Agricultural Produce Supply Chain Network of Capsicum

Subjects: Agricultural Economics & Policy

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Vegetables are important for both nutritional and economic stability and contribute significantly to the agricultural landscape of India. The demand for vegetables is rising, driven by population growth and increased awareness of their benefits.

Keywords: supply chain ; marketing channel ; performance ; efficiency ; logistics

1. Introduction

Vegetables hold a significant position in the Indian economy, yielding greater returns per unit area and time. They serve as crucial contributors to both nutritional and economic stability. The demand for vegetables is on a steady rise, driven by factors such as population growth, a heightened awareness of their nutritional benefits and a rise in per capita income. Vegetables boast higher productivity, shorter growth cycles and increased value and, consequently, they yield higher income, which positively impacts livelihoods (Rai et al. 2019). Moreover, vegetable crops promote enhanced diversification and intensification within the realm of crop cultivation. The farming of vegetables plays a vital role in poverty alleviation by generating employment, improving dietary habits and providing new opportunities for impoverished farmers. Due to the bulkiness and perishable nature of vegetable products, their sustained market demand results in the creation of high-productivity employment (Gebrehiwot et al. 2018). The increase in horticultural production and marketing plays a pivotal role in promoting the commercialization of the rural economy, resulting in the creation of numerous off-farm employment opportunities (LeRoux et al. 2010). In India, vegetables are cultivated across an expanse of 11,065 hectares, yielding a total production of 199,882 metric tonnes. West Bengal leads the nation as the largest producer of vegetables, accounting for 15.35% of the total, followed by Uttar Pradesh (14.46%), Madhya Pradesh (10.18%), Bihar (8.91%), Maharashtra (7.84%), Gujarat (6.74%), Odisha (4.55%), Karnataka (3.69%) and Himachal Pradesh (0.94%) (National Horticultural Board 2022). Capsicum, scientifically known as *Capsicum annum* L., holds significant agricultural and commercial value in India. Additionally, their nutritional richness, abundant in vital nutrients such as Vitamin C and Vitamin A, serves a medicinal purpose and antioxidants play a pivotal role in enhancing the local diet, thereby improving overall nutrition and health outcomes. Their subtle taste, pleasing aroma, diverse array of colours and nutritional benefits contribute to their worldwide popularity (Olutumise 2022; Schipmann and Qaim 2011). In India, capsicum production share is highest in West Bengal followed by Karnataka, Haryana, Jharkhand and Himachal Pradesh (APEDA 2023).

Himachal Pradesh is a state located in the heart of the northwestern Himalayan region, amidst pristine valleys and rugged terrain. It is a state famous for its picturesque landscapes and vibrant agricultural practices. The varied agroclimatic conditions of Himachal Pradesh facilitate the cultivation of a wide range of vegetables, encompassing both temperate and subtropical nature. Among the myriad crops that thrive in this region, capsicum stands as a vital component of the agrarian landscape, contributing significantly to the state's agricultural economy. In Himachal Pradesh, it is extensively grown as a cash crop in agroclimatic zones-II (mid-hills, subhumid) and -III (high hills, temperate wet) (Bala et al. 2011; Thakur et al. 2022b). Therefore, commercial cultivation of capsicum yields substantial income through domestic sales and exports to neighbouring regions. Moreover, capsicum cultivation diversifies the agricultural portfolio of the state, ensuring sustainability and offering a buffer against climate-induced uncertainties and market fluctuations. Its versatile use in various culinary traditions ensures a steady and consistent demand in both local and regional markets (Devkota and Sharma 2014; Maspaitella et al. 2018). Additionally, through processing and preservation techniques, there exists a potential for value addition, creating opportunities for agro-industries and entrepreneurial ventures. Therefore, with escalating global demand for fresh and high-quality produce, the agricultural sector plays an indispensable role in sustaining economies and nourishing populations (Manjunath and Girish 2016; Marine et al. 2016; Verano et al. 2023). The cultivation and marketing of capsicum, however, are not without their challenges. The marketing of vegetable crops

presents a multifaceted challenge due to factors like the perishability of the produce and seasonal fluctuations in production. Given the perishable nature of vegetables like capsicum, a swift and well-organized supply chain in marketing becomes imperative (Bukar et al. 2015; Bhattarai et al. 2013). An efficient agricultural produce supply chain system holds great significance for economic development as it stimulates production, prevents unnecessary swings in output and prices, lowers production costs and ensures a fair distribution of consumer prices. The supply chain network forms the lifeline of this sector, serving as the conduit through which produce traverses from the hands of the diligent farmer to the discerning consumer (Lenne and Ward 2010; Zhang et al. 2019; Thakur et al. 2021). The present research is set to address important aspects of capsicum marketing by undertaking a comprehensive exploration of the key actors involved from farmers to local traders, wholesalers, commission agents, retailers and consumers. Therefore, this empirical research attempts to highlight the dynamics of the agricultural produce supply chain network of capsicum in Himachal Pradesh, its marketing performance and the constraints hindering its seamless flow from farm to fork (Chand et al. 2020; Thakur et al. 2022a).

Simultaneously, the present research holds paramount importance in the context of the local economy and livelihoods. Himachal Pradesh is renowned for its diverse agricultural practices, with capsicum cultivation representing a significant portion of the agricultural output. Therefore, understanding the nuances of marketing performance and constraints in this specific crop's supply chain is crucial for the economic sustenance of the region. By delving into the intricacies of capsicum marketing, this research offers practical insights for farmers, intermediaries, policymakers and other stakeholders in the region, whereas the study's methodologies, findings and recommendations provide valuable contributions to the broader field of agricultural business management, supply chain management and rural development. The challenges faced in capsicum marketing in the northwestern Himalayan region are not isolated; they resonate with similar issues encountered in agricultural supply chains worldwide. Furthermore, this research fills a critical gap in the existing literature by offering a detailed case study of a specific crop within a unique geographical context. The existing literature often provides general insights into agricultural supply chains, but this study focuses on the capsicum crop in a region with unique challenges and opportunities. The methodologies employed and the insights gained can be used as a model for similar studies in diverse agricultural regions globally, promoting a better understanding of the complex dynamics between farmers, intermediaries and consumers. Further, the study's emphasis on identifying and addressing constraints in the supply chain network aligns with broader global agendas, including sustainable agriculture, food security and poverty alleviation. Moreover, the present research work contributes to the literature by offering actionable insights for researchers, policymakers and stakeholders involved in the agricultural sector, fostering sustainability, profitability and equity within the capsicum supply chain. Therefore, methodologies and strategies developed in this research can be adapted and applied in different regions, contributing to a more resilient and efficient global agricultural ecosystem (Sidhu et al. 2010; Wang et al. 2014; Krafft et al. 2015; Thakur et al. 2023b; Sakas et al. 2023).

2. Agricultural Produce Supply Chain Network of Capsicum

The agricultural produce supply chain is a critical component of the agricultural sector, ensuring the efficient movement of goods from producers to consumers. An effective understanding of existing marketing channels is crucial for streamlining the supply chain network. Previous research has made significant strides in this area. Thakur et al. (2023c) conducted a comprehensive study on marketing costs and price spreads of vegetable crops in India. Their research sheds light on the various channels through which produce flows, the associated costs and the economic implications for farmers, whereas Panda and Sreekumar (2012) highlight the impact of intermediaries and the advantages of direct sales. Their study provides practical considerations for improving marketing practices in the agricultural sector. As the number of intermediaries increases, the producer's share in the consumer's price tends to decrease (Chand et al. 2020). This finding resonates with the existing literature on supply chain dynamics, where excessive intermediation can lead to reduced returns for primary producers. The study underscores the advantage of direct sales channels for producers. When producers have the ability to sell their produce directly to consumers or retailers, they tend to receive higher net returns (Mishra et al. 2014).

Furthermore, the studies by Kumar et al. (2004) and Sidhu et al. (2010) applied metrics like marketing cost, price spread and market margin to assess the market performance of vegetable crops. Their research offers a foundational understanding of the metrics used to gauge marketing performance, which can be directly applied to the context of capsicum cultivation. Acharya's approach, outlined in Acharya and Agarwal (2016), offers a valuable framework for evaluating marketing efficiency in agricultural produce. This approach has been successfully applied in studies focused on diverse Indian crops, providing a proven tool for assessing capsicum's marketing efficiency. Additionally, Thakur et al. (2023a) applied Acharya's approach to assess marketing performance in agricultural supply chains. Their study showcases the applicability and efficacy of this framework in evaluating marketing performance, providing a relevant

precedent for capsicum cultivation, whereas Aliyi et al. (2021) provide a comprehensive and insightful analysis of smallholder vegetable production in Ethiopia. By addressing profitability, market performance and constraints, the study not only contributes valuable empirical evidence but also offers pertinent policy recommendations for advancing the vegetable sector and promoting rural economic growth and poverty reduction. This research used various techniques such as marketing cost, price spread and marketing efficiency to study the market performance of marketing channels. Moreover, the study conducted by Mgale and Yunxian (2020) offers critical insights into the dynamics of rice marketing among smallholder farmers in rural Tanzania. They used Acharya and Agarwal's method to evaluate marketing efficiency, which is a robust approach. This method provides a comprehensive view of the efficiency levels across different marketing channels, enabling evidence-based policy interventions (Acharya 2016). Simultaneously, Chand et al. (2020), focusing on the marketing efficiency of vegetables in Rajasthan, India, provide critical insights into the challenges faced by farmers in the vegetable supply chain. The research contributes significantly to the discourse on agricultural marketing in developing economies. The comprehensive methodology employed, involving data collection from farmers, wholesalers and retailers, ensures a well-rounded analysis of the vegetable supply chain (Thakur et al. 2023b). The researchers used the Acharya approach to study marketing efficiency. Further, research revealed that the assessment of the farmer's share in consumer expenditure is a key indicator of the distribution of benefits along the supply chain, whereas the calculation of the marketing efficiency serves as a critical metric for evaluating the effectiveness of the marketing system. Moreover, analysing market constraints is essential for identifying and prioritizing challenges within the supply chain network. The research conducted by Kumari and Chauhan (2021) employed Garrett's ranking to identify and prioritize constraints in cash crop marketing. Their work provides a methodological precedent for the analysis of marketing constraints in the capsicum supply chain in Himachal Pradesh. Further, a study conducted by Kumar et al. (2019) provides valuable insights into the constraints faced by farmers in vegetable marketing. Their research contributes to the broader discourse on agricultural development and highlights the need for targeted interventions to address the specific constraints faced by stakeholders in the vegetable supply chain.

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