
Cassani&Gomez-Zavaglia [5]	Argentina	Survey	Fruits and vegetables
Tort et al. [6]	Turkey	Review	Fruits and vegetables
Do and Huang [7]	Multiple (Taiwan), Vietnam)	model	Fresh fruit
Lima et al. [8]	Brasil	model	Fruit and vegetable
López-Gálvez et al. [9]	Spain	Theory	Fresh produce
Jouzani& Govindan [10]	Multiple (Iran, China, Denmark)	Model	Diary supply chain
Rossi et al. [11]	Italy	Model	Perishable food
Kumar et al. [12]	UK	model	Perishable food
Yakavenka et al. [13]	Multiple (Greece, USA)	Model	Perishable food
Zhu & Krikke [14]	The Netherlands	Model	Perishable food
Jabarzadeh et al. [15]	Iran, UK	Model	Fruit
Cao& Mohiuddin [16]	Multiple (China, Canada)	Model	Fresh vegetable
Gokarn&Kuthambalayan [17]	India	Model	Fresh produce
Parajuli et al. [18]	USA	Review	fruit and vegetable

Siddh et al. [19]	India	Model	Perishable food
Musavi & Bozorgi-Amir [20]	Iran	Model	Perishable food
Govindan et al. [21]	Multiple (Denmark, Iran)	Model	Perishable food
Hu et al. [22]	Taiwan	Model	Vegetable
Veerapa & Chien [23]	Multiple (Australia, Vietnam)	Case study	Vegetable
Sim et al. [24]	UK	Case study	Perishable food

Table 1 showcases all the scholarly articles in the domain of sustainable fresh produce supply chain. The table categorizes the publications based on the authors, country or region, research methodology, and specific areas of study.

3.1. Annual Publications

Fig. 1 displays the yearly frequency of publications about sustainable fresh produce supply chain. It is clear that research in this area is growing steadily over time. Additionally, there has been a notable surge in the quantity of papers since 2019. This can be attributed to an amplified awareness and apprehension regarding sustainability in the fresh produce supply chain.

The upward trend of publications over the last four years suggests a growing interest in this field among both academic and corporate sectors. Notwithstanding this expansion, research concerning sustainable fresh produce supply chain is still constrained. Nevertheless, with the burgeoning global population, it is plausible that this matter will garner further attention in the future.

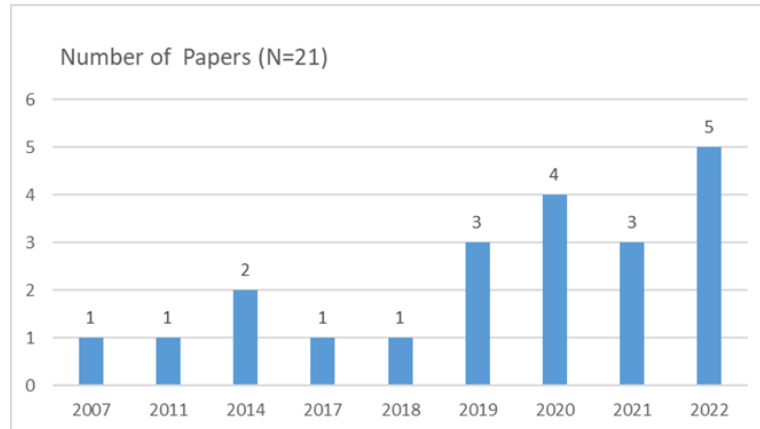


Fig. 1: Annual distribution of publications

3.2. Journal Publications

Table 2 presents the frequency of research publications in different journals. Out of the 21 articles studied, all of them addressed issues related to the sustainable fresh produce supply chain. As seen in the figure, Sustainability had the highest number of publications with 3 articles, accounting for 14.29%. The International Journal of Production Economics and Journal of Cleaner Production ranked second with two papers each, accounting for 9.52% of the total publications. And the remaining journals published only one article each, which accounts for 4.76% respectively. This indicates that the distribution of research in sustainable fresh produce supply chain is relatively fragmented and lacks a systematic approach. This also suggests that this issue is not a top priority for these journals. Overall, this information highlights the need for more focused research in this area.

Table 2: year of publications

Journal	Number of papers
Sustainability	3
International journal of production economics	2
Journal of Cleaner Production	2
Computers & Industrial Engineering	1
Business Strategy and the Environment	1
Foods	1
Science of the Total Environment	1
International Journal of Logistics Research and Applications	1
Environmental Science and Pollution Research	1
Benchmarking: An International Journal	1
The International Journal of Life Cycle Assessment	1
Annals of Operations Research	1
Frontiers in Nutrition	1
AIMS Environmental Science	1
<i>Horticultura Brasileira</i>	1
<i>Management of Environmental Quality: An International Journal</i>	1
<i>1 International Symposium on Sustainable Vegetable Production in Southeast Asia</i>	1

3.3. Research Methods of Publications

Table 1 lists the five research methodologies used in the papers: (1) modeling papers, (2) surveys, (3) theoretical papers, (4) literature reviews, and (5) case studies. In this study, publications that utilized case studies to support modeling are classified as modeling papers. Fig. 2 and Fig. 3 depict the distribution of publications according to their research methods. As depicted in the figures, modeling is the most widely used methodology with 15 papers, accounting for 71.43%. Case studies and literature reviews with 2 papers respectively, accounting for 9.52% of the total publications. The remaining methodologies had one paper respectively, accounting for 4.76%. These results highlight the dominance of modeling as a research method in sustainable fresh produce supply chain.

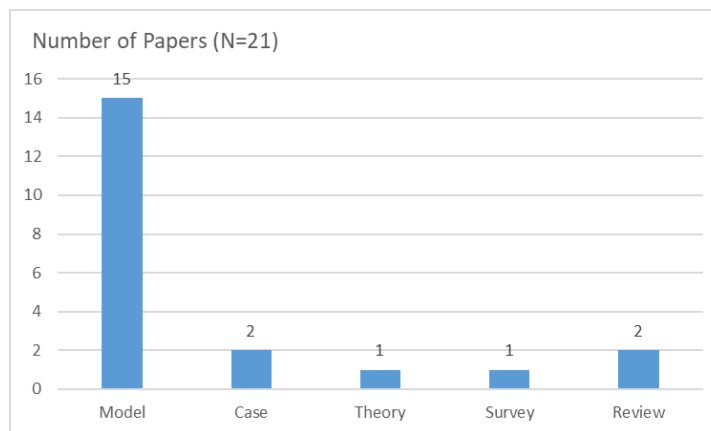


Fig. 2: Research methods

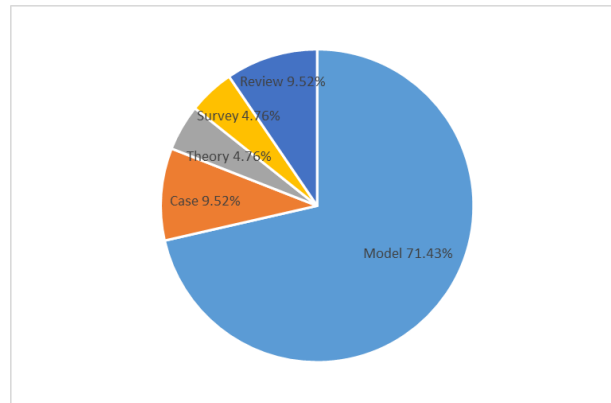


Fig.3: Structure of research methods of papers

3.4. Country or Region of Publications

Table 1 indicates that research publications on the sustainable fresh produce supply chain come from both developed and developing countries or regions. Iran, the United States and UK are the top three countries with 5, 3 and 3 papers respectively. However, the distribution of research across countries or regions is scattered, as even the country with the most contributions (Iran) only accounts for 23.81% of the total publications.

3.5. Specific Field

Table 1 also shows that the bulk of the papers focus on the general fresh produce supply chain, while 11 papers delve into specific areas, with 2 focused on the dairy supply chain and 9 on the fruit and vegetable supply chain.

4. Implications

Assessing the sustainable fresh produce supply chain is crucial in evaluating the advancement towards accomplishing sustainability objectives, identify areas of improvement, and inform future strategies. Sustainable fresh produce supply chains have gained significant attention in recent years due to growing concerns around environmental sustainability, food safety, and economic viability [7]. As a result, there has been a significant increase in research publications related to this topic over the past decade.

Many journals have published numerous articles on sustainable fresh produce supply chains [6,18]. These publications have covered a range of topics related to sustainable supply chain management, including sustainable sourcing, transportation, packaging, and distribution.

Research methods employed in these publications have varied, with some using quantitative methods such as statistical analysis and modeling, while others have employed qualitative methods such as case studies and interviews. Many studies have also utilized a combination of both methods to provide a more comprehensive analysis.

The publications reviewed in this study originate from various countries and regions, including Asia, North America, Europe, and so on [10,13]. This indicates that the issue of sustainable fresh produce supply chain is a global concern that requires collaborative efforts from various stakeholders in the supply network to promote sustainable practices.

The specific fields covered by the publications reviewed include agriculture, environmental studies, and business [16]. This interdisciplinary approach is essential to address the complex challenges

associated with sustainable fresh produce supply chain, such as climate change, labor rights, and food waste.

The review of sustainable fresh produce supply chain is a complex and multifaceted topic that requires collaboration across different disciplines and sectors [6]. The publications on this topic provide valuable insights into the challenges and opportunities for creating more sustainable and equitable food systems, and can inform policy and practice at the local, national, and global levels.

5. Conclusion

This paper furnishes a literature review on the sustainable fresh produce supply chain to illuminate current trends and potential avenues for future research in this sphere. The results show that over 71.43% of research publications have been produced in the past four years. This increase in research activity can be attributed to the growing concern for economic, environmental, and social responsibility in fresh produce supply chain.

This review accentuates the pivotal role of sustainable practices in fresh produce supply chain. The annual publications and journal articles reviewed demonstrate a growing interest in sustainable supply chain management across various regions and fields. The research methods used in these publications include quantitative and qualitative approaches, as well as case studies, surveys, and literature reviews.

The findings of this review suggest that practices of sustainable supply chain management can improve economic efficiency, environmental protection, and social responsibility of the fresh produce industry. Sustainable fresh produce supply chain is a burgeoning area that presents ample opportunities for the application of established methodologies to new challenges. This paper provides valuable insights into the current state and future prospects of research in this field. However, more research is needed to address challenges such as food waste, climate change, and labor rights in the supply chain. It is crucial for stakeholders of fresh produce industry to collaborate and adopt innovative solutions to achieve a more sustainable and equitable food system.

Acknowledgement

The authors are grateful to the editors and anonymous reviewers for their insightful comments which have lead to an improved version of this paper. This work was supported by the Sichuan Science and Technology Department Project (Nos.2022JDR0257 and 2021JDR0346), the Humanities and Social Sciences of Ministry of Education of China (No.19YJC630222), the System Science and Enterprise Development Research Center Project (Nos. Xq21B07 and Xq21B09), the Social Science Planning Project of Sichuan Province (No.SC21EZD032), and the Project of South Sichuan Development Research Institute (No. CYQCNY20212).

References

- [1] 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.*
- [2] O'Rourke, D. (2014) *The science of sustainable supply chains. Science, 344 (6188), 1124-1127.*
- [3] Fabregas, R., Kremer, M., & Schilbach, F. (2019). *Realizing the potential of digital development: The case of agricultural advice. Science, 366 (6471).*
- [4] Abbasian, M., Sazvar, Z., & Mohammadisiahroudi, M. (2022) *A hybrid optimization method to design a sustainable resilient supply chain in a perishable food industry. Environmental Science and Pollution Research, 1-24.*
- [5] Cassani, L., & Gomez-Zavaglia, A. (2022) *Sustainable Food Systems in Fruits and Vegetables Food Supply Chains. Frontiers in Nutrition, 9, 1-15.*
- [6] Tort, Ö. Ö., Vayvay, Ö., & Çobanoğlu, E. (2022) *A systematic review of sustainable fresh fruit and vegetable supply chains. Sustainability, 14 (3), 1573.*

- [7] Do, M. H., & Huang, Y. F. (2022) Evaluation of parameters for the sustainable supply chain management: A Taiwanese fresh-fruit sector. *AIMS Environmental Science*, 9, 16-32.
- [8] Lima, D. M., Marsola, K. B., de Oliveira, A. L., & Belik, W. (2022) Strategies for reducing the waste of fruit and vegetable supply chains: the search for sustainable wholesale systems. *Horticultura Brasileira*, 40, 334-341.
- [9] López-Gálvez, F., Gómez, P. A., Artés, F., Artés-Hernández, F., & Aguayo, E. (2021) Interactions between Microbial Food Safety and Environmental Sustainability in the Fresh Produce Supply Chain. *Foods*, 10 (7), 1655.
- [10] Jouzdani, J., & Govindan, K. (2021) On the sustainable perishable food supply chain network design: A dairy products case to achieve sustainable development goals. *Journal of Cleaner Production*, 278, 123060.
- [11] Rossi, T., Pozzi, R., Pirovano, G., Cigolini, R., & Pero, M. (2021) A new logistics model for increasing economic sustainability of perishable food supply chains through intermodal transportation. *International Journal of Logistics Research and Applications*, 24 (4), 346-363.
- [12] Kumar, A., Mangla, S. K., Kumar, P., & Karamperidis, S. (2020) Challenges in perishable food supply chains for sustainability management: A developing economy perspective. *Business Strategy and the Environment*, 29 (5), 1809-1831.
- [13] Yakavenka, V., Mallidis, I., Vlachos, D., Iakovou, E., & Eleni, Z. (2020) Development of a multi-objective model for the design of sustainable supply chains: The case of perishable food products. *Annals of Operations Research*, 294 (1), 593-621.
- [14] Zhu, Q., & Krikke, H. (2020) Managing a sustainable and resilient perishable food supply chain (PFSC) after an outbreak. *Sustainability*, 12 (12), 5004.
- [15] Jabarzadeh, Y., Reyhani Yamchi, H., Kumar, V., & Ghaffarinasab, N. (2020) A multi-objective mixed-integer linear model for sustainable fruit closed-loop supply chain network. *Management of Environmental Quality: An International Journal*, 31 (5), 1351-1373.
- [16] Cao, Y., & Mohiuddin, M. (2019) Sustainable emerging country agro-food supply chains: Fresh vegetable price formation mechanisms in rural China. *Sustainability*, 11 (10), 2814.
- [17] Gokarn, S., & Kuthambalayan, T. S. (2019) Creating sustainable fresh produce supply chains by managing uncertainties. *Journal of Cleaner Production*, 207, 908-919.
- [18] Parajuli, R., Thoma, G., & Matlock, M. D. (2019) Environmental sustainability of fruit and vegetable production supply chains in the face of climate change: A review. *Science of the Total Environment*, 650, 2863-2879.
- [19] Siddh, M. M., Soni, G., Jain, R., & Sharma, M. K. (2018) Structural model of perishable food supply chain quality (PFSCQ) to improve sustainable organizational performance. *Benchmarking: An International Journal*, 25 (7), 2272-2317.
- [20] Musavi, M., & Bozorgi-Amiri, A. (2017) A multi-objective sustainable hub location-scheduling problem for perishable food supply chain. *Computers & Industrial Engineering*, 113, 766-778.
- [21] Govindan, K., Jafarian, A., Khodaverdi, R., & Devika, K. (2014) Two-echelon multiple-vehicle location-routing problem with time windows for optimization of sustainable supply chain network of perishable food. *International journal of production economics*, 152, 9-28.
- [22] Hu, M. C., Chen, Y. H., & Huang, L. C. (2014) A sustainable vegetable supply chain using plant factories in Taiwanese markets: A Nash-Cournot model. *International Journal of Production Economics*, 152, 49-56.
- [23] Veerapa, N. K., & Chien, T. M. (2011) Sustainable agricultural practices in Vietnam: a supply chain perspective of organic vegetable production in Hanoi. 1 International Symposium on Sustainable Vegetable Production in Southeast Asia, 958, 35-42.
- [24] Sim, S., Barry, M., Clift, R., & Cowell, S. J. (2007) The relative importance of transport in determining an appropriate sustainability strategy for food sourcing. *The International Journal of Life Cycle Assessment*, 12(6), 422-431.