

The Supply Chain Management Influencing the Efficiency of the Fruit and Vegetable Import Business from China

¹Lan Hehui, ²Nutpatsorn Tanaborworpanid and
³Kietchai Veerayannon

Graduate Scholl, North Bangkok University, Thailand.
Email: ¹lan.heh@northbkk.ac.th, ²nutpatsorn.ta@northbkk.ac.th,
³kietchai.ve@gmail.com

Received November 19, 2024; **Revised** December 14, 2024; **Accepted** December 22, 2024

Abstract

This study aims to 1) study the current conditions, competitive issues, and supply chain management of the import business for vegetables and fruits from China; 2) compare the efficiency of the import business for vegetables and fruits from China based on the characteristics of the businesses, and 3) examine the supply chain management factors that affect the efficiency of the import business for vegetables and fruits from China; and 4) to propose supply chain management strategies to enhance the efficiency of the import business for vegetables and fruits from China. The research utilizes interviews as the primary data collection tool, with 20 interviewees, and a questionnaire completed by 217 respondents. The results were that: 1) The import market for vegetables and fruits from China is facing intense competition due to the increasing demand for high-quality products from consumers. To enhance business efficiency, the focus should be on market data analysis, developing strong relationships with producers in China, and utilizing technology in transportation. Responding to changing consumer demands will help create a competitive advantage in the market. 2) A statistically significant difference was found in the efficiency of the import business for vegetables and fruits from China based on the duration of business operations, with significance at the .05 level. 3) Factors of Supply Chain Management Affecting the Effectiveness of Vegetable and Fruit Import Businesses from China can jointly explain the effectiveness of vegetable and fruit import businesses from China overall, accounting for 66.00% (Adj. $R^2 = .660$). The order of influence is as follows: Returning products, Planning, and Making (Beta = .222, Sig. = .004) 4) Recommendations for supply chain management to enhance the efficiency of the import business for vegetables and fruits from China include two approaches: 1) Management approach to enhance the competitiveness of high-quality vegetable and fruit import businesses from China, and 2) development approach to improve supply chain management processes.

Keywords: Supply Chain; Efficiency; Import Business

Introduction

The import business of vegetables and fruits from China to Thailand has experienced continuous growth over the past few years. The primary reason for this growth is Thailand's participation in international trade agreements such as Free Trade Agreements (FTA) and the Regional Comprehensive Economic Partnership (RCEP), which facilitate smoother and more

efficient international trade, particularly the import of high-demand vegetables and fruits from China into the Thai market. Additionally, these imports mainly pass through the Chiang Khong Customs House in Chiang Rai Province, which handles the highest volume of imports and plays a vital role in distributing products to central and other regional markets nationwide (Chiang Khong Customs House, 2021-2023).

The expansion of this business has highlighted the critical importance of effective supply chain management (SCM) to support the growth of the fruit and vegetable import business from China and enable it to compete effectively in international markets. Given that fruits and vegetables have a short shelf life, efficient SCM is essential for managing transportation time and ensuring that products reach the end consumers in optimal condition. Good management not only directly impacts import-export businesses but also affects the overall supply chain performance. Implementing SCM practices across all processes—from Planning, Sourcing, Making, Delivery, Returns, to operational support (Enable)—enhances competitiveness, reduces costs, and contributes to the sustainability of the business.

This study focuses on the fruit and vegetable import business from China, targeting wholesale and import industry entrepreneurs, as well as experienced professionals and scholars. It aims to investigate operational challenges in this industry, such as transportation difficulties, quality control, and efficient supply chain management. The research draws on recent related studies and includes interviews with industry entrepreneurs and experts. The objective of this research is to fill knowledge gaps concerning the factors influencing the success of the fruit and vegetable import business from China.

Therefore, this research is significant for enhancing the efficiency of supply chain management in the import business by examining factors related to quantity, quality, time/location, and costs/expenses that impact business success. It will be beneficial for strategic import planning and the development of an efficient supply chain network, thereby supporting the import business's ability to adapt to market changes.

The transportation of fruits and vegetables from China to Thailand is fraught with difficulties due to the perishable nature of the goods. Managing transportation time and ensuring the products reach the end consumers in optimal condition is a significant challenge that impacts the overall efficiency and success of the import business. Maintaining the quality of fruits and vegetables during transit is critical. The research aims to identify the factors affecting quality control and how SCM practices can mitigate these issues to ensure the products remain fresh and marketable upon arrival in Thailand.

Based on the above information, the researcher is interested in studying the performance of the vegetable and fruit import business from China by analyzing whether business performance varies according to business characteristics and examining how supply chain management factors affect the performance of the vegetable and fruit import business from China. The findings will be valuable to industry entrepreneurs, government agencies, related organizations, and academics who wish to study and develop strategies for enhancing the efficiency of the fruit and vegetable import business from China in the future.

Research Objectives

1. To compare the performance of vegetable and fruit import businesses from China by classifying them based on their business characteristics.
2. To study the supply chain management factors that impact the performance of vegetable and fruit import businesses from China.

Literature Review

The concepts and theories related to Supply Chain Management (SCM)

The concept and theory of supply chain management, specifically the Supply Chain Operations Reference (SCOR) Model (Supply Chain Council, 2011), was developed to explain the characteristics of supply chain management operations and business activities in the supply chain. It aims to meet customer satisfaction and address the issue of lacking standardization by establishing common performance metrics for measuring efficiency in each process. This allows organizations to apply these practices effectively. The core processes in SCOR include:

1. **Planning:** This involves setting strategies and planning the entire supply chain operation, including forecasting customer demand, managing resources, and planning production and delivery of goods. Effective planning enables organizations to respond efficiently to market demands.
2. **Sourcing:** This is the process of procuring the necessary raw materials or products for production. It focuses on selecting quality and cost-effective suppliers and managing agreements and delivery terms to ensure raw materials meet quality standards and arrive on time.
3. **Making:** This is the process of producing goods or services according to customer demand. It involves considering product quality, production speed, and the efficient use of resources. Well-planned and managed production processes help reduce costs and improve supply chain efficiency.
4. **Delivering:** This involves managing the process of delivering goods or services to customers. It includes handling orders, transportation, and delivery to ensure that products reach customers on time and meet their expectations for quality.
5. **Returning:** This is the process of managing product returns due to defects or customer dissatisfaction. Returns allow customers to exchange or return products that do not meet quality standards or expectations. Efficient and swift return management is crucial as it helps maintain customer satisfaction and build trust.

Concept and Theory of Performance Measurement

Peterson & Plowman (1989) define performance measurement as the evaluation of a business or organization's ability to operate in various areas to achieve goals and enhance competitive capabilities. Performance measurement is divided into four main components as follows:

1. **Cost:** This refers to evaluating a business's ability to manage resources and expenses to achieve maximum efficiency. This allows the business to operate at the lowest possible cost without compromising the quality or quantity of the products.
2. **Quality:** This concerns evaluating whether the organization can produce goods or services that meet the established standards. Quality, in this context, refers to whether the products or services meet the customer's expectations.
3. **Quantity:** This measures the results of production to determine whether the quantity of goods or services is sufficient to meet market demand. Maintaining an appropriate production volume in line with customer needs enables a business to remain competitive.
4. **Time:** This evaluates whether the organization can perform its operations according to the scheduled time. This includes production, delivery, and service provision. Efficient operations conducted on time help reduce delays and ensure that customer needs are met promptly.

Teerapornlertratt et al. (2024). Marketing Mix Factors for Service Business and Corporate Image Affecting the Decision to Use Road Freight Services. The objectives of the study are 1) to examine the marketing mix factors for service businesses, corporate image, and decision-making in using road freight transport services, 2) to test the impact of the marketing mix factors for service businesses on decision-making in using road freight transport services, and

3) to test the impact of corporate image on decision-making in using road freight transport services. This research provides insights into factors influencing customer decision-making, crucial for developing marketing strategies and improving services in the road freight transport business. This study investigated road freight transport service users in Thailand, selecting 180 participants using a specific random sampling method. A questionnaire, which was validated for content (IOC=0.67) and reliability (Cronbach's Alpha Coefficient=0.59), was used to assess user opinions. Data collection focused on Bangkok and its vicinity, with sample proportions determined by the density of transport activity in each area to cover a wide range of businesses using road freight transport services. Descriptive statistics were employed for general data and opinion analysis, while multiple regression analysis was used to find statistically significant relationships between variables at the 0.05 level.

The study found that service processes, marketing promotions, physical characteristics, and corporate image are the primary factors influencing customer decision-making, with corporate image rated the highest, reflecting its importance in the overall perception and reputation of the corporation. However, most factors such as products, price, location, marketing promotion, staff, and service process do not significantly impact the decision to use road freight services, except for physical characteristics, which are the only factors significantly affecting the decision to use the service. Corporate image does not significantly influence the decision to use road freight services. The research highlights the importance of service processes and physical characteristics in the road freight transport business. While corporate image plays a key role in creating customer satisfaction and decision-making, other elements of the service business marketing mix factors are less significant compared to physical characteristics in influencing service usage decisions.

Ayasanond et al. (2024). Factors Affecting the Service Efficiency of International Freight Forwarding Companies. The main objectives are 1) to study opinions on factors affecting company efficiency, and 2) to analyze the relationship between information systems, service networks, and customer relationship management with service efficiency in international freight forwarding businesses. The goal is to assist companies in this industry to improve and develop operational strategies for enhanced efficiency.

Methodology: This quantitative research conducted surveys using questionnaires to analyze the relationship between various factors and the service efficiency of international freight forwarding companies. A purposive sampling of 385 participants was used, collecting data via Google Forms distributed through online networks. The IOC value was 0.67, and Cronbach's Alpha was 0.72. Descriptive statistics were used to explore demographic characteristics and assess the importance of service factors, utilizing means and standard deviations for summarizing basic data. Inferential statistics focused on correlation analysis, employing correlation coefficients and P-values to examine relationships and statistical significance, affirming the role of information systems, service networks, and customer relationship management in service efficiency.

Results: The study found that (1) the general demographic of the 385 respondents was predominantly male, aged 21-30, at officer level, in the service industry sector, belonging to large-sized organizations, and involved in more than 15 import-export transactions per month; (2) significant factors for the service efficiency of international freight forwarding companies included information systems, service networks, and customer relationship management, all highly important for service efficiency; (3) information systems, service networks, and customer relationship management positively correlated with enhancing service efficiency. On

Collusion: The research indicates that key factors in the business of international freight forwarding companies, such as information systems, service networks, and customer relationship management, have a positive relationship with company service efficiency.

Conceptual Framework

This research is a quantitative study. The researcher has developed a conceptual framework for the study based on the Supply Chain Management concepts from the Supply Chain Operation Reference Model (SCOR Model) combined with the performance concepts of Peterson and Plowman (1989). This framework is applied to assess the performance of the business involved in the importation of vegetables and fruits from China. The details are as follows:

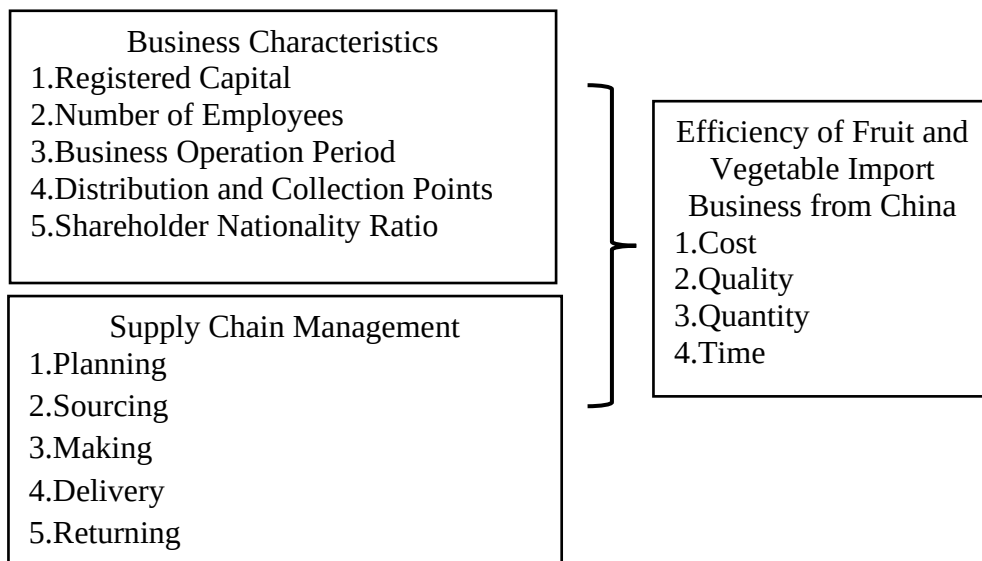


Fig.1 Conceptual Framework

Research Methodology

This research uses a questionnaire as a research tool to collect data for quantitative analysis, developed from the research conceptual framework as follows:

Instrument Used in the Research

The instrument is a questionnaire, which was created based on a review of relevant concepts, theories, documents, and previous research to guide the development of the questionnaire. The framework and content were defined according to the objectives and elements needed to gather results for the study. The quality of the instrument was then checked by presenting the draft questionnaire to experts, academics, and the supervising professor to evaluate its content validity and question suitability, as well as language appropriateness. The feedback received was used to revise and improve the questionnaire to ensure its completeness before use. The researcher then calculated the Index of Item Objective Congruence (IOC) from the opinions of 5 experts, obtaining an IOC score of 0.840. After ensuring the content validity, the questionnaire was tested for reliability by revising it based on expert feedback and conducting a try-out with 30 participants. The reliability of the questionnaire was then analyzed using Cronbach's Alpha Coefficient, resulting in a reliability score of 0.908 for supply chain

management and 0.753 for the performance of the business importing vegetables and fruits from China. These scores are considered acceptable.

Data Collection: The researcher obtained permission to collect data from businesses involved in importing vegetables and fruits from China. Data was then collected using the questionnaire. Afterward, the completed questionnaires were reviewed, and only those that were fully completed and met the predetermined criteria were selected for analysis.

Statistical Analysis: Descriptive statistics were used to describe the characteristics of the business, including the arithmetic mean, standard deviation (SD), and inferential statistics were used to compare the performance of the businesses importing vegetables and fruits from China. The statistical methods applied include One-Way ANOVA and Multiple Regression Analysis.

Research Results

Objective 1: To compare the performance of businesses importing vegetables and fruits from China, classified by business characteristics. The results showed significant differences in the performance of businesses importing vegetables and fruits from China, categorized by business characteristics, with differences in the duration of business operation at a statistically significant level of 0.05.

Table 1: Comparison of the differences in the performance of businesses importing vegetables and fruits from China, classified by business duration.

The efficiency of the business importing vegetables and fruits from China		Source of Variance	SS	df	MS	F	Sig.
Cost	Between Groups		2.273	3	.758	.905	.440
	Within Groups		178.445	213	.838		
	Total		180.719	216			
Quality	Between Groups		.431	3	.144	.320	.811
	Within Groups		95.715	213	.449		
	Total		96.146	216			
Quantity	Between Groups		.135	3	.045	.241	.868
	Within Groups		39.772	213	.187		
	Total		39.907	216			
Time	Between Groups		.633	3	.211	3.446*	.018
	Within Groups		13.038	213	.061		
	Total		13.671	216			
Overall	Between Groups		.223	3	.074	.924	.430
	Within Groups		17.097	213	.080		
	Total		17.320	216			

* Statistical significance at the 0.05 level.

From Table 1, it was found that the overall efficiency of the fruit and vegetable import business from China, categorized by the duration of operation, did not show any significant differences. However, when considering individual aspects, the efficiency of the business showed significant differences in the aspect of time (Time) when categorized by the duration of operation at the 0.05 significance level. Therefore, the Least Significant Difference (LSD) method was used for pairwise comparison, as shown in Table 2.

Table 2: Comparison of the differences in the efficiency of the fruit and vegetable import business from China in terms of time (Time), categorized by the duration of operation.

(n=217)

Business operation duration	$\bar{X}$	Business operation duration			
		1-3 years	4-6 years	7-10 years	More than 10 years
1-3 years	3.94	-	.031 (.535)	-.138** (.010)	-.113* (.026)
4-6 years	3.91	-	-	-.107* (.023)	.082 (.060)
7-10 years	3.80	-	-	-	-.025 (.593)
More than 10 years	3.83	-	-	-	-

** Statistically significant at the .01 level

* Statistically significant at the .05 level

From Table 2, it can be observed that the business efficiency in importing vegetables and fruits from China, in terms of time, is lower for businesses with 1-3 years of operation compared to those with more than 10 years of operation. Additionally, businesses with 4-6 years of operation have lower time efficiency compared to those with 7-10 years of operation.

Objective 2: The factors in supply chain management that affect the performance of the business importing vegetables and fruits from China. The results showed that the analysis of the relationship between supply chain management factors and the performance of the business importing vegetables and fruits from China revealed that supply chain management factors include Planning, Sourcing, Making, Delivery, Returning, and the performance of the business importing vegetables and fruits from China includes Cost, Quality, Quantity, and Time. From the sample group of wholesale vegetable and fruit importers from China, it was found that the five supply chain management factors together explained 66.00% of the performance of the business importing vegetables and fruits from China ($\text{Adj. } R^2 = .660$) with statistical significance at the .01 level. The factors in order of influence were: Returning ($\text{Beta} = 1.027$, $\text{Sig.} = .000$), Planning ($\text{Beta} = .597$, $\text{Sig.} = .000$), and Making ($\text{Beta} = .222$, $\text{Sig.} = .004$). These three factors had a statistically significant positive effect at the .01 level, while other factors did not show statistical significance.

Table 3: Analysis of the Relationship Between Supply Chain Management Factors and the Efficiency of the Business in Importing Vegetables and Fruits from China: An Overview

Overall	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	1.659	.174		9.506**	.000
Planning	.241	.043	.560	.597**	.000
Sourcing	.190	.102	.429	.869	.063
Making	.166	.057	.222	.918**	.004
Delivery	.085	.050	.220	1.701	.090
Returning	1.077	.238	1.027	4.529**	.000
R	R^2	Adj. R^2	SE(est)	F	Sig.

.817	.668	.660	.165	84.772**	.000
------	------	------	------	----------	------

** Statistically significant at the .01 level

From Table 3, it was found that the five supply chain management factors together explained 66.00% of the performance of the business importing vegetables and fruits from China (Adj.R2 = .660), with statistical significance at the .01 level. The factors in order of influence were: Returning (Beta = 1.027, Sig. = .000), Planning (Beta = .597, Sig. = .000), and Making (Beta = .222, Sig. = .004). These three factors had a statistically significant positive effect at the .01 level, while other factors did not show statistical significance.

Discussions

1. Comparison of the performance of the business importing vegetables and fruits from China, categorized by business characteristics

The analysis was conducted using one-way ANOVA. It was found that there was a significant difference when classified by the duration of business operation at the .05 level. Therefore, the Least Significant Difference (LSD) method was used for pairwise comparison. The results of the comparison of performance in all four areas of the business importing vegetables and fruits from China, classified by the duration of business operation, revealed that, for businesses operating for 1-3 years, the performance in the area of Time differed from businesses operating for 7-10 years and more than 10 years. Businesses with 1-3 years of operation had lower performance in terms of Time than those with 7-10 years and more than 10 years of operation. For businesses operating for 4-6 years, the performance in the area of Time differed from businesses operating for 7-10 years. Businesses with 4-6 years of operation had lower performance in terms of Time than those with 7-10 years of operation.

These findings are consistent with the research of Sakorn (2020), which studied the performance of agricultural product import businesses in Thailand, and the research of Thipkaew (2021), which found the impact of business operation duration on business performance. Additionally, the research of Vichitkan (2019) examined the relationship between operational performance and the duration of business operation in the food industry. These studies help to understand the relationship between the duration of business operation and the performance of the business importing vegetables and fruits from China.

2. Supply Chain Management Factors Affecting the Performance of the Business Importing Vegetables and Fruits from China

The analysis of the relationship between supply chain management factors and the performance of the business importing vegetables and fruits from China revealed that the supply chain management factors include Planning, Sourcing, Making, Delivery, and Returning, while the performance of the business importing vegetables and fruits from China includes Cost and Quality. This aligns with the research of Bannakarn (2021), who studied strategies to improve the efficiency of the supply chain in the business of importing vegetables and fruits, focusing on improving performance in terms of quality and cost. Regarding Quantity and Time, from the sample group of wholesale vegetable and fruit importers from China, it was found that the five supply chain management factors together explained 66.00% of the performance of the business importing vegetables and fruits from China (Adj.R2 = .660), with statistical significance at the .01 level. The factors in order of influence were: Returning (Beta = 1.027, Sig. = .000), Planning (Beta = .597, Sig. = .000), and Making (Beta = .222, Sig. = .004). These three factors had a statistically significant positive effect at the .01 level, while other factors did not show statistical significance. This is consistent with the research of Malila (2019), which studied supply chain management to improve efficiency in the business of importing vegetables and fruits. The study found that improving planning, sourcing, and delivery processes had a significant effect on reducing operational costs and increasing product quality.

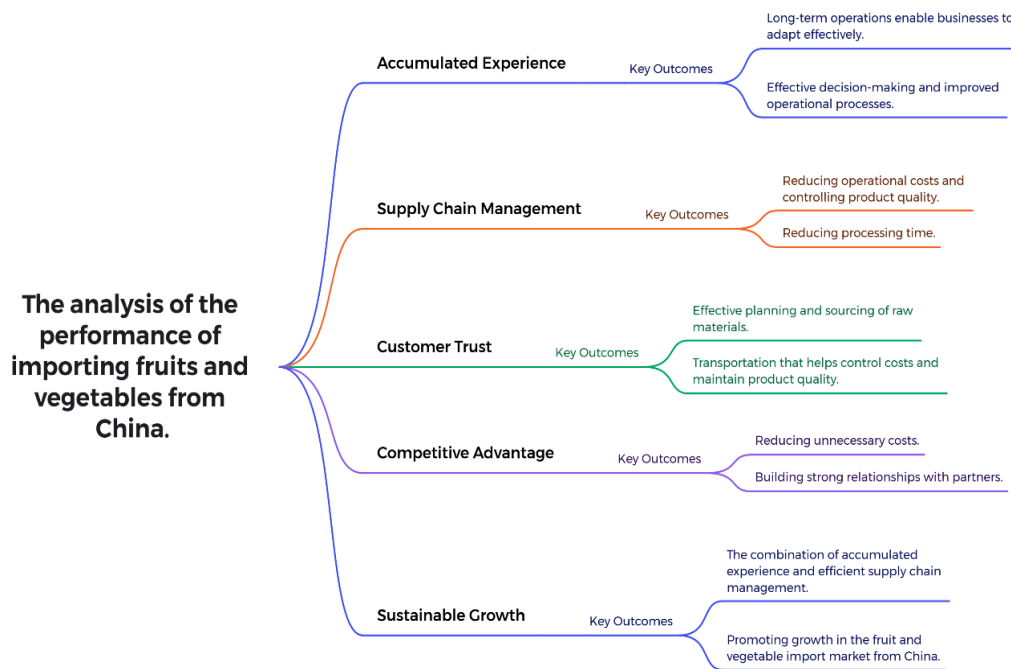
Additionally, creating an efficient management system helped enhance the competitiveness of the vegetable and fruit import business in the market.

Knowledge from Research

The analysis of the impact of business operational duration and supply chain management on the performance of the fruit and vegetable import business from China shows that long-term accumulated experience and efficient supply chain management play a significant role in reducing costs, improving product quality, and shortening processing time. This helps enhance the business's competitiveness in the fruit and vegetable import market.

Conclusion

The analysis indicates that accumulated experience from long-term business operations and efficient supply chain management play a crucial role in enhancing the performance of the fruit and vegetable import business from China. Businesses with extensive operational experience are better equipped to adapt to and handle various challenges, resulting in more effective decision-making and improved operational processes. Efficient supply chain management helps reduce operational costs, control product quality, and shorten processing time. Effective planning, sourcing of raw materials, and transportation allow businesses to control costs and maintain product quality, thereby fostering customer trust and satisfaction. The combination of accumulated experience and efficient supply chain management enables businesses to create a competitive advantage, reduce unnecessary costs, and maintain strong relationships with partners, leading to sustainable growth in the fruit and vegetable import



market from China. As in the following mind mapping

Fig. 2 the Mind mapping

Suggestions

1.The Food and Drug Administration (FDA) should strengthen its oversight of food safety standards, particularly regarding chemical residue inspection and quality assurance of

imported fruits and vegetables, through the implementation of policies that facilitate entrepreneurs' access to explicit quality standards.

2. The Ministry of Commerce fulfills dual roles by supporting entrepreneurs through marketing and trade promotion initiatives while regulating fruit and vegetable imports in accordance with trade and tax regulations. Additionally, the Ministry provides comprehensive training programs to enhance entrepreneurs' competencies in supply chain management and business administration, thereby strengthening their market competitiveness.

3. The Thai-Chinese Fruit and Vegetable Importers Association enhances trade cooperation, promotes business development, and mediates negotiations between government agencies to establish transparent, internationally recognized quality standards. Furthermore, the association facilitates members' access to innovative product management and quality inspection technologies while addressing challenges related to import control measures. The association also strengthens relationships between Chinese producers and Thai entrepreneurs to promote knowledge exchange and technological innovations in production and transportation processes.

References

- Angyurekul, N., & Suchato, R. (2013). *Opportunities and obstacles of fruit trade between Thailand and Indonesia under the ASEAN Economic Community framework: Final research report*. Office of Science, Research and Innovation Promotion Committee.
- Ayasanond, C., Munkongtum, C., & Thriyawanich, C. (2024). Factors affecting the service efficiency of international freight forwarding companies. *Interdisciplinary Academic and Research Journal*, 4(2), 645–662. <https://doi.org/10.60027/iarj.2024.275054>
- Malila, S. (2019). Supply chain management to enhance efficiency in the vegetable and fruit import business. *Journal of Business Management*, 8(2), 75–90.
- Peterson, E., & Plowman, G. E. (1989). *Business organization and management* (3rd ed.). Irwin.
- Sakorn, S. (2020). A study of the impact of fruit imports from China on the Thai economy. *Journal of Trade and Investment*, 12(2), 45–60.
- Supply Chain Council. (2011). *Supply chain operations reference (SCOR) model version 11.0*. Supply Chain Council. <https://www.supply-chain.org/>
- Thipkaew, J. (2021). Analysis of factors influencing supply chain management in the fruit import business. *Journal of Management*, 18(2), 100–115.
- Teerapornlertratt, P., Ayasanond, C., & Munkongtum, C. (2024). Marketing mix factors for service business and corporate image affecting the decision to use road freight services. *Interdisciplinary Academic and Research Journal*, 4(2), 605–622. <https://doi.org/10.60027/iarj.2024.275003>
- Vijitkan, N. (2019). Strategies to improve efficiency in supply chain management for fruit import businesses. *Journal of Business Management*, 10(1), 45–60.