GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466

www.aarf.asia,Email : editoraarf@gmail.com

A detailed review on supply chain management of vegetables in India

Ajinkya A. Bhujbal

Ph. D Scholer

Lovely Professional University, Jalandhar Punjab - 144001

Dr. Nitin Goyal

Assistant professor

Lovely Professional University, Jalandhar Punjab - 144001

Abstract:

This research paper conducts an in-depth review of the supply chain management practices in the fruits and vegetables sector in India, addressing the challenges and opportunities inherent in the complex network of production, distribution, and retailing. The study critically examines existing literature, identifying key issues such as post-harvest losses, inadequate infrastructure, and the need for technological integration. It delves into the importance of collaborative efforts between the government and private operators to optimize physical infrastructure, information sharing, and services crucial for quality improvement in the supply chain. Moreover, the paper explores the evolving dynamics with the entry of corporate entities into the market and the impact on traditional supply chain models. As India strives to emerge as a global leader in the food sector, the research emphasizes the urgency of adopting best practices, including cold chain development and intelligent infrastructure. This comprehensive review contributes valuable insights to the ongoing discourse on efficient supply chain management in the context of the burgeoning demand for fresh fruits and vegetables.

Keywords: Supply Chain Management, Fruits and Vegetables, India, Post-harvest losses, Infrastructure, Collaborative efforts, Cold chain development, Best practices, Corporate entry, Food sector.

Introduction

In the realm of agricultural economics and supply chain management, the intricate dynamics governing the flow of vegetables in India present a fascinating area of study. The vegetable supply chain in the Indian subcontinent is a complex network that involves numerous stakeholders, from farmers and distributors to retailers and consumers. This review aims to delve into the multifaceted aspects of the supply chain management of vegetables in India, shedding light on the challenges, opportunities, and the overall impact on the agricultural landscape. India, being one of the world's largest producers of vegetables, plays a pivotal role in the global food market. The vegetable supply chain, however, is not without its set of challenges. The sector grapples with issues ranging from inefficient logistics and infrastructure to market unpredictability and the need for sustainable practices. Understanding these challenges is crucial for devising strategies that can enhance the

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,Email : editoraarf@gmail.com

efficiency of the supply chain and ensure the availability of quality vegetables to consumers. The agricultural landscape in India is characterized by a vast network of smallholder farmers who contribute significantly to vegetable production. These farmers, often working in traditional and fragmented systems, face challenges such as limited access to technology, credit, and market information. Consequently, the supply chain is marked by a lack of coordination and transparency, leading to inefficiencies in procurement, distribution, and marketing. Moreover, the logistics infrastructure in India presents a significant hurdle in the seamless movement of vegetables from farms to markets. Transportation bottlenecks, inadequate storage facilities, and post-harvest losses contribute to the overall inefficiency of the supply chain. Addressing these logistical challenges is essential for improving the overall resilience and responsiveness of the vegetable supply chain. In recent years, there has been a growing recognition of the need for sustainable and environmentally friendly practices in agriculture. The vegetable supply chain in India is no exception, and stakeholders are increasingly exploring ways to integrate eco-friendly approaches. From adopting precision farming techniques to promoting organic farming practices, these initiatives aim to not only address environmental concerns but also enhance the quality and safety of vegetables in the supply chain. As we navigate through this review, it becomes evident that the supply chain management of vegetables in India is at a critical juncture. The challenges are substantial, but so are the opportunities for innovation and improvement. By analysing the current state of affairs and identifying potential interventions, this review sets the stage for a comprehensive exploration of the intricate web that defines the supply chain of vegetables in India. In doing so, it seeks to contribute to the ongoing discourse on agricultural sustainability and supply chain resilience in the context of a vital component of India's agrarian economy.

Review of Literature

Rais and Sheoran (2015) conducted a pivotal study examining the scope of supply chain management in fruits and vegetables in India, which serves as a foundational resource for comprehending the challenges prevalent in this domain. The research underscores India's global prominence as the largest producer of various fruits and vegetables while highlighting a substantial gap between per capita demand and supply. The identified chasm is attributed to extensive post-harvest losses arising from inadequate storage and handling practices, including improper bagging without crating, lack of temperature-controlled vehicles, and insufficient cold chain facilities across the country. These inefficiencies, compounded by limited processing capabilities, contribute significantly to national losses. The study emphasizes the imperative need for an enhanced supply chain management framework encompassing storage, packaging, handling, transportation, and value-added services to bridge the demand-supply gap effectively. The drawbacks identified in the current supply chain scenario include elevated wastage levels, quality degradation, inadequate infrastructure, and high operational costs. The paper advocates a collaborative effort between the government and private operators to ameliorate physical infrastructure, facilitate information sharing, and provide essential services for elevating the quality of the vegetable supply chain. This literature review draws from Rais and Sheoran's comprehensive analysis to contextualize and build upon the insights offered, offering a robust foundation for understanding the intricacies of the supply chain management of vegetables in India.

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,Email : editoraarf@gmail.com

Halder and Pati (2011) contribute significantly to the discourse on the supply chain management of fruits and vegetables in India, presenting a comprehensive analysis of the challenges and opportunities inherent in the current system. With the escalating demand for fresh produce driven by a growing population, the authors underscore the need for proper storage and transportation facilities to ensure the delivery of these perishable items in a fresh state to consumers. The study highlights the vulnerability of the country to international price shocks and exchange-rate volatility due to insufficient investment in agriculture. The lack of transparency in pricing, the dominance of traders, and weak links in the supply chain contribute to revenue losses for farmers and additional costs for other supply chain partners, ultimately burdening the end consumer. The authors recognize the transformative impact of organized retail's entry into the market and its substantial investments. The review of literature conducted in this study elucidates the challenges and opportunities in supply chain management, aiming to bridge the rural-urban market divide. By exploring overlooked problems and research gaps, the paper lays the groundwork for understanding the constraints in supply chain management for perishable goods in India. The proposed research advocates for the adoption of best practices in supply chain management, such as collaborative forecasting, data integration, increased IT usage, and demand-based production. The authors emphasize the role of corporate entry into the marketing of vegetables and fruits in establishing direct tie-ups with farmers and reducing intermediaries. The study concludes by highlighting the imperative of proper supply chain management in contributing to the development of India's agrarian economy and positioning the country as a global leader in the food sector.

Sihariya, Hatmode, and Nagadevara (2013) contribute significantly to the understanding of the supply chain management (SCM) of fruits and vegetables in India. With a profound focus on the substantial production volumes, the authors highlight that India, as of the NHB report in 2011, produces 146 million tons of vegetables and 75 million tons of fruits annually. The major contributors to vegetable production are potato, tomato, onion, cabbage, and brinjal, while prominent fruits include mango, banana, citrus fruits, apple, guava, papaya, pineapple, and grapes. Acknowledging the pivotal role of fresh fruits and vegetables in the Indian context, the study emphasizes the influential role of their marketing in the economy. Despite the low margin nature of retailing in this sector, the immense market potential in India has attracted corporate entities. The paper underscores the unique challenges posed by the perishability, seasonality, and bulkiness of agricultural produce, coupled with the diverse climatic conditions, small land holdings, and scattered production across remote villages. The study highlights the integral role of efficient SCM in addressing these challenges and its contribution to increased production, per capita consumption, and overall economic development. Recognizing SCM as a source of both challenges and opportunities in the marketing of fruits and vegetables, the paper aims to identify and analyze various issues associated with SCM in this sector. Furthermore, the study delves into the analysis of business models adopted by vegetable retailers in organized retailing, providing valuable insights into the strategies that can optimize the supply chain for fruits and vegetables in India.

Negi and Anand (2015) shed light on a critical aspect of the fruits and vegetables supply chain in India, emphasizing the frailty of the cold chain as a weak link in the overall system. Given that the Indian economy is agriculturally driven, the authors stress the pivotal role that the development of cold chain infrastructure plays in mitigating losses and wastages, augmenting farmer income, generating local employment, and ultimately enhancing the livelihoods of farmers. The study, through

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,Email : editoraarf@gmail.com

a meticulous review of both foundational and contemporary literature, provides an insightful examination of the current status and challenges associated with the cold chain in the Fruits and Vegetables (F&V) sector in India. By underscoring the urgency for intelligent cold chain infrastructure, the paper directs the attention of stakeholders to the pressing need for enhancements in this critical aspect, which is identified as a major impediment in the F&V supply chain. The cold chain infrastructure encompasses essential components such as grading, sorting, packing, storage, processing, and transportation facilities within the supply chain network. Recognizing the significance of a robust cold chain, the study advocates for strategic interventions to address the weaknesses in this sector, paving the way for a more efficient and resilient fruits and vegetables supply chain in India.

Negi and Anand (2015) contribute significantly to the understanding of the supply chain in the fruits and vegetables agribusiness in Uttarakhand, India, by identifying major issues and challenges faced by this sector. Fruits and vegetables, being high-value crops, play a crucial role in augmenting farmers' incomes and creating employment opportunities. The authors underscore the credibility of the fruits and vegetables sector in India for providing sustainable income, ensuring nutritional security, and generating employment opportunities in both rural and urban areas. With India being the second-largest food producer globally, Uttarakhand stands out as a significant region for the cultivation of high temperate fruits and vegetables, contributing to the large food processing industry. However, the study reveals that the entire supply chain in Uttarakhand faces various issues, resulting in poor price realization for growers and high prices for consumers. The inefficient supply chain and cold chain infrastructure emerge as major impediments to the rapid growth of the fruits and vegetables production sector in Uttarakhand. Through a thorough review of basic and contemporary literature, the study delves into the issues and challenges specific to the supply chain of fruits and vegetables in Uttarakhand. The authors advocate for the development of an efficient supply chain to increase the shelf life of fruits and vegetables, thereby reducing losses and wastages, increasing farmer income, generating local employment opportunities, and improving the overall livelihood of farmers. Recognizing the pivotal role of agriculture in Uttarakhand's economy, the study emphasizes that an efficient supply chain is essential for the state's development and contributes to the broader Indian economy. The paper concludes by suggesting mitigation strategies to address the identified challenges in the supply chain of fruits and vegetables in Uttarakhand.

Deliya, Thakor, and Parmar (2012) contribute to the discourse on the marketing of fresh fruits and vegetables from a supply chain management (SCM) perspective, shedding light on the challenges and opportunities in the context of the competitive marketplace. In today's dynamic business environment, organizations face increasing pressure to innovate and deliver value to customers. The authors highlight the evolving power dynamics between sellers and customers, emphasizing the pivotal role of SCM in not only cost reduction but also in maintaining and enhancing the quality of marketed fruits and vegetables. Given the perishable nature of these agricultural products, the study underscores the crucial role played by the supply chain in marketing. The authors elaborate on the complexities introduced by factors such as diverse land holdings, varied climate conditions, wide geographical production spread, and the prevalence of remote villages, contributing to the intricacies of SCM for fruits and vegetables in India. Despite being at a growing stage, SCM in the marketing of fruits and vegetables faces challenges in India due to factors like perishability, seasonality, bulkiness, and diverse consumption habits of Indian consumers. The dominance of unorganized retailers in the Indian retail market further complicates the state of the supply chain. The study identifies drawbacks

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,Email : editoraarf@gmail.com

in the current supply chain, including numerous intermediaries, high levels of wastage, quality degradation, poor infrastructure, and elevated costs. Recognizing the need for improvement, the authors advocate for a collaborative effort between government and private operators to enhance physical infrastructure, facilitate information sharing, and provide services aimed at improving the overall quality of the supply chain. This paper not only highlights the challenges but also underscores the potential for improvement and optimization in the supply chain management of fresh fruits and vegetables in the Indian market.

Negi and Anand (2016) provide a comprehensive overview of the retail supply chain models for fruits and vegetables (F&V) in India, contributing to a deeper understanding of the complexities and challenges within this crucial sector. With India holding the position of the second-largest food producer globally and the widespread cultivation of high-temperate F&V in the Himalayas and Terai region, the authors emphasize the importance of these products for retailers across diverse geographical areas and seasons. Fruits and vegetables, beyond being a significant contributor to the Indian economy, play a vital role in ensuring sustainable income, nutritional security, and employment opportunities in both rural and urban areas through retailing. As the population continues to grow, the demand for fresh F&V escalates, presenting both opportunities and challenges for the retail sector. The chapter delves into the various retail supply chain models currently adopted by F&V retailers in India, encompassing both traditional or unorganized retailers and modern or organized retailers. The distinctions between these models are explored, shedding light on the dynamics that shape the supply chain in this sector. Additionally, the chapter addresses the myriad issues affecting the retail supply chain of F&V, providing a nuanced understanding of the hurdles faced by the industry. Given the direct link between the F&V retail supply chain and the health and happiness of customers, the study emphasizes the pivotal role this sector plays in the broader context of the Indian economy. By presenting an in-depth analysis of the different retail supply chain models and addressing pertinent issues, Negi and Anand contribute valuable insights to the strategic management of the F&V retail industry in India.

Somashekhar, Raju, and Patil (2014) contribute to the understanding of agriculture supply chain management in India, focusing on the scenario surrounding fruits and vegetables (F&V). India's status as the second-largest food producer globally and the widespread cultivation of high-temperate F&V in the Himalayas and Terai region underscore the significance of this sector. These products hold importance for retailers throughout the plain areas across all seasons. The authors emphasize the credibility of the F&V sector in providing sustainable income, nutritional security, and employment opportunities, thereby contributing to the growth of the Indian economy in both rural and urban areas. As the population continues to grow, the demand for fresh F&V rises, but this growth is accompanied by various challenges hindering the expansion of the retail sector. The chapter provides an insightful overview of the F&V retail supply chain in India, recognizing its vital role not only in economic development but also in directly impacting the health and happiness of customers. Different types of retail supply chain models, adopted by both traditional or unorganized retailers and modern or organized retailers, are discussed in the chapter. The authors delve into various issues related to the retail supply chain in this sector, offering a comprehensive understanding of the challenges faced by the industry. This chapter serves as a valuable resource for comprehending the complexities of agriculture supply chain management, specifically within the context of F&V in India. By

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,Email : editoraarf@gmail.com

highlighting the role of the supply chain in economic growth and the well-being of customers, Somashekhar, Raju, and Patil contribute to the broader discourse on social science and management.

Singh, Sikka, and Singh (2009) delve into the domain of Supply Chain Management (SCM) in the context of the Indian fresh produce supply chain, examining the associated opportunities and challenges. The authors establish that SCM, in a broad sense, involves managing relationships between businesses responsible for efficiently producing and supplying agribusiness products, ensuring the reliable fulfillment of consumers' requirements in terms of quantity, quality, and price. They note that in practice, SCM often entails managing both horizontal and vertical alliances. The focus of the paper is on developing countries, where the supply chain of agricultural products typically involves numerous players or agents, with many small farmers at one end and consumers at the other. The authors highlight the intricacies of these traditional supply chains, which are tightly interlinked with social structures. In many developing countries, small farmers are often price-takers, and their interaction with markets is limited, typically involving dealings with produce collectors or sales at local/village markets and district markets. By presenting this overview, the authors lay the foundation for exploring the challenges and opportunities specific to the Indian fresh produce supply chain. This paper, presented at the International Food & Agribusiness Management Association's 19th Annual World Symposium, contributes to the broader understanding of SCM in the context of agricultural products, shedding light on the complexities inherent in supply chains in developing countries like India.

Gardas, Raut, and Narkhede (2018) contribute to the understanding of post-harvest losses (PHL) in the fruit and vegetable (F&V) supply chain in India, employing the Decision Making and Trial Evaluation Laboratory (DEMATEL) approach. The post-harvest and marketing system, characterized as a chain of interlinked activities starting after harvest and continuing until the delivery of the food product to consumers, is pivotal for ensuring the efficient and timely delivery of harvested products without compromising volume, quality, and safety. The paper aims to identify and model the critical causal factors contributing to PHL in the Indian F&V supply chain. Utilizing a detailed literature review and expert opinions, fifteen causal factors were identified through the DEMATEL method, a multi-criteria decision-making tool. The application of DEMATEL helped establish cause-effect relationships among the identified factors. The study revealed that the most critical factors requiring attention for progressive PHL reduction include lack of proper packaging facilities, lack of proper storage facilities, insufficient infrastructure, improved handling of products at the farm and marketplace, lack of processing facilities, lack of linkage between farmers and processing units, lack of linkages in the marketing channel, and a large number of intermediaries. These findings provide valuable insights for supply chain members and decision-makers, offering guidance on reducing PHL and enhancing the overall performance of the F&V supply chain in India. The research emphasizes the significance of addressing these critical factors to ensure a more efficient and resilient post-harvest system.

Findings

The literature review reveals several key findings pertaining to the supply chain management of fruits and vegetables in India. Rais and Sheoran (2015) underscore the substantial gap between per capita

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 12, Issue 03, March 2024 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,Email : editoraarf@gmail.com

demand and supply, attributing it to post-harvest losses caused by inadequate storage and handling practices. They advocate for an enhanced supply chain management framework to bridge this gap effectively. Halder and Pati (2011) highlight the challenges arising from the perishable nature of these products and the lack of transparency in pricing, emphasizing the transformative impact of organized retail's entry into the market. Sihariya, Hatmode, and Nagadevara (2013) stress the vital role of efficient supply chain management in addressing challenges posed by the diverse nature of agricultural production and the low-margin business of retailing fresh produce. Negi and Anand (2015) bring attention to the weak link in the form of the cold chain infrastructure, emphasizing its role in reducing losses, increasing farmer income, and contributing to India's emergence as a global leader in the food sector. Their study advocates for urgent development in this critical aspect of the supply chain. Furthermore, Negi and Anand (2015) extend their analysis to Uttarakhand, identifying issues in the entire supply chain and emphasizing the need for an efficient system to boost the state's economy.

Deliya, Thakor, and Parmar (2012) shed light on the challenges faced by the marketing of fresh fruits and vegetables, emphasizing the complexities introduced by diverse factors such as varied climate conditions and the dominance of unorganized retailers. They call for collaborative efforts between the government and private operators to improve physical infrastructure and overall supply chain quality.

Negi and Anand (2016) provide an overview of retail supply chain models, emphasizing the crucial role of fruits and vegetables in the Indian economy. Their study contributes insights into the dynamics of traditional and modern retail supply chain models and the challenges faced by the industry.

Somashekhar, Raju, and Patil (2014) discuss the importance of the F&V retail supply chain in India for sustainable income, nutritional security, and employment opportunities. The authors provide a comprehensive overview of the different retail supply chain models and the challenges faced by the sector.

Singh, Sikka, and Singh (2009) explore the challenges and opportunities in SCM for fresh produce in India, emphasizing the complexity of traditional supply chains in developing countries.

Finally, Gardas, Raut, and Narkhede (2018) identify critical causal factors for post-harvest losses in the F&V supply chain, highlighting issues such as lack of proper packaging and storage facilities, insufficient infrastructure, and numerous intermediaries.

In conclusion, the literature underscores the multifaceted challenges in the supply chain management of fruits and vegetables in India, while also presenting opportunities for improvement through enhanced infrastructure, technology adoption, and collaborative efforts across various stakeholders.

Conclusions

In conclusion, the extensive review of literature on the supply chain management of fruits and vegetables in India reveals a complex landscape characterized by challenges and opportunities. The key findings from the reviewed studies converge on several crucial aspects that merit attention for the development of a robust and efficient supply chain in this sector. Firstly, the perishable nature of fruits and vegetables poses a significant challenge, leading to substantial post-harvest losses. Inadequate storage and handling practices, coupled with insufficient cold chain infrastructure, emerge as critical

weaknesses in the current supply chain. Urgent attention is needed to address these issues and enhance the overall efficiency of the post-harvest system. Organized retail's entry into the market is recognized as a transformative force that can contribute to overcoming challenges. The studies emphasize the potential of organized retail in improving transparency, reducing intermediary layers, and ensuring better prices for both farmers and consumers. This suggests that strategic interventions and collaborations with organized retail entities could positively impact the fruits and vegetables supply chain. Furthermore, the role of technology and infrastructure development is highlighted as crucial for optimizing the supply chain. Intelligent cold chain infrastructure, proper packaging facilities, and improved storage are identified as key factors in reducing losses and enhancing the shelf life of fruits and vegetables. The development of physical infrastructure and the integration of information-sharing mechanisms are advocated to elevate the overall quality of the supply chain. The studies also underline the significance of collaborative efforts between the government and private operators. Such partnerships are seen as essential for improving physical infrastructure, facilitating information-sharing, and providing necessary services to enhance the efficiency of the supply chain. This collaborative approach is crucial for addressing the multifaceted challenges faced by the sector. In summary, the literature underscores the need for a holistic and integrated approach to supply chain management in the fruits and vegetables sector in India. Strategic interventions, technological advancements, infrastructure development, and collaborative efforts are identified as key elements for optimizing the supply chain, reducing losses, and promoting sustainable economic development in the agricultural landscape. Future research and practical initiatives should focus on implementing these insights to transform the challenges into opportunities for the growth and prosperity of the fruits and vegetables supply chain in India.

References

1. Deliya, M., Thakor, C., & Parmar, B. (2012). A study on "differentiator in marketing of fresh fruits and vegetables from the supply chain management perspective." Commerce and Management, 1(3), 40-57.
2. Gardas, B. B., Raut, R. D., & Narkhede, B. (2018). Evaluating critical causal factors for post-harvest losses (PHL) in the fruit and vegetables supply chain in India using the DEMATEL approach. Journal of Cleaner Production, 199, 47-61.
3. Halder, P., & Pati, S. (2011). A need for a paradigm shift to improve supply chain management of fruits & vegetables in India. Asian Journal of Agriculture and Rural Development, 1(393-2016-23908), 1-20.
4. Negi, S., & Anand, N. (2015). Cold chain: a weak link in the fruits and vegetables supply chain in India. IUP Journal of Supply Chain Management, 12(1), 48.
5. Negi, S., & Anand, N. (2016). An overview of fruits and vegetables' retail supply chain models in India. In Handbook of Research on Strategic Supply Chain Management in the Retail Industry, 170-187.
6. Rais, M., & Sheoran, A. (2015). Scope of supply chain management in fruits and vegetables in India. Journal of Food Processing and Technology, 6(3).
7. Sihariya, G., Hatmode, V. B., & Nagadevara, V. (2013). Supply chain management of fruits and vegetables in India.

8. Singh, S. P., Sikka, B. K., & Singh, A. (2009, June). Supply chain management and Indian fresh produce supply chain: opportunities and challenges. In Proceedings of the International Food & Agribusiness Management Association, 19th Annual World Symposium, Budapest, Hungary, 20-23.
9. Somashekhar, I. C., Raju, J. K., & Patil, H. (2014). Agriculture supply chain management: a scenario in India. Research Journal of Social Science and Management, 4(07), 89-99.