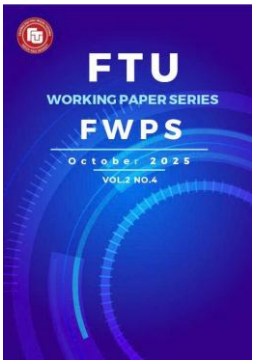

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CÁC YẾU TỐ ẢNH HƯỞNG ĐẾN KHẢ NĂNG PHỤC HỒI CỦA CHUỖI CUNG ỨNG NGÀNH CÀ PHÊ TẠI VIỆT NAM

Đinh Thị Minh Phương[1], Thạch Hà Trang, Nguyễn Thị Ngọc Tâm, Trần Phương Thảo

Sinh viên K60 CLC Kinh tế đối ngoại – Viện Kinh tế & Kinh doanh quốc tế

Trường Đại học Ngoại thương, Hà Nội

Nguyễn Thị Xuân Mai

Sinh viên K60 Kinh tế quốc tế – Khoa Kinh tế quốc tế

Trường Đại học Ngoại thương, Hà Nội

Nguyễn Thị Yến

Giảng viên Viện Kinh tế & Kinh doanh quốc tế

Trường Đại học Ngoại thương, Hà Nội

Tóm tắt

Việt Nam là nước xuất khẩu cà phê lớn thứ hai thế giới, với chuỗi cung ứng đóng vai trò quan trọng trong nền kinh tế. Tuy nhiên, ngành cà phê đang đối mặt với nhiều thách thức ngày càng gia tăng như biến đổi khí hậu, biến động giá cả và sự kém hiệu quả trong cấu trúc chuỗi cung ứng. Nghiên cứu này khám phá các yếu tố ảnh hưởng đến khả năng phục hồi của chuỗi cung ứng cà phê Việt Nam thông qua phương pháp định tính, bao gồm phỏng vấn chuyên gia và phân tích chủ đề. Kết quả nghiên cứu chỉ ra bốn yếu tố quan trọng: Tính linh hoạt, Sự nhanh nhạy, Hợp tác và Minh bạch. Mặc dù các doanh nghiệp và nhà hoạch định chính sách đã thực hiện nhiều biện pháp để nâng cao khả năng phục hồi - như đa dạng hóa thị trường, chuyển đổi số và hợp tác công-tư, nhưng vẫn tồn tại nhiều rào cản như chuỗi cung ứng phân mảnh, thiếu niềm tin giữa các bên liên quan và hạn chế trong việc tiếp cận thông tin thị trường. Nghiên cứu này cung cấp những gợi ý thực tiễn cho các nhà hoạch định chính sách, doanh nghiệp và các bên liên quan nhằm xây dựng chiến lược hiệu quả hơn để nâng cao khả năng phục hồi của ngành cà phê Việt Nam.

[1] Tác giả liên hệ, Email: k60.2112150135@ftu.edu.vn

Từ khoá: khả năng phục hồi chuỗi cung ứng, ngành cà phê Việt Nam, tính linh hoạt, sự nhanh nhạy, hợp tác, minh bạch

FACTORS AFFECTING THE RESILIENCE OF VIETNAM'S COFFEE SUPPLY CHAIN

Abstract

Vietnam is the world's second-largest coffee exporter, with its supply chain playing a crucial role in the country's economy. However, the industry faces increasing challenges from climate change, price volatility, and structural inefficiencies. This study explores key factors influencing the resilience of Vietnam's coffee supply chain through a qualitative approach, including expert interviews and thematic analysis. The findings highlight four critical dimensions: Agility, Flexibility, Collaboration, and Visibility. While businesses and policymakers have implemented various strategies to enhance resilience - such as market diversification, digital transformation, and public-private partnerships - barriers remain in the form of fragmented supply chains, lack of trust among stakeholders, and limited access to market information. This research provides practical insights for policymakers, businesses, and supply chain actors to develop more effective strategies for strengthening the resilience of Vietnam's coffee industry.

Keywords: supply chain resilience, Vietnam coffee industry, agility, flexibility, collaboration, visibility

1. Introduction

Vietnam is one of the world's leading coffee producers, ranking second in global exports after Brazil. The industry plays a vital role in the national economy, providing employment for millions and being a key source of export revenue (International Coffee Organization, 2023). By the end of the 2023-2024 period, Vietnam exported approximately 25 million 60-kilogram bags of coffee, maintaining its position as the world's largest Robusta producer, with Robusta accounting for 97% of the country's total coffee output (USDA Foreign Agricultural Service, 2024).

Although coffee exports remain strong, the industry is increasingly vulnerable to external and internal challenges. Additionally, extreme weather events, such as unseasonal rainfall and prolonged dry spells, have further disrupted harvest cycles and reduced coffee bean quality (FAO, 2023). These compounding factors highlight the urgent need to strengthen the resilience of Vietnam's coffee supply chain against both external shocks and internal changes.

Supply chain resilience (SCR) has emerged as a crucial framework for enabling supply chains to anticipate, absorb, adapt, and recover from disruptions while ensuring operational continuity and minimizing negative impacts on businesses and customers. While existing research has extensively explored supply chain resilience in various industries, there is a significant gap in understanding the specific dynamics of the coffee supply chain in Vietnam. This research seeks to address that gap by examining the factors influencing the resilience of this vital sector.

The primary objective of this study is to identify and evaluate the key factors affecting

coffee supply chain resilience in Vietnam. This research provides valuable insights for policymakers, businesses, and stakeholders, helping them design strategies to strengthen the resilience of Vietnam's coffee supply chain.

2. Literature Review

A systematic literature review approach was employed, utilizing VOSviewer for bibliometric analysis to identify key factors contributing to SCR within the context of Vietnam's coffee industry. Through this analysis, four main factors - Agility, Flexibility, Visibility, and Collaboration - have been identified as the most frequently cited elements enhancing SCR.

In general, findings from prior research reveals that Agility enables firms to rapidly adjust strategies in response to changes, while Flexibility allows for adaptation to varying operational conditions. Visibility strengthens real-time information flow, improving decision-making and risk management, whereas Collaboration fosters strong partnerships, enhancing coordinated responses to disruptions. These factors collectively enhance firms' ability to anticipate and mitigate risks, maintain operational continuity, and secure long-term competitiveness.

The following sections present key findings from the systematic literature review, focusing on the concept of Supply Chain Resilience and its four key influencing indicators, explaining their relevance to the coffee industry.

2.1. Supply chain resilience (SCR)

Supply chain resilience (SCR) is a multidimensional concept with no universally accepted definition (El-Naggar & Ali, 2023). Early studies described SCR as the ability to respond to disruptions and restore normal operations (Rice & Caniato, 2003). Over time, its definition has evolved to emphasize proactive planning and adaptive capabilities, allowing supply chains to maintain structural integrity and even gain a competitive advantage post-disruption (Ponis et al., 2012). At the same time, supply chain disruptions have become more complex, extending beyond demand fluctuations to include external shocks such as natural disasters, geopolitical tensions, and technological advancements (McKinsey, 2020)."

To identify key drivers of SCR, a systematic literature review was conducted. Using VOSviewer software, four critical indicators were identified: Flexibility, Collaboration, Visibility, and Agility. The following sections analyze how these factors contribute to strengthening SCR in the coffee supply chain.

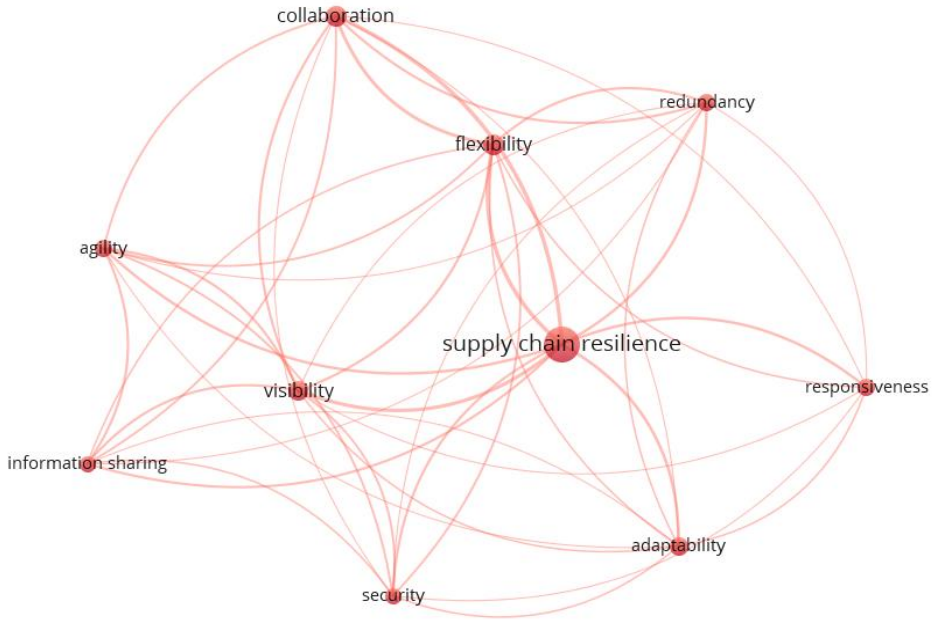

Figure 1. Image of correlation among supply chain resilience factors.

Source: Author's synthesis results through VOSviewer software

With Flexibility, Collaboration, Visibility, and Agility identified as key indicators of SCR, this study further investigates their roles through in-depth interviews with industry experts to provide insights into enhancing SCR in the coffee supply chain.

2.2. Key indicators of Supply chain resilience

2.2.1. Agility

Gligor et al. (2013) defined Agility as "a firm's ability to quickly adjust tactics and operations within its supply chain to respond or adapt to changes, opportunities, or threats", emphasizing its role as a critical driver of firm success, especially in dynamic and uncertain environments. Brusset (2016) further reinforced this view by positioning Agility as a key factor in maintaining competitiveness in fast-paced and unpredictable industries.

Research highlights a strong link between agility and supply chain resilience (SCR). Firms with higher agility levels demonstrate greater resilience by rapidly reconfiguring resources, adapting to market shifts, and improving coordination among supply chain partners (Singh et al., 2017; Gligor et al., 2019). Additionally, agility enhances resilience through improved visibility and operational flexibility, enabling firms to sustain business continuity even during major disruptions like the COVID-19 pandemic (Dubey et al., 2021).

2.2.2. Flexibility

Flexibility in supply chains is the ability to adjust resources, processes, and structures in response to external changes (Stevenson & Spring, 2007). It extends across the entire value chain, enabling firms to modify operations, speed, and scale to meet market demands (Delic & Eyers, 2020; Salavatihesari, 2016). By integrating flexibility with resilience, businesses can better adapt to disruptions and shifting customer needs (Cardoso et al., 2015).

Studies highlight flexibility as a key driver of supply chain resilience. It allows firms to

realign resources, maintain stability, and recover quickly from disruptions. Historical cases, such as post-tsunami recovery in Japan, demonstrate its role in crisis response (Sáenz & Revilla, 2014). Moreover, flexibility in distribution, production, and workforce management enhances overall supply chain adaptability (Christopher & Holweg, 2011; Mandal et al., 2016).

2.2.3. Visibility

Supply chain Visibility (SCV) refers to the ability to provide timely and accurate information across the supply chain, enabling stakeholders to monitor, control, and make strategic decisions (Schoenthaler, 2003). Beyond information availability, SCV also emphasizes data quality, accessibility, and analytical capabilities (Mubarik et al., 2021).

Effective SCV enhances operational efficiency by reducing costs in distribution and inventory management while improving service levels and risk management (Razak et al., 2021). In contrast, poor SCV can lead to issues like estimation errors, incorrect stock data, and delivery delays, negatively impacting productivity and revenue (Lee et al., 1997; Yu & Goh, 2014). More importantly, SCV strengthens supply chain resilience by improving procurement transparency, enhancing risk assessment, and identifying bottlenecks (Mubarik et al., 2021; Tan et al., 2019). By providing real-time insights, SCV enables businesses to respond swiftly to disruptions and maintain supply chain stability (Dubey et al., 2020; Burgos & Ivanov, 2021).

2.2.4. Collaboration

Collaboration in supply chains enables organizations to coordinate and execute joint activities toward shared goals (Cao et al., 2010). It enhances resilience by improving knowledge sharing, resource mobilization, and synchronized responses to disruptions (Scholten & Schilder, 2015; Jüttner & Maklan, 2011).

Beyond operational benefits, strong partnerships foster trust, improve risk management, and enhance decision-making during crises (Kamalahmadi & Parast, 2016; Wieland & Wallenburg, 2013). In the coffee industry, collaboration among producers, manufacturers, and roasters helps mitigate supply chain vulnerabilities, particularly in response to market and climate challenges (Fischer et al., 2012; Samper et al., 2017).

3. Methodology

3.1. In-depth interview methodology

This study employs a qualitative research approach using in-depth interviews with three experts in the coffee industry and supply chain management. Purposive sampling was used to select participants who possess not only expertise in coffee trade but also hands-on experience in coffee cultivation and processing, ensuring a deep understanding of both market dynamics and production challenges (Patton, 2002).

Semi-structured interviews were conducted to explore key challenges in Vietnam's coffee supply chain, focusing on the role of Flexibility, Collaboration, Agility, and Visibility in enhancing supply chain resilience (SCR). This method allows for a structured yet flexible exploration of complex supply chain dynamics while capturing expert insights (Gill et al., 2008). Interviews were transcribed and analyzed using thematic analysis, following Braun & Clarke's (2006) framework, where key themes were identified based on existing literature and

emerging findings.

The qualitative findings provide contextual depth, complementing quantitative analysis and offering practical recommendations to strengthen Vietnam's coffee supply chain resilience. By capturing industry expertise across the entire coffee value chain - from cultivation to trade - this approach enhances the study's validity and applicability in real-world supply chain management (Nowell et al., 2017).

3.2. In-depth interview process

To ensure a comprehensive understanding of supply chain resilience in Vietnam's coffee industry, participants for in-depth interviews were carefully selected based on their expertise, industry experience, and roles within the supply chain. The selection criteria included:

Table 1: Profiles and information of interview participants

Respondent	**Position**	**Years of Experience**	**Area of Expertise**	**Organization Type**
R1	Farmer	30 years	Cultivation, crop cycles, factors affecting yield	Smallholder farm (0.35-0.4 ha)
R2	Farmer	20 years		Medium-scale farm (2-4 ha)
R3	CEO	20 years	Business operations, supply chain management, process optimization, import-export operation	Processor and Import-Export Company
R4	CEO	10 years		Processor and Import-Export Company
R5	Supply chain manager	10 year year	Logistics management, transportation optimization, resilience improvement	Processor and Import-Export Company

A total of three individuals participated in the interviews, which were conducted over a period of 2 weeks. Given the limited sample size, the findings provide exploratory insights rather than definitive conclusions. While these interviews offer valuable perspectives, they may not fully capture the diversity of experiences within the entire supply chain. This limitation is acknowledged in the study's discussion section.

A semi-structured interview format was used, allowing for Flexibility while maintaining a structured framework. The in-depth interviews aimed to:

- Understand the current state of Vietnam's coffee industry and its supply chain, including recent developments, challenges, and structural characteristics.
- Identify key difficulties faced by farmers, enterprises, and other stakeholders, as well as the factors influencing supply chain efficiency and resilience.
- Extract insights that contribute to the broader research objectives, particularly in understanding how resilience factors interact and how policymakers and businesses can enhance supply chain resilience.

Interview questions were customized based on participant roles to ensure depth and relevance:

- Farmers were asked about their experiences with supply chain disruptions, adaptation strategies, and support mechanisms.
- Business representatives provided insights into corporate strategies, risk management practices, and industry challenges.

Interviews were conducted both in person and online, depending on participant availability, and each session lasted approximately 30-60 minutes. The conversations were recorded (with consent) and transcribed for analysis. To ensure participant privacy, personal identifiers were removed, and interviewees were referred to by their roles rather than by name.

To ensure the reliability and accuracy of the collected data, interview responses were cross-checked with relevant documents and industry reports. This triangulation approach helped validate the information provided by participants and ensured consistency between qualitative insights and existing literature.

To ensure research integrity, all participants were provided with informed consent forms detailing the purpose of the study, data usage, and confidentiality measures. Identities of the interviewees were anonymized to protect their privacy. The study adheres to ethical research standards, ensuring that data is used responsibly and securely.

This qualitative approach provided valuable depth to the research, complementing the quantitative findings and offering a comprehensive understanding of supply chain resilience in the Vietnamese coffee industry.

4. Results & Discussion

4.1. Overview about the coffee industry in Vietnam

The coffee supply chain in Vietnam is characterized by a highly fragmented and informal structure, dominated by smallholder farmers. While some large corporations like NesCafé and Trung Nguyen Coffee have established vertically integrated models, the majority of coffee production and trade in Vietnam operates through multiple intermediaries.

Figure 2: Coffee supply chain in Vietnam.

Source: Authors

The supply chain begins in the Central Highlands, where small-scale farmers cultivate and harvest coffee cherries. These cherries are then sold to local traders, who act as intermediaries between farmers and processing companies. The processed green coffee beans are primarily exported, with only a small portion used for domestic roasting and consumption. Processing companies handle roasting, grinding, and packaging before distributing coffee products to both local and international markets.

Despite Vietnam's position as one of the world's top coffee exporters, challenges such as price volatility, quality inconsistencies, and shifting agricultural trends have impacted the industry. In recent years, a significant portion of coffee farmland has been converted to other crops like durian, raising concerns about the long-term sustainability of coffee production in the country.

4.2. Discussion: Resilience factors in Vietnam's coffee industry

To enhance resilience, coffee supply chain stakeholders have adopted various strategies across four key dimensions: Flexibility, Collaboration, Agility, and Visibility. However, there exists limitations in structural and institutional frameworks that make it difficult to mitigate these disruptions effectively.

Flexibility

In terms of products, many coffee companies are expanding beyond traditional robusta coffee to offer other categories of coffee (e.g., specialty, ready-to-drink coffee), thus reducing dependence on a sole product line and making efficient use of resources. Alongside product diversification, market diversification has also become a key approach. In the past, Vietnam heavily relied on the EU as its primary coffee export market. However, to reduce dependency and enhance Agility, Vietnamese exporters are increasingly targeting other markets in Asia, Middle East, and the United States. This diversification allows the industry to quickly shift focus in response to geopolitical or economic changes in traditional markets.

Multiple supplier relationships have also been established by several Vietnamese firms to ensure a stable supply of coffee beans during disruptions. Firms like Trung Nguyen Legend have been sourcing coffee beans from multiple regions across Vietnam, including Dak Lak, Lam Dong, and Gia Lai, rather than relying on a single origin. This strategy helps mitigate risks from localized climate issues or transportation delays, ensuring a steady supply for production and exports.

Another strategy used in enhancing Flexibility is expanding sales channels. The expansion into e-commerce (e.g. Shopee, Lazada, Amazon) has been particularly beneficial, providing

alternative revenue streams for companies and allowing businesses to adjust sales channels in response to shipping delays or market access issues. However, the overall scale of e-commerce in Vietnam's coffee industry remains relatively limited. While Vietnam's total e-commerce export value reached approximately $3.5 billion in 2023 (Lim, 2023), coffee represents only a small proportion of this figure, and the majority of smallholder farmers and cooperatives have not yet actively engaged in online sales.

Despite efforts to enhance Flexibility, Vietnam's coffee supply chain faces several structural challenges. Smallholder farmers often lack the financial resources and technical knowledge to shift between different coffee varieties or adopt sustainable farming practices, limiting their ability to respond to market and climate fluctuations. Although diversification could improve resilience, many farmers and firms struggle with high costs as this process requires significant investment in processing, certification, and branding. Yet fluctuating global demand and volatile prices deter many businesses from fully committing to diversification.

Farmers have also attempted to diversify coffee cultivation by intercropping with other crops, such as fruit trees or spices. Although there are positive outcomes from intercropping to SCR, these practices could damage the coffee supply. Many farmers are shifting to higher-profit crops (e.g. durian, macadamia, and passion fruit) due to coffee's relatively lower earnings, leading to the reduction in coffee production. With fewer areas of coffee plantation, supply decreases, leading to higher price volatility and potential shortages in global markets. This also weakens Vietnam's position as a leading robusta coffee exporter, making the industry more vulnerable to external market pressures and reducing long-term economic stability for coffee-reliant farmers.

Overall, these difficulties further amplify financial challenges. Many small and medium enterprises (SMEs) and farmers are struggling with limited access to flexible financing, making it difficult for them to invest in diversification strategies, modern equipment, or advanced farming techniques.

Agility

The Vietnamese government has also played a crucial role in enhancing supply chain Agility through policy support and infrastructure development. Programs like Vietnam Sustainable Agriculture Transformation Project (VnSAT) and the National Agricultural Extension Center (NAEC) provide farmers with access to training, resources, and market information, enabling them to respond more effectively to disruptions. In terms of infrastructure development, the Ministry of Agriculture and Rural Development (MARD) initiated a project in 2023 to develop high-quality coffee zones in the Central Highlands provinces. With a total investment of 440 billion VND from the state budget, they aimed to connect transportation infrastructure with local coffee production areas and improve the smooth flow of the supply chain.

However, Agility is also constrained by limited adoption of digital tools for real-time decision-making and supply management. While several initiatives for real-time data sharing have been introduced, many farmers still rely on traditional methods due to a lack of technical skills or access to affordable technology.

The role of middlemen in the supply chain also has a profound impact on the industry's Agility. A survey on the coffee industry in Vietnam revealed that over 95% of farmers exclusively sell their coffee to middlemen rather than other intermediaries (Enveritas, 2020). Additionally, according to Circular No. 08/2013/TT-BCT, foreign-invested enterprises in Vietnam are prohibited from directly purchasing agricultural products, including coffee, from farmers. Instead, these enterprises must buy through licensed local entities or intermediaries. As a result, middlemen play a dominant role in regulating supply flows, often withholding coffee when prices are low and releasing it when prices rise. This concentration of power hinders the supply chain's ability to make rapid adjustments in response to market shifts.

Collaboration

Farmer cooperatives and training programs play a crucial role in enhancing resilience of coffee production in Vietnam. The Nescafé Plan, implemented by Nestle since 2011 in Vietnam, focuses on training farmers in agriculture practices, distributing high-yield, disease-resistant coffee plantlets, and promoting efficient water management techniques. By 2023, the program had supported over 21,000 Vietnamese farming households, resulting in a 5% to 25% increase in coffee productivity per hectare compared to 2022 (Nestle, 2024). By equipping farmers with essential skills and knowledge, these initiatives strengthen farmers' productivity, income and improve overall resilience. Such vertical collaboration further reinforces supply chain stability, as firms directly collaborate with cooperatives or farmers to ensure stable pricing and reduce reliance on volatile global markets.

At a broader level, public-private partnerships (PPP), such as the Vietnam Sustainable Agriculture Partnership (PSAV) and the Vietnam Coffee Coordination Board (VCCB), have significantly fostered collaboration between farmers, businesses, and government agencies. Between 2010 and 2016, PSAV had organized 1,200 on-site workshops to share knowledge and address production challenges. As a result, these collaborative efforts contributed to a 12–17% increase in coffee yields, a 14% rise in farmers' average income, and noticeable improvements in coffee cherry size and plant health during the program period (MARD, 2017). PPP has facilitated close collaboration among stakeholders to promote certification adoption, expand market access, and ensure that all actors work together to strengthen the resilience of Vietnam's coffee sector.

However, the lack of trust among stakeholders is a major barrier to the Vietnam coffee industry. A 2024 report from the International Labour Organization (ILO) has highlighted that weak coordination and lack of trust create inefficiencies in Vietnam's coffee supply chain. Skepticism persists among farmers, cooperatives, exporters, and processors regarding data sharing, fair pricing, and long-term commitments. The dominance of middlemen in transactions further erodes trust by limiting direct engagement between farmers and larger buyers. Consequently, farmers may be reluctant to adopt traceability systems or share production data due to fears of being exploited by middlemen or losing bargaining power.

Visibility

The implementation of Visibility-enhancing technologies in Vietnam's coffee sector has seen significant development in the previous years. In 2024, Simexco Daklak successfully

experimented in applying artificial intelligence (AI) in coffee production and business operations. According to Simexco Daklak, AI implementation has helped the company reduce costs by over 50 billion VND. In addition, several coffee cooperatives and businesses in Vietnam have begun adopting QR code-based and blockchain tracking systems that allow end consumers to trace the coffee's origin, though such technologies remain in the early stages of adoption. These technological adaptations enhance transparency and support quicker responses to disruptions by providing real-time visibility.

Notably, the government has officially legalized regulations on the issuance of plantation area codes in Article 64 of Crop Production Law No. 31/2018/QH14, following with guidelines and instructions to enforce stricter implementation of plantation area codes. These regulations enable the systematic management and verification of coffee origin, ensuring traceability throughout the supply chain. Thus, complying with international regulations like the EUDR, which mandates that coffee imports to the EU must be deforestation-free and requires precise geolocation data for cultivation areas.

However, Visibility strategies face significant challenges due to the complexity of the coffee supply chain, which consists of a vast network of smallholder farmers and intermediaries. The connection and data-sharing between ministries, sectors, and locals are still disjointed, with each entity operating independently. Specifically, this lack of integration creates major obstacles in managing plantation area codes. According to Nguyen Minh, Director of Dong Thap Department of Agriculture and Rural Development, many production areas remain spontaneous, lacking standardized processes and consistent quality control. Budget constraints also limit regular monitoring of pesticide use and packaging standards.

Furthermore, smallholder farmers - who account for the majority of the industry - often lack the resources and technical expertise to adopt advanced technologies. Without a cohesive approach to technology adoption, the industry struggles to achieve the real-time Visibility and coordination needed to respond quickly to disruptions or changing market demands.

Another significant obstacle is lack of access to market information. Although real-time data on market prices, demand trends and export regulations are increasingly available, many smallholder farmers struggle to access and effectively utilize this information. Limited digital literacy, lack of direct engagement in international trade, and reliance on middlemen often mean that farmers often do not leverage real-time data to make informed decisions.

5. Conclusion, limitations and future research

The Vietnamese coffee industry plays a crucial role in the country’s economy, but its supply chain remains highly vulnerable to external and internal disruptions. This study has explored key factors influencing supply chain resilience, highlighting the importance of Agility, Flexibility, Collaboration, and Visibility in mitigating risks and ensuring long-term stability. While various strategies - such as market diversification, digital transformation, and public-private partnerships - have been adopted to enhance resilience, structural challenges persist, including fragmented supply chain structures, lack of trust among stakeholders, and limited access to technology and market information.

To build a more resilient coffee supply chain, policymakers and businesses must focus on

improving coordination among supply chain actors, fostering greater transparency, and supporting smallholder farmers in adopting sustainable and adaptive practices. Strengthening financial support mechanisms, enhancing digital adoption, and encouraging deeper collaboration between the public and private sectors are also essential steps toward mitigating future risks.

Limitations and Future research

Despite its contributions, this study has certain limitations. First, the research primarily relies on qualitative data collected through expert interviews, which may not fully capture the perspectives of all stakeholders in the coffee supply chain, particularly smallholder farmers and local traders. Second, the findings are context-specific to Vietnam, and while they provide valuable insights, their applicability to other coffee-producing regions may be limited. Third, due to resource and time constraints, the study does not incorporate a quantitative assessment of resilience factors, which could provide a more comprehensive evaluation.

Future research could address these limitations by conducting broader surveys with a larger sample of supply chain participants, integrating quantitative models to measure resilience levels, or examining the impact of emerging technologies—such as blockchain and AI - on supply chain adaptation. A comparative analysis between Vietnam and other coffee-producing countries could also offer deeper insights into best practices for enhancing supply chain resilience.

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