

FACTORS INFLUENCING INFORMATION SHARING IN VIETNAM'S LYCHEE SUPPLY CHAIN

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ABSTRACT

Effective information sharing is essential for supply chain efficiency amid global digital transformation. This study examines the factors influencing information-sharing practices in Vietnam's lychee supply chain, with a focus on market orientation, social embeddedness, personal motivation, and technology adoption. We employed a qualitative case study approach, conducting semi-structured interviews with farmers in Hong Giang Commune, Bac Giang Province. The findings reveal that social embeddedness has a significant impact on the efficiency of information sharing, promoting collective communication while limiting the depth of insights. Market orientation faces challenges due to demand uncertainty, and technology adoption remains constrained despite its possibilities. The study underscores challenges such as dependence on intermediaries and demand fluctuations, providing insights into enhancing information-sharing practices within agricultural supply chains.

Keywords: Information sharing, lychee supply chain, social embeddedness, digital transformation, Vietnam agriculture

INTRODUCTION

Vietnam's 4,000-year history profoundly shapes its cultural identity, rooted in agriculture, which contributed 11.96% to the country's GDP in 2023 (Statista, 2024b). Since the 1986 Reformation, agriculture has undergone significant transformation, producing a diverse range of products. Rice is the primary crop, making Vietnam a leading exporter with 7.6 million metric tons (Top *et al.* 2023/2024 | Statista, 2024). Coffee exports reached \$3.38 billion in 2023, ranking second after Brazil (Workman, n.d.). Vietnam focuses on high-value products, such as quality fruits, and collaborates with New Zealand on dragon fruit production to boost farmers' livelihoods (New Zealand Ministry of Foreign Affairs and Trade, n.d.-b).

Vietnam's agriculture is advancing in the application of science. The Ministry of Agriculture and Rural Development (MARD) reports that science and technology account for over 35% of agricultural production (WTO Center, 2023). Focused on biological advancements, farmers increasingly use mechanized machinery and information technologies for mass production. Government support aims to shift from "agricultural production" to "agricultural business," enhancing Vietnam's global role.

Effective communication with partners is vital in the global agricultural supply chain. Adequate information is necessary for production planning and stock management. However, despite technological advancements, Vietnam lags behind global standards in information sharing. Digital transformation, crucial for mass-scale sharing, faces challenges in agriculture (Dang Duy Hien, Vietnam+, 2024).

Vietnam's agricultural supply chain is complex and influenced by cultural traditions and organizational structures, not just technology. Lin's (2006) study suggests that sharing is influenced by customer uncertainty, partner commitment, and IT enablement, presenting both challenges and opportunities.

Lychees are primarily grown in southern China, Vietnam, Taiwan, Malaysia, and the Indian subcontinent, with cultivation in Vietnam dating back to the 1st Century B.C. Lychee is a popular summer fruit, supported by increased exports to over 30 countries, including China, the United States, and the European Union, in 2023. However, Vietnam's competitiveness is questioned, as it produces only 50,000 tons compared to China (1.43 million tons) and India (430,000 tons). Quality issues and low variety hamper lychee exports. The FAO encourages farmers to diversify for better quality.

Vietnam's fruit exports face challenges from inconsistent market demand and fragmentation. Limited farmer information hinders production growth. This study investigates the impact of social embeddedness on information sharing in the lychee supply chain, with a focus on vulnerable farmers.

Information sharing is crucial for supply chain performance, particularly as sharing technology becomes increasingly accessible. It is essential for decision-making across all supply chain drivers. While Vietnamese agriculture prioritizes mechanization and automation, further research is needed on effective information sharing to support farmers' decisions and balance supply with demand.

LITERATURE REVIEW

Information-Sharing in Supply Chain and Integration

Information-sharing has significantly improved supply chain efficiency, resilience, and collaboration. It addresses issues such as the bullwhip effect (Lee *et al.*, 2000b) and fosters innovation by enhancing visibility, speed, and adaptability (Scholten & Schilder, 2015). This approach is crucial for modern supply chains, which face increasing complexity due to shifting demand-supply dynamics and the presence of numerous stakeholders.

Information-sharing effectiveness depends on several factors: the relationship dimension involves trust, commitment, power dynamics, and a shared vision to foster collaboration among supply chain partners (Mohr & Spekman, 1994; Li & Lin, 2006). Advanced IT systems cannot overcome barriers to effective information exchange without trust. The Intra-Organization Dimension refers to internal IT infrastructure, top management support, company reputation, and market orientation, which are all critical factors (Fei J *et al.*, 2015). However, prioritizing IT over communication and common objectives can lead to reduced efficiency (Li & Lin, 2006). The Inter-Organization Dimension emphasizes the significance of external IT systems, organizational compatibility, social interaction habits, and legal protections in influencing collaboration between firms (Fei J *et al.*, 2015). Regular interactions enhance relational capital, reduce conflicts, and reinforce partnerships (Cheng, 2010). Lastly, the Environmental Dimension encompasses competition, environmental uncertainty, government regulations, and cultural norms impacting information-sharing practices (Fei J *et al.*, 2015). For example, regulatory frameworks and national culture can promote or hinder collaboration.

Despite its advantages, information sharing faces notable challenges. Mistrust and suspicion may lead partners to hesitate in sharing vital information due to concerns about misuse or competition (Zhou & Benton, 2007b). High levels of uncertainty among suppliers impede information-sharing, while customer uncertainty has a lesser effect (Li & Lin, 2006). Overreliance on technology can diminish effectiveness; thus, focusing solely on IT infrastructure rather than building inter-organizational relationships is detrimental. Enhanced information sharing improves supply chain integration and performance (Prajogo & Olhager, 2011). Technological advancements, like electronic communication systems, facilitate tighter synchronization and better workflow control (Zhou & Benton, 2007b). However, technology alone is insufficient; strong relational connections are equally important (Larson & Kulchitsky, 2008).

Motivation of Farmers in the Agricultural Supply Chain

Farmers are the backbone of the agricultural supply chain, playing a vital role in food security and economic stability, especially in developing nations where agriculture is a key economic sector. With technological advancements and the growing complexity of the food supply chain, farmers face changing demands, including stricter regulations, evolving customer preferences, and greater emphasis on sustainable practices. Understanding farmers' motivations is crucial to encouraging their engagement in modern agricultural development.

Key motivations for farmers include profit and survival, which, for many, particularly smallholders, are the primary driving forces since agriculture provides their main income. Smaller farmers often rely on direct sales to local markets or collectors, making survival-based decisions central to their role in the supply chain (Demartini *et al.*, 2017). Payment and market price are crucial incentives for farmers. However, challenges such as personal buyer relationships and stringent market quality and quantity requirements can hinder their participation (Kc *et al.*, 2022).

Farmers are motivated to achieve higher yields and better-quality crops, which enable them to compete effectively in the market and obtain premium prices. Farmers must adapt to increasingly stringent sustainability regulations and evolving customer preferences to access markets. These requirements often necessitate changes in farming practices, which can be challenging to implement (Menozzi *et al.*, 2015).

Embracing modern technologies, such as precision farming, can give farmers a competitive edge by enhancing efficiency and productivity. External factors, including agri-environmental programs and incentives, influence technology adoption. Uematsu *et al.* (2011) noted that U.S. cotton farmers were more likely to adopt precision farming technologies when supported by these programs.

Nevertheless, farmers face risks and constraints related to their motivation, such as economic constraints. The high cost of transitioning to sustainable practices or adopting new technologies often deters farmers, particularly in developing countries

(Menozi *et al.*, 2015; Moumouni & Streiffeler, 2010). Seasonal variability and uncertainty return further complicated investment decisions. Limited access to resources is another concern since small-scale farmers frequently lack sufficient capital, training, and infrastructure, impeding their ability to adopt advanced practices or meet market demands (Moumouni & Streiffeler, 2010).

Market pressures stemming from strict market demands regarding quality, quantity, and sustainability can overwhelm farmers, especially those in fragmented supply chains (Kc *et al.*, 2022). In response, policymakers, supply chain directors, and cooperators can implement solutions to support farmers in producing sustainably with both high quality and quantity.

Supportive policies and incentives include financial support, subsidies, and training programs to promote sustainable practices and technologies (Uematsu *et al.*, 2011). Strengthening farmer cooperatives can enhance farmers' negotiating power, improve resource access, and ensure compliance with market requirements (Demartini *et al.*, 2017). Finally, technology integration encourages affordable and accessible technologies tailored to local conditions to help farmers achieve optimal yields while meeting sustainability goals (Kc *et al.*, 2022).

Vietnam Agriculture

Agriculture is a cornerstone of Vietnam's economy, playing a critical role in food security and contributing significantly to national exports. As a major player in the global rice, coffee, and pepper markets, Vietnam's agricultural sector achieved an export turnover of \$53.22 billion in 2022, highlighting its economic importance (Viet Nam's Steps Toward Sustainable Agriculture and Food Systems at COP28, n.d.). Despite these achievements, the sector faces significant challenges that hinder its long-term sustainability and competitiveness.

Some challenges facing Vietnam's agriculture include fragmented agrifood supply chains, which remain limited to stakeholder cohesion. This fragmentation is particularly pronounced among non-cooperative and small-scale farmers who struggle to meet sustainable farming requirements and regulations (Yang *et al.*, 2021). Transitioning to sustainable practices requires long-term planning, which could disrupt traditional farming performance (Vietnam: Vietnam Issues Sustainable Agriculture and Rural Development Strategy 2021-2030 Vision to 2050, 2022).

Moreover, climate change impacts such as erratic rainfall, extreme weather, and rising temperatures exacerbate crop yield variability and quality. These climate-related disruptions threaten the entire food chain, especially since most Vietnamese agriculture is weather-dependent (Viet Nam's Steps Toward Sustainable Agriculture and Food Systems at COP28, n.d.).

Limited technological adoption is another challenge. Despite government efforts and cooperative initiatives, the adoption of modern farming technologies remains limited. Small-scale cooperatives face constraints such as understaffing, outdated techniques, and insufficient land for large-scale technology implementation (Trạch, 2024). Only 10% of Vietnamese cooperatives operate effectively, highlighting the untapped potential of this vital socio-economic structure (Vietnam Key Figures National Report, 2019).

As an export-oriented sector, Vietnamese agriculture must comply with increasingly stringent regulations in key markets like China and the EU. While cooperatives play a pivotal role in export production, generating EUR 537.9 million annually, their limited technological integration and operational inefficiencies hinder compliance and competitiveness (Vietnam Key Figures National Report, 2019).

However, opportunities exist for farmers and other organizations in Vietnamese agriculture. Strengthening cooperatives is critical to Vietnam's socio-economic development, but their potential remains underutilized. Enhancing their capacity through better management systems, technological integration, and staff training could improve productivity and sustainability (Trạch, 2024).

Addressing sustainability and climate resilience requires coordinated efforts between the government, cooperatives, and farmers. Policies promoting sustainable practices and climate adaptation strategies are essential for mitigating risks and ensuring long-term food security (Vietnam: Vietnam Issues Sustainable Agriculture and Rural Development Strategy 2021-2030 Vision to 2050, 2022).

Lastly, adopting advanced farming technologies can optimize crop yields and improve supply chain efficiency. Government support and private-sector collaboration are crucial for overcoming barriers to technological adoption (Ledesma & Bernardita, 2016).

Research Gap

The factors influencing information sharing have been thoroughly analyzed, particularly in various industries. However, studies on its application in agriculture are limited, often focusing on technology. While examining advanced technology is important, its relevance in developing nations is often overlooked.

The study primarily focuses on the upstream part of the supply chain, specifically the farmers' production chain. Although the farmers create the bulk of the value in the products, they lack the capital or understanding of how to upscale or adapt to a more volatile international market, which could lead to a serious effect on productivity. Henceforth, a study started from the upstream to understand the practice of the farmers, for further meditation in the downstream stage would be reasonable.

Further research is needed to explore how these factors affect farmers' motivations in the supply chain, which could enhance the efficiency of the lychee supply chain by optimizing payments and crop management, thus boosting farmers' economic incentives. Additionally, the capabilities of Vietnamese cooperatives in information sharing remain underexplored. Investigating this area could yield valuable insights and promote an industry mindset in export-oriented agriculture. The research question is:

“How do these factors influence information sharing in lychee production in Vietnam?”

Conceptual Model Justification

Market orientation is crucial for agricultural production in developing countries, particularly for smallholder farmers who are adapting to environmental changes and evolving market conditions. Limited financial infrastructure complicates this adaptive process, even in the face of government support. Emphasizing market orientation has been shown to enhance agricultural output through innovative methodologies. In Vietnam, research focusing on market orientation predominantly examines cooperative farmers.

Moreover, social embeddedness has a significant influence on economic outcomes, particularly within agricultural communities, where stakeholder relationships impact business operations. In Vietnam, this embeddedness assists small enterprises in problem-solving and information exchange, necessitating further investigation into its implications for lychee production. This research will scrutinize the cultural impacts on the lychee supply chain, emphasizing how information sharing is shaped by cultural determinants, focusing on uncertainty avoidance regarding trust and coordination.

Additionally, the varying communication styles influenced by cultural contexts result in distinct negotiation and collaboration strategies, rendering cultural considerations essential for comprehending information sharing among farmers.

The study will also assess payment systems, which are vital for the livelihoods of smallholder farmers. Their characteristics and frequency profoundly impact cash flow and decision-making processes. This underscores the necessity of exploring factors that enhance or impede farmer development.

Technological advancements pose challenges as well; while certain studies suggest that information technology factors might not significantly influence information sharing, others contend that electronically enabled sharing can bolster supply chain relationships. Embracing technology is paramount for facilitating effective information sharing and gaining a competitive edge, thus promoting the exploration of innovative methods, such as “pigeon carriage.”

Government support has been instrumental; since 1986, Vietnam's agricultural sector has undergone a transition from a centrally planned system to a market-oriented framework. Agricultural support has shifted from taxation to stabilized assistance since the mid-1990s, epitomized by initiatives such as the New Rural Development program, which seeks to mitigate inequality and poverty. Furthermore, government policies have fostered the development of agricultural cooperatives by providing a conducive legal environment, which has culminated in Vietnam's emergence as a leading food exporter.

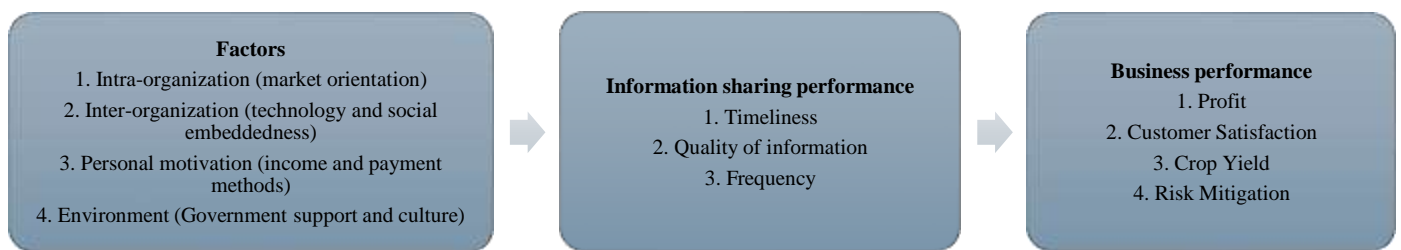


Figure 1 - Conceptual Model

With this justification above and due to the limited content of the journal, we choose the following propositions to examine:

1. Proposition 1: Information-sharing performance is associated with business performance.

2. Proposition 2: Market orientation of the cooperative is associated with information-sharing performance.
3. Proposition 3: Technology devices and platforms for exchanging information are associated with information-sharing performance.
4. Proposition 4: Social embeddedness is associated with information-sharing performance.

METHOD

This research uses a case study approach, which is considered viable for contemporary events without controlling behavior (Yin, 2002). It is suitable when the phenomenon and context boundaries blur, giving researchers limited control. The study collected data via a survey, classifying it as a mono-method qualitative study focused on information flow and actor relationships in the supply chain (Saunders, 2007).

Data Collection

Data were collected through surveys in Hong Giang Commune, Luc Ngan County. The case study focused on the Hong Giang Commune Cooperative and consisted of five interviews with farmers who export Chaozhou lychee to China, Japan, and Western nations. They are also running a project to implement modern agricultural technology.

All participants had a high school education and were cooperative members. The cooperative handles information, instruction, and quality control while the farmers manage their land. They primarily grow lychee and other fruits like pomelo or longan to utilize their land year-round. Smartphones are their primary communication tool; they use word-of-mouth to exchange crop-related information. Semi-structured interviews guide the conversation and maintain relevance. The main questions are followed by extended ones for clarification. This research focuses on lychee farmers in Hong Giang Commune, aiming to explore their perspectives on information sharing. Interviews will occur on-site after the 2024 harvest within a single day at the Cooperatives' site, the only permanent location available. Choosing a group of farmers linked through a cooperative aims to assess the connectivity between farmers and other parties.

Data Analysis

All responses are transcribed verbatim and analyzed thematically, a flexible method for identifying patterns within qualitative data (Clarke & Braun, 2016). Thematic analysis helps generate insight from common and similar patterns and understanding of the experience in people's views and journeys. The analysis followed the seven propositions above. The survey was conducted with five different members of the same local cooperative in Hong Giang Commune, each with a distinct background and experience in lychee production for both export and domestic consumption.

Information sharing and business performance

Information sharing has a significant impact on business performance, including in the agricultural sector. Participants in the survey agreed that the efficiency of information sharing, in terms of timeliness, content quality, and frequency, was stable. Farmers noted that effective communication with firms and local governments improved their profits and overall performance. Communication among farmers in Hong Giang Commune enhanced crop development as they exchanged vital information about pesticides, fertilizers, and optimal selling markets. This knowledge allowed farmers to prioritize increasing crop yields. Except for 2024, when extreme heat affected lychee growth, previous seasons had consistently produced up to 9 tons per family. Sharing information with the government also boosted high-quality lychee production through seminars and training, helping farmers leverage government support. While connections with exporters were functional, farmers indicated that communication was inconsistent. The crop yield-price paradox persists due to inadequate pre-season forecasts.

Social embeddedness and information-sharing efficiency

Social embeddedness is a key paradigm in economic studies. Unlike orthodox economics, which isolates economic activities from social structures, it emphasizes the link between social and financial activities. Embeddedness refers to the degree to which non-economic institutions constrain economic activity (Polanyi, 1944). Granovetter's 1985 concept clarified how social factors influence economic outcomes (Hess, 2009), more specifically, economic behavior, individuals, and firms in interpersonal and inter-organizational networks and relations impact different economic activities differently. In Vietnam, farmers are connected through

collective communication, strengthening ties among communes and cooperatives. They also communicate with intermediaries to stay informed about market changes, using two network types:

- Farmer–Farmer: Farmers communicate through gatherings and social media, ensuring rapid information dissemination and consistent quality across plantations. However, this method often leaves them needing to figure out individual actions without precise guidance.
- Farmer–Trader/Collector: This network facilitates the flow of information between cooperatives and firms. While cooperatives guide farmers, they operate individually. Participants initially reported no exchange disruptions but later learned that they depended on middlemen due to a lack of foreign knowledge, resulting in information imbalances that rendered them passive in uncertain scenarios.

Farmers also build relationships with local government bodies, receiving updates on new regulations, especially concerning Vietnam–China trade. Thus, social embeddedness affects information-sharing efficiency in timeliness, quality, and frequency.

Market orientation and information-sharing efficiency

Market orientation strategically focuses on identifying consumer needs and defining products for development (Kopp, 2020). This research focuses on the target market for lychee exports, which is crucial for business development as firms develop strategies for competitive advantage (Hurley, 1998). Unlike traditional marketing, which relies on promoting existing products, market orientation emphasizes customer-centered products that cater to market preferences. Within the cooperative, it optimizes production, especially for short-term crops like lychee, targeting China and the EU/Japan markets. The core issue lies with the EU/Japan market, where farmers struggle to achieve economies of scale due to uncertain demand. They possess the techniques for high-quality production but lack data for scaling. Many members shift to other markets due to inadequate capital and the inability to maintain long-term production. However, switching markets is challenging due to differing preferences. The Chinese market seeks nearly perfect lychee, while the Western market values agricultural practices and high-quality standards. Market orientation is performed pre-season, informing farmers of market quality and quantity needs. Timeliness and quality of information targeting Western markets have drawbacks, with communication often lacking valuable insights for production planning. Overall, market orientation is loosely applied, creating ambiguity for members. It provides strategic information for crop planning but offers limited improvements in information-sharing efficiency. Still, it helps farmers engage in more focused conversations aimed at the target market through updated content.

Technology devices, platforms, and information sharing efficiency

This factor improves the efficiency of information sharing. Participants actively use social media on their smartphones or personal computers, bypassing more complex systems like email. Understandably, farmers often lack access to a Customer Relationship Management (CRM) system due to their limited educational backgrounds. While their use of mobile phones may seem outdated, they effectively leverage Vietnamese apps such as "Zalo" to build a strong network that provides real-time updates and weather alerts. They also narrow their information gap by using Facebook or Google to track market trends, although these resources cannot entirely replace direct insights from intermediaries or exporters. In summary, while technology facilitates smooth communication, its effect on the efficiency of information sharing is limited. Although it enhances the timeliness of information, its effectiveness relies more on the user's skills than on the device itself. There is little concrete evidence regarding the quality or frequency of communication; however, farmers now have access to a broader range of information through various channels.

CONCLUSION AND LIMITATIONS

This study contributes to understanding factors influencing information-sharing practices in Vietnam's lychee supply chain. It highlights the critical role of social embeddedness, technology adoption, market orientation, and government support in shaping how farmers access, exchange, and utilize information to improve their business performance.

The findings reveal that social embeddedness is central to promoting frequent and timely communication among farmers through informal networks and local gatherings. However, this sharing mode often lacks depth and actionable insights, limiting its effectiveness in supporting strategic decision-making. Farmers rely heavily on interpersonal relationships and word-of-mouth communication, which facilitates rapid dissemination but may lead to incomplete or inconsistent information.

Technology adoption, particularly through smartphones and social media platforms such as Zalo and Facebook, enhances the timeliness of information flow. Farmers leverage these tools to stay updated on weather forecasts, market trends, and government policies despite the limited use of formal systems like CRM or ERP. However, the quality and depth of shared information remain constrained by reliance on intermediaries and the absence of structured digital infrastructure.

Market orientation influenced farmers' production planning and alignment with export market demands. While it provides strategic direction, it does not significantly enhance the efficiency of information sharing itself. This suggests that while farmers understand the importance of aligning with market needs, they lack direct access to reliable and timely market intelligence, especially for high-value markets like the EU and Japan.

While the scope is limited to farmers, this focus is intentional: they form the foundation of the supply chain and face the greatest challenges in accessing market intelligence and digital tools. Understanding their realities is critical to addressing systemic inefficiencies and power imbalances. Future research should extend to other stakeholders, but starting from the weakest link ensures inclusive and equitable digital transformation.

The research limitations include a small sample size due to limited farmer access post-harvest. In-depth interviews helped gather insights but are narrow in scope, suggesting further research with a larger sample is necessary. Incorporating quantitative methods may also offer a broader understanding of factors influencing information-sharing efficiency.

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