

Logistics and Cold Chain Factors Influencing the Export Performance of Thai Durian to the Chinese Market

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Abstract

Thai durian is one of Thailand's most important agricultural exports. China is the biggest market for it, both in terms of volume and value. Chanthaburi Province is very important to this trade because it is where most of the durian in Thailand is grown and shipped out. Because durian spoils quickly, the success of its export depends a lot on how well logistics work and how well the cold chain is managed throughout the whole supply chain. Quality can go down and money can be lost if there are problems or inefficiencies at any point. Consequently, this study investigates the logistics and cold chain elements affecting the export performance of Thai durian to the Chinese market, specifically concentrating on Chanthaburi Province.

A quantitative research methodology was utilized. A structured questionnaire was used to collect data from important people involved in durian exports, such as exporters, logistics service providers, and cold chain operators who send shipments to China. We looked at 200 valid responses using descriptive statistics, tests of reliability and validity, and multiple regression analysis. This study looked at logistics factors like how well transportation works, how reliable delivery is, how to manage lead times, and how to get supply chain partners to work together. Cold chain factors included keeping the right temperature, moving goods in refrigerated trucks, having cold storage facilities, and making sure that cold chain conditions stayed the same throughout the distribution process. The quality of the products, the reliability of the delivery, and the competitiveness of the exports were all used to measure export performance.

The findings demonstrate that logistics and cold chain factors significantly affect export performance. Cold chain factors, in particular, were found to have a big effect on the quality of the product and how reliable the delivery was. These results show how important good cold chain management is, along with good logistics operations, for making Thai durian exports more competitive. The study gives useful information to exporters and policymakers, stressing the need to improve logistics infrastructure and cold chain systems to help Thailand's agricultural exports grow in a sustainable way.

Keywords: Thai durian, logistics factors, cold chain management, export performance, Chinese market

1. Introduction

Durian is one of Thailand's most valuable agricultural exports. The Chinese market buys the most durian, both in terms of volume and value. Chanthaburi Province is known as Thailand's main center for growing and exporting durian. It makes a big difference to the country's agricultural income and export earnings. The province is an important part of the durian export supply chain because it connects farmers, packing houses, exporters, logistics service providers, and international markets. Because durian spoils quickly, successful exports depend a lot on good logistics and cold chain management. Logistics and cold chain systems that are well-managed not only help businesses by cutting down on losses after harvest and making sure products are of good quality, but they also help the economy grow, create jobs in rural areas, and make Thailand's agricultural exports more competitive in global markets (Christopher, 2016; Aung & Chang, 2014; Zhang, Liu, & Chen, 2020).

An analysis of logistics practices in durian export operations in Chanthaburi Province, utilizing interviews with exporters and logistics service providers, alongside industry reports, has revealed several significant issues. First, interruptions in the cold chain often happen during transportation and transshipment, which causes temperature changes that hurt the quality and shelf life of the fruit. Second, problems with transportation and delivery reliability, like traffic jams, long waits at border crossings, and inconsistent transit times, raise logistics costs and lower the rate of on-time delivery. Third, exporters can't find operational problems and make improvements on time because there aren't any systematic systems for measuring and monitoring logistics performance. These problems cause the quality to go down, the rejection rates to go up in the Chinese market, the costs of doing business to go up, and the competitiveness of exports to go down. These problems can be fixed by making systematic improvements to logistics and the cold chain, which makes them good candidates for empirical research.

To tackle the identified issues, this study utilizes logistics factors and cold chain factors as the primary independent variables within the research framework. Logistics factors stress the importance of efficient transportation, reliable delivery, managing lead times, and working together with other supply chain partners. Cold chain factors, on the other hand, stress the importance of controlling temperature, using refrigerated transportation, having cold storage facilities, and keeping the cold chain going. Previous research has shown that successfully combining logistics and cold chain management can greatly improve export performance by keeping product quality high, cutting down on losses, and making customers happier (Aung & Chang, 2014; Rong, Akkerman, & Grunow, 2011). Consequently, the implementation of these concepts is anticipated to enhance export performance, the dependent variable in this study, especially regarding product quality, delivery reliability, and competitiveness in the Chinese market.

Taking all of this into account, the researcher wants to do this study called "Logistics and Cold Chain Factors Influencing the Export Performance of Thai Durian to the Chinese Market: Evidence from Chanthaburi Province." The results of this study are anticipated to yield pragmatic insights for durian exporters, logistics service providers, and policymakers engaged in the advancement of agricultural export development. The results are applicable not only to durian exporters in Chanthaburi Province but also to other agricultural export sectors encountering analogous logistical and cold chain issues, thus enhancing the overall efficiency of Thailand's agri-food export supply chains.

1.1 Research Hypotheses

Based on the research objectives and the conceptual framework of this study, the following hypotheses are proposed:

H1: Logistics factors have a significant positive influence on the export performance of Thai durian to the Chinese market.

H2: Cold chain factors have a significant positive influence on the export performance of Thai durian to the Chinese market.

To further examine the specific dimensions of export performance, the following hypotheses are formulated:

H3: Logistics factors have a significant positive influence on product quality in Thai durian exports to the Chinese market.

H4: Logistics factors have a significant positive influence on delivery reliability in Thai durian exports to the Chinese market.

H5: Cold chain factors have a significant positive influence on product quality in Thai durian exports to the Chinese market.

H6: Cold chain factors have a significant positive influence on delivery reliability in Thai durian exports to the Chinese market.

1.2 Research Objective

1.2.1 To examine the influence of cold chain factors on the export performance of Thai durian to the Chinese market.

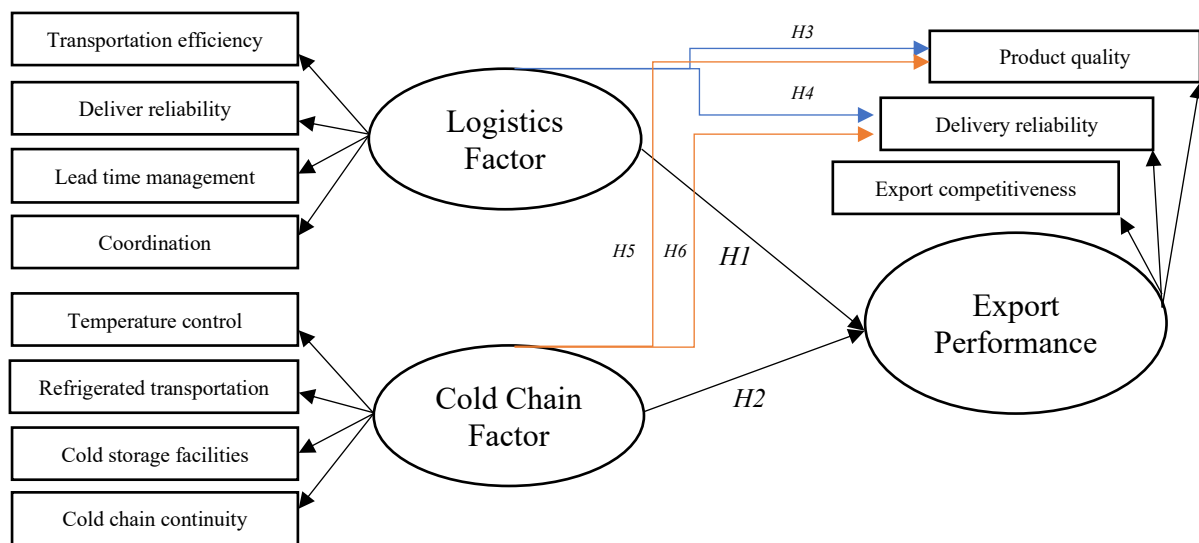
1.2.2 To analyze the relationship between logistics factors and export performance in terms of product quality, delivery reliability, and competitiveness.

1.2.3 To analyze the relationship between cold chain factors and export performance in the context of durian exports from Chanthaburi Province.

1.3 Conceptual Framework

The conceptual framework proposes that logistics factors and cold chain factors directly influence the export performance of Thai durian to the Chinese market, as illustrated in Figure 1. Logistics factors focus on transportation efficiency, delivery reliability, lead time management, and coordination, while cold chain factors emphasize temperature control, refrigerated transportation, cold storage facilities, and cold chain continuity. Export performance is reflected through product quality, delivery reliability, and export competitiveness.

Figure 1: Conceptual Framework



2. Literature Review

2.1 Export Performance in Agricultural and Perishable Product Supply Chains

The export performance of agricultural and perishable product supply chains is widely acknowledged as a complex phenomenon shaped by logistics efficiency, infrastructure quality, and supply chain management methodologies. Perishable agricultural products are very sensitive to time, temperature, and how they are handled. This means that efficient logistics and cold chain systems are necessary to keep the quality of the products high and make them competitive in international markets. Earlier research shows that production capacity alone does not determine export performance. Instead, it is the effectiveness of post-harvest handling, transportation, and coordination across the supply chain that does.

Empirical evidence from developing and emerging economies underscores that logistical bottlenecks markedly impede export performance. For example, research in Central America shows that poor road infrastructure and complicated export procedures make transportation more expensive and time-consuming, which makes perishable agricultural exports less competitive (Fries & Fernandez, 2012). Research in India indicates that inadequate cold storage facilities and restricted access to refrigerated transportation impede farmers' compliance with export standards, highlighting the necessity of cold chain preparedness for export success (Farooqui et al., 2025).

Aside from problems with infrastructure, good supply chain management has been shown to be very important for improving export performance. Structured supply chain frameworks, like the SCOR model, along with tools for making decisions based on multiple criteria, have been shown to work well in the floriculture industry and other sectors that deal with perishable goods (Marques-Perez et al., 2022). Studies from China and Vietnam indicate that supply chain optimization strategies—such as enhancing coordination among stakeholders, improving quality inspection services, and increasing market access—positively influence export performance (Yong-jian, n.d.; Ngo-Thi-Ngoc & Nguyen-Viet, 2021). These findings

collectively indicate that export performance in agricultural supply chains is significantly influenced by integrated logistics and management practices.

2.2 Logistics Factors in Export Supply Chains

Logistics factors are a key factor in export performance because they affect the cost, speed, and reliability of trade across borders. The Logistics Performance Index (LPI) literature delineates essential aspects of logistics performance, such as customs efficiency, infrastructure quality, logistics service capacity, and transportation reliability, all of which directly influence export competitiveness.

Customs efficiency, which is the speed and predictability of clearance procedures, has been shown to greatly improve export performance by cutting down on delays and transaction costs. Research in Southeast Asia shows that better customs efficiency is linked to more exports, especially in industries where time is important (Xuan et al., 2023; Huy, 2023). Infrastructure quality, including transportation networks, ports, and information systems, also helps logistics work better by making it easier and more reliable for goods to move. Evidence from ASEAN countries demonstrates that investments in maritime and transportation infrastructure substantially enhance export market penetration (Mahlous et al., 2024).

There has also been more interest in the role of logistics service providers (LSPs) in the literature. Exporters' logistics performance and strategic choices are affected by the capacity, service quality, and cost competitiveness of LSPs. Research in Vietnam's electronics and seafood export industries indicates that service reliability and transportation punctuality are significant determinants influencing exporters' utilization of logistics services (Doan et al., 2025; Nguyễn et al., 2021). Also, supportive government policies and changes to the rules have been shown to make logistics more efficient by lowering administrative barriers and encouraging supply chain integration (Nguyen & Dang, 2024). The literature consistently affirms that logistics factors are instrumental in determining export performance.

2.3 Cold Chain Management in Perishable Food Exports

Managing the cold chain is an important part of exporting perishable foods because it makes sure that the products are safe, of good quality, and meet international standards all the way through the supply chain. Poor cold chain systems often lead to lower quality, more food waste, and less competitive exports. Previous studies have found that problems with infrastructure and operations, like not having enough refrigeration and temperature changes during shipping, are big problems for keeping the cold chain intact (Farooqui et al., 2025; Pattanaik & Jenamani, 2024).

Studies show that controlling the temperature is very important for keeping the quality of exported perishable goods. For instance, it has been shown that uneven air circulation in refrigerated containers can cause temperature differences, which can speed up the loss of quality in fresh fruit exports (Pattanaik & Jenamani, 2024). Moreover, human factors, including driver training and handling practices, substantially affect cold chain efficacy, especially in developing nations where monitoring systems are still inadequate (Maldonado-Simán et al., 2015).

Recent literature also emphasizes the increasing significance of technological innovation in cold chain management. The use of Internet of Things (IoT), RFID, and cloud-based monitoring systems makes it possible to track temperatures in real time and make decisions before problems happen, which lowers losses and makes exports more reliable (Lu & Wang,

2016). Additionally, simulation-based and agent-based modeling methodologies have been utilized to enhance cold chain operations, illustrating their capacity to elevate export performance while reducing waste and environmental repercussions (Badiee et al., 2024).

From a sustainability standpoint, cold chain logistics must reconcile quality preservation with environmental concerns, especially greenhouse gas emissions (Hiranphaet, 2023). Research shows that developed economies are more likely to have sustainable cold chain practices, while developing countries have trouble because of high investment costs and broken supply chains (Akram et al., 2023; Qian et al., 2022). To make cold chain systems stronger and help exports grow in a sustainable way, we need policy changes, partnerships between the public and private sectors, and cooperation between countries.

3. Methodology

3.1 Research Design

This study employs a quantitative research methodology to analyze the impact of logistics and cold chain variables on the export performance of Thai durian to the Chinese market. A quantitative design is suitable as it facilitates empirical testing of hypothesized relationships among variables and offers objective evidence to substantiate causal inferences. The research utilizes a cross-sectional survey design to gather data from essential stakeholders engaged in the durian export supply chain at a specific moment.

3.2 Population and Sample

The study's participants are businesses and groups that export Thai durian from Chanthaburi Province. These include durian exporters, logistics service providers, cold storage operators, and freight forwarding companies that work with the Chinese market. The study area was chosen to be Chanthaburi Province because it is the biggest place in Thailand for growing and exporting durian.

A purposive sampling method was used to make sure that the people who answered the questions had firsthand experience and knowledge of durian export logistics and cold chain operations. Eligible respondents comprised managers, supervisors, and operational personnel tasked with logistics planning, cold chain management, or export coordination. A target sample size of 200 respondents was established, deemed sufficient for multivariate statistical analyses, including multiple regression analysis and structural equation modeling (Hair et al., 2019).

3.3 Data Collection

A structured questionnaire was used to gather primary data from the chosen respondents. To get more responses, the questionnaire was given out both in person and online. Before full-scale data collection, academic experts and industry professionals looked over the questionnaire to make sure it was clear and valid.

The survey had four main parts: General information about the respondents and organizations, Logistics factors, Cold chain factors, and Export performance.

A five-point Likert scale was used to rate all of the measurement items, with 1 being "strongly disagree" and 5 being "strongly agree."

3.4 Measurement of Variables

We used items from established logistics performance literature to measure logistics factors like transportation efficiency, delivery reliability, lead time management, and coordination between supply chain partners.

Indicators that measured temperature control, refrigerated transportation, cold storage facilities, and cold chain continuity throughout the export process were used to measure cold chain factors.

Export performance was evaluated as a multidimensional construct, encompassing product quality, delivery reliability, and competitiveness in the Chinese market. These indicators show how well the business is doing in both operational and market-oriented ways.

3.5 Data Analysis

Statistical software was used to analyze the data. Initially, descriptive statistics were utilized to encapsulate respondent characteristics and overarching variable trends. We used Cronbach's alpha to check the internal consistency of the measurement scales for reliability analysis. Factor analysis was used to look at construct validity.

Multiple regression analysis was used to see how logistics factors, cold chain factors, and export performance were related in order to test the research hypotheses (H1–H6). The outcomes were examined at a significance level of 0.05. The results offer empirical evidence regarding the comparative significance of logistics and cold chain factors in improving the export performance of Thai durian to the Chinese market.

4. Results and Discussion

4.1 Descriptive Statistics

This part shows the descriptive statistics of the research variables to give an idea of how respondents feel about logistics factors, cold chain factors, and how well Thai durian does in the Chinese market. Mean values and standard deviations are presented to encapsulate the central tendency and variability of each measurement item. The results provide initial insights into the relative significance and perceived efficacy of logistics and cold chain practices before hypothesis testing.

Table 1: Descriptive Statistics of Research Variables

Variable	Measurement Item	Mean	Standard Deviation (SD)
Logistics Factors	Transportation efficiency	4.12	0.63
	Delivery reliability	4.08	0.66
	Lead time management	3.97	0.71
	Coordination among supply chain partners	4.05	0.68
Cold Chain Factors	Temperature control	4.26	0.59
	Refrigerated transportation	4.18	0.62
	Cold storage facilities	4.09	0.65
	Cold chain continuity	4.21	0.61
Export Performance	Product quality	4.24	0.58

Variable	Measurement Item	Mean	Standard Deviation (SD)
	Delivery reliability	4.11	0.64
	Export competitiveness	4.03	0.69

Source: Author's analysis

Table 1 shows that people who answered the survey agreed with all of the variables at a high level, with mean values between 3.97 and 4.26. The items related to the cold chain, especially temperature control and cold chain continuity, had the highest average scores. This shows how important they are for Thai durian exports to China. Logistics factors and export performance indicators also had relatively high mean values. This suggests that respondents thought logistics efficiency and export outcomes were generally good, but could be better.

4.2 Hypothesis Testing Results

This section presents the outcomes of hypothesis testing aimed at analyzing the correlations among logistics factors, cold chain factors, and the export performance of Thai durian to the Chinese market. We used multiple regression analysis to test the proposed hypotheses (H1–H6). The standardized coefficients, t-values, and significance levels show how strong and important each relationship is. The findings furnish empirical validation for the proposed conceptual framework.

Table 2 shows that all of the proposed hypotheses (H1–H6) are statistically supported at the 0.001 level of significance. Logistics factors have a big positive effect on overall export performance ($\beta = 0.421$). This shows that transportation efficiency, delivery reliability, lead time management, and coordination among supply chain partners are all very important for boosting Thai durian exports to the Chinese market.

Table 2: Summary of Hypothesis Testing Results

H1-6	Relationship Tested	(β)	t-value	p-value	Result
H1	Logistics Factors → Export Performance	0.421	6.87	< 0.001	Supported
H2	Cold Chain Factors → Export Performance	0.536	8.12	< 0.001	Supported
H3	Logistics Factors → Product Quality	0.389	5.94	< 0.001	Supported
H4	Logistics Factors → Delivery Reliability	0.412	6.33	< 0.001	Supported
H5	Cold Chain Factors → Product Quality	0.558	8.47	< 0.001	Supported
H6	Cold Chain Factors → Delivery Reliability	0.497	7.26	< 0.001	Supported

Source: Author's analysis

Cold chain factors have an even bigger effect on export performance ($\beta = 0.536$), which shows how important it is to control temperature, use refrigerated transportation, have cold storage facilities, and keep the cold chain going to keep product quality high and meet market needs. Logistics and cold chain factors also have a big effect on the most important parts of export performance: product quality and delivery reliability. This shows that an integrated approach to logistics and cold chain management is needed for perishable agricultural exports.

4.3 Discussion

This study's results show that both logistics and cold chain factors have a big effect on how well Thai durian exports to China, especially from Chanthaburi Province. This finding corroborates the prevailing perspective in the literature that export performance in perishable agricultural supply chains is significantly influenced by post-harvest logistics efficiency and temperature-controlled distribution systems, rather than solely by production capacity.

In line with previous research on agricultural and perishable product exports, the substantial impact of logistics factors on export performance validates that transportation efficiency, delivery reliability, lead time management, and coordination among supply chain partners are essential determinants of competitiveness in international markets. Fries and Fernandez (2012) and Xuan et al. (2023) came to similar conclusions, saying that delays in logistics and procedures raise costs and make time-sensitive exports less reliable. Inefficient logistics operations can lead to longer transit times and higher handling risks for Thai durian exports, which hurts the quality of the product and its acceptance in China.

The findings further illustrate that cold chain elements have a more significant impact on export performance compared to general logistics elements. This finding is consistent with earlier studies that emphasize the crucial importance of temperature regulation and the continuity of the cold chain in maintaining the quality of perishable food items (Aung & Chang, 2014; Pattanaik & Jenamani, 2024). The Chinese market has long transportation distances and strict quality standards. Even small problems with temperature management can make quality go down faster and cause more products to be rejected. The significant influence of cold chain factors identified in this study highlights the imperative of sustaining continuous cold chain systems throughout the durian export supply chain.

Furthermore, the disaggregated analysis of export performance dimensions indicates that both logistics and cold chain factors substantially affect product quality and delivery reliability. This finding corroborates prior research indicating that export performance ought to be regarded as a multidimensional construct rather than a singular outcome (Zou et al., 1998; Katsikeas et al., 2000). By cutting down on delays and uncertainty, efficient logistics operations make deliveries more reliable. Effective cold chain management, on the other hand, directly protects the quality of the product. The combination of these two factors is necessary for long-term export competitiveness in markets for perishable agricultural products.

From a wider supply chain point of view, the results support the idea that logistics and cold chain management need to be handled together. As Marques-Perez et al. (2022) and Rong et al. (2011) have pointed out, making isolated logistics processes better isn't enough if cold chain continuity isn't also guaranteed. When it comes to durian exports from Chanthaburi Province, fragmented coordination between exporters, logistics service providers, and cold chain operators may hurt overall performance, even if each activity gets better. Consequently, integrated supply chain strategies are essential to fully achieve performance improvements.

This study enhances the existing literature by offering empirical evidence from a significant durian-producing region in an emerging economy. Prior studies have analyzed logistics and cold chain issues either independently or within distinct agricultural frameworks; this research illustrates their cumulative impact on export performance in a high-value perishable product supply chain. The results enhance comprehension of the determinants of export performance

and underscore the strategic significance of logistics-cold chain integration in bolstering the global competitiveness of Thai agricultural exports.

5. Conclusion

This study investigated the logistics and cold chain factors affecting the export performance of Thai durian to the Chinese market, focusing specifically on durian exports from Chanthaburi Province. The study utilized a quantitative research methodology to furnish empirical evidence regarding the correlations among logistics factors, cold chain factors, and export performance. The results show that both logistics and cold chain factors are very important for improving export performance, especially when it comes to product quality, delivery reliability, and export competitiveness.

The results show that logistics factors like how well transportation works, how well lead time is managed, how reliable delivery is, and how well supply chain partners work together all have a big positive effect on export performance. Also, cold chain factors like temperature control, refrigerated transportation, cold storage facilities, and cold chain continuity were found to have a strong and important effect on export results. These results show how important it is to combine logistics and cold chain management to make sure that perishable agricultural exports do well in very competitive international markets.

The findings have important effects on exporters, logistics service providers, and policymakers in real life. To keep product quality high and cut down on losses after harvest, exporters should put money into making their logistics more efficient and building up their cold chain infrastructure. Logistics service providers should work together better and be more reliable across the supply chain. Policymakers should also help build cold chain facilities and logistics skills in important production areas like Chanthaburi Province.

This study has some limitations, even though it made some good points. The data were gathered from a particular geographic region and concentrated on a singular export market, potentially constraining the generalizability of the results. Subsequent research may broaden its focus by investigating alternative durian-producing regions, integrating supplementary export markets, or employing longitudinal research methodologies to document temporal dynamics.

This study emphasizes the significance of integrated logistics and cold chain management in enhancing the export performance of Thai durian. Thailand can make its agricultural export sector more sustainable and competitive in the global durian market by fixing problems with logistics and making sure that the cold chain stays strong.

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