

An Analysis of Competency-Based Supply Chain Operations of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province

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Abstract

This study aimed to (1) analyze the competencies of supply chain processes among community enterprises and chemical free vegetable entrepreneurs in Chiang Mai Province, and (2) propose practical guidelines for enhancing their operations. A quantitative research approach was employed with a sample of 385 participants. Data were collected through questionnaires and analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation) and multiple regression analysis.

The results indicated that the overall competency levels across supply chain processes planning, sourcing, production, delivery, and return were rated high. Collectively, these five variables explained 71.7% of the variance in operational performance with statistical significance ($p < 0.05$). The proposed development guidelines emphasize strengthening business management knowledge, upgrading production standards to meet international levels, expanding marketing channels (particularly online platforms), and fostering strong local brand identities. Furthermore, the study highlights the importance of human capital development and collaboration among government, private sector, and educational institutions to reinforce and sustain the growth of community enterprises in the long term.

Keywords: Supply Chain Competency; Community Enterprises; Chemical-Free Vegetable Entrepreneurs

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Introduction

In an era where consumers are increasingly concerned about food safety and health, the market for pesticide-free and organic vegetables has been expanding steadily both domestically and internationally (Nitzko, S., 2024). This trend is especially evident in Chiang Mai Province, a key agricultural hub in northern Thailand, which is rich in natural resources, favorable climate, and strong community-based knowledge factors that are conducive to safe and environmentally friendly vegetable production (Gadhoke, 2023). However, to enhance and sustain the competitiveness of agricultural entrepreneurs, it is essential to consider the entire supply chain system from production and storage to transportation and distribution to ensure responsiveness to market demands in an efficient manner (Tan, 2001). Although community enterprises and pesticide-free vegetable entrepreneurs play a critical role in driving the grassroots economy and promoting food security within their communities, in practice, they face numerous challenges. These include inadequate production planning aligned with market demand, inconsistent quality control, underdeveloped logistics systems, and constraints in labor and technology (Angwattanakit, S. & Anuphan, N., 2020). These issues negatively affect the overall supply chain performance, resulting in resource and time losses and missed market opportunities, ultimately diminishing long-term competitiveness.

Understanding the supply chain and evaluating the competencies of each process within it is, therefore, a crucial necessity especially in a globalized and increasingly complex agricultural market (Mentzer, et al., 2001). Despite the strong commitment of community enterprises and pesticide-free vegetable entrepreneurs in Chiang Mai to produce safe and consumer-responsive products, practical challenges persist throughout the operational processes. A key issue is the lack of accurate market information in production planning, which leads to oversupply in certain seasons and shortages in others clear signs of inefficiency. Moreover, sourcing quality and standardized raw materials remains a challenge due to price and quality inconsistencies. Labor management also relies heavily on elderly workers, and there is a lack of systematic knowledge transfer to the younger generation.

Given these circumstances, there is an urgent need to analyze the operational performance of community enterprises and pesticide-free vegetable entrepreneurs in Chiang Mai using a competency-based supply chain framework. This research aims to evaluate the existing capabilities at each stage of the supply chain and to identify

sustainable and systematic development strategies. The study applies the SCOR Model to assess competencies across five key areas: Plan, Source, Make, Deliver, and Return. The research findings are expected to help relevant agencies develop targeted policies and support local entrepreneurs in capacity building. This will ultimately add value to the safe agricultural supply chain and contribute to food security and sustainable agricultural systems at the local level.

Research Objectives

1. To analyze the competency of supply chain processes of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province
2. To propose guidelines for improving the operations of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province

Research Methodology

This study is quantitative research aiming to analyze the competency-based supply chain performance of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province. The SCOR Model was employed as the primary conceptual framework to analyze the structural and systematic aspects of the operations. The research process consisted of four key steps:

1. Population and Sample Group The population of this study comprised community enterprises and chemical-free vegetable entrepreneurs distributed across Chiang Mai Province. As there was no definitive population database available, a reliable sampling approach was required to ensure representativeness. The researcher employed Yamane's formula (1967), which is suitable for cases where the total population cannot be precisely determined. A 95% confidence level and a 5% margin of error were set, resulting in a calculated sample size of 385 respondents. This sample size is considered adequate for quantitative analysis at the regional level.

2. Research Instrument The primary research instrument was a structured questionnaire designed based on a five-point Likert scale (ranging from "Strongly Agree" to "Strongly Disagree"). The questionnaire was developed based on the SCOR Model (Plan, Source, Make, Deliver, Return) and relevant supply chain management concepts. The draft questionnaire underwent content validity assessment by three experts. The Item-Objective Congruence (IOC) scores ranged from 0.68 to 1.00, indicating acceptable validity. Following expert feedback, the questionnaire was

revised and subsequently tested for reliability using a pilot sample of 30 respondents. Cronbach's Alpha was applied to ensure the internal consistency and reliability of the instrument prior to full-scale deployment.

3. Data Collection Upon receiving approval from the Graduate School of Maejo University, the researcher collaborated with the Chiang Mai Provincial Agricultural Office to facilitate access to the target group. Data were collected using an online questionnaire distributed to 385 community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai. After collecting all responses, the researcher thoroughly reviewed the data for completeness and quality to ensure the suitability of the dataset for accurate and comprehensive statistical analysis.

4. Data Analysis The collected data were analyzed using descriptive statistics, including percentage (to represent data proportion), mean (to indicate central tendency), and standard deviation (to reflect data dispersion). Additionally, F-test (ANOVA) was used to examine differences in supply chain performance across various groups of enterprises or entrepreneurs. The data were presented in well-organized tables accompanied by detailed explanations. This facilitated an in-depth analysis of existing problems and development pathways at the supply chain process level, in accordance with the SCOR Model. The findings are intended to inform targeted and sustainable policy and strategic support for local enterprises.

Results

The researcher conducted a study entitled "An Analysis of Competency-Based Supply Chain Operations of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province." The findings of the study can be summarized according to the following steps:

Part 1 General Information of the Respondents, The study found that the majority of organic vegetable entrepreneurs in Chiang Mai Province are male (52.20%) and are predominantly middle-aged, with an average age of approximately 46 years. This reflects a readiness in terms of professional experience. Most respondents hold a bachelor's degree (45.97%), which is higher than the average educational level of farmers in general. This indicates that organic farming today requires a higher degree of knowledge, skill, and systematic management. It also suggests a positive trend in the participation of younger and more highly educated individuals in promoting sustainable agriculture.

Part 2 An Analysis of the Competency of Supply Chain Processes of Community Enterprises and Chemical-Free Vegetable Entrepreneurs in Chiang Mai Province, with a summary of each key aspect as follows.

An Analysis of Process Competency in the Supply Chain of Community Enterprises and Pesticide-Free Vegetable Entrepreneurs in Chiang Mai Province	$\bar{X}$	S.D.	results
1. Plan	3.66	0.81	High
2. Source	3.94	0.74	High
3. Make	3.65	0.79	High
4. Deliver	3.89	0.80	High
5. Return	3.96	0.81	High
Total	3.82	0.79	High

Table 1 Analysis of Process Competencies in the Supply Chain of Community Enterprises and Chemical-Free Vegetable Entrepreneurs in Chiang Mai Province

The research findings, as presented in the table, indicate that the supply chain processes of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province exhibit a high level of competency across all areas. In particular, procurement and reverse logistics stand out, reflecting effective resource management and strong customer responsibility. However, areas such as planning and production still reveal gaps for improvement, especially in the application of technology and data to enhance operational efficiency.

The results of the Pearson Correlation test between the independent variables and the dependent variable (Y) revealed the correlation coefficients among the variables, as shown in Table 2.

Variable	X ₁	X ₂	X ₃	X ₄	X ₅	Y
Plan (X ₁)	1	0.592**	0.594**	0.614**	0.601**	0.538**
Source (X ₂)		1	0.604**	0.642**	0.678**	0.651**
Make (X ₃)			1	0.700**	0.708**	0.708**
Deliver (X ₄)				1	0.648**	0.655**
Return (X ₅)					1	0.666**

*Statistically significant at the 0.01 level

Table 2 The results of the Pearson Correlation test between the independent variables and the dependent variable (Y)

Based on the table showing the correlation coefficients between the supply chain management processes according to the SCOR model and the operations of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province, all variables exhibit correlation coefficients lower than 0.75. This indicates that the variables are moderately correlated, and there is no issue of multicollinearity among the predictive variables, as shown in Table 3.

Variable	B	SE	Beta	t	Sig.	Collinearity Statistics	
						Tolerance	VIF
Intercept	0.479	0.176		0.449	0.000		
Plan (X1)	0.309	0.064	0.248	4.829	0.000*	0.488	5.142
Source (X2)	0.181	0.071	0.142	2.548	0.011*	0.267	3.745
Make (X3)	0.264	0.047	0.271	5.620	0.000*	0.199	5.018
Deliver (X4)	0.188	0.067	0.163	2.823	0.005*	0.167	2.001
Return (X5)	0.309	0.064	0.248	4.829	0.000*	0.272	3.679

R = 0.847 R^2 = 0.717 Adjusted R^2 = 0.715

*Statistically significant at the 0.05 level

Table 3 Multiple Regression Analysis of
SCOR Processes Affecting Community Enterprise Operations

The regression coefficient analysis in the table tests the relationship between each independent variable and the operational performance of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province, based on the SCOR Model supply chain management processes. The regression analysis reveals a constant coefficient of 0.479 and an R^2 value of 0.717, indicating that the independent variables can predict the dependent variable with an accuracy of 71.7%, while the remaining 28.3% is influenced by other factors. In conclusion, the supply chain management processes based on the SCOR Model namely planning, sourcing, production, delivery, and return significantly affect the performance of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province at the 0.05 significance level.

Part 3: Proposed Guidelines for the Development of Community Enterprises and Chemical-Free Vegetable Entrepreneurs in Chiang Mai Province. The study found that community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province lack a clear and structured management system, including areas such as business planning, accounting, and organizational management. Therefore, it is

essential to promote knowledge and management skills, as well as develop transparent and sustainable administrative mechanisms to ensure efficient and continuous operations. In terms of production and product standards, while chemical-free vegetables are being cultivated, there are still limitations in knowledge and compliance with production standards such as GAP or Organic Thailand. Development efforts should focus on building academic knowledge, promoting group-based production, and improving product quality to meet international standards, thereby enhancing consumer confidence. Regarding marketing, the distribution channels remain limited, and there is a lack of branding and market expansion strategies. Key development guidelines include promoting online marketing channels, building networks with health-conscious markets, and enhancing the image of safe, high-quality local products to increase value and reach new customer segments. Finally, the development of human capital and collaborative networks is a crucial factor. It is recommended to encourage peer learning among farmer groups, involve youth in enterprise development, and provide business mentorship. Additionally, partnerships with the government, private sector, and academic institutions should be strengthened to build resilience and ensure the long-term sustainability of community enterprises.

Discussion

Based on the study titled “An Analysis of Competency-Based Supply Chain Operations of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province,” the following key issues are identified for discussion.

1. The analysis of supply chain process competencies among community enterprises and pesticide-free vegetable entrepreneurs in Chiang Mai Province revealed that, overall, performance in all areas was at a high level particularly in procurement and reverse logistics. This reflects effective resource management and strong customer responsibility. However, planning and production remain areas with room for development, especially in the use of technology and data to enhance operational efficiency. This aligns with the findings of Pinta, L. (2022), who emphasized that the management of GAP-certified vegetable supply chains in Chiang Mai should focus on input procurement, awareness of GAP standards, and efficient delivery. Similarly, the research by Thongkamnush, et al. (2022) found that supply chain management for safe agricultural products in Chiang Mai should emphasize

connectivity and relationships within the supply chain, as well as addressing challenges and obstacles. Yossuk & Kawichai (2017) also indicated that the development of organic agriculture in Chiang Mai requires collaboration among all sectors, including support from government agencies and relevant organizations. Meanwhile, Angwattanakit & Anuphan (2020) highlighted the importance of enhancing the capacity for managing organic agricultural product supply chains within communities. Taken together, these studies suggest that improving operations among community enterprises and pesticide-free vegetable entrepreneurs in Chiang Mai should focus on strengthening capabilities in planning and production through the integration of technology and data-driven decision-making. This would enhance both the efficiency and sustainability of the supply chain.

2. Guidelines for Improving the Operations of Community Enterprises and Chemical-Free Vegetable Entrepreneurs in Chiang Mai Province. The study reveals several key areas that influence the potential and sustainability of community enterprises and small-scale entrepreneurs in the region, particularly in organizational management, production, marketing, human capital development, and collaborative networks.

1. Organizational and Business Management: Most community enterprises lack efficient management systems, such as business planning, accounting practices, and systematic organizational administration. This weakness affects their ability to grow and adapt to market competition. This finding is consistent with the study by Kumsak, et al. (2025), which identified the lack of management knowledge and financial governance as major barriers for community enterprises in Northern Thailand. These limitations hinder effective long-term planning. Therefore, enhancing management skills, establishing transparent governance systems, and providing organizational management training are crucial developmental strategies that should be prioritized.

2. Production and Product Standards: Although farming groups are capable of cultivating chemical-free vegetables, they still face limitations in knowledge, understanding, and implementation of production standards such as GAP (Good Agricultural Practices) and Organic Thailand. This is aligned with Yossuk & Kawichai (2017), who pointed out that small-scale farmers often lack access to standard certification due to insufficient academic support and lack of collective production systems. Recommended strategies include strengthening knowledge transfer from government and academic institutions, promoting producer cooperatives for resource sharing and learning, and supporting systematic access to

international standards. 3. Marketing and Value Creation: Marketing remains a significant challenge due to limited distribution channels, lack of branding strategies, and the inability to expand the customer base sustainably. This study supports the findings of Changprachak (2025), which observed that community products often rely on traditional marketing methods and lack the use of technology and digital tools to reach consumers. Development strategies should focus on building distinctive local brands, utilizing online platforms such as e-commerce, and creating networks with health markets and health-conscious consumer groups. These efforts would help increase product value and foster sustainable growth. 4. Human Capital Development and Collaborative Networks: Human capital is a fundamental driver of sustainable development, particularly in agriculture, which depends on community cooperation and shared learning. The findings are consistent with Micheline & Fiorentino (2012), who emphasized the concept of “Shared Value” creating mutual benefits among businesses, communities, and various sectors which leads to resilience and sustainability. Therefore, engaging youth in development initiatives, providing business mentorship, and fostering collaboration among government agencies, the private sector, and academic institutions should be core strategies in advancing community enterprises toward stable growth.

New Knowledge

The research titled “An Analysis of Competency-Based Supply Chain Operations of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province” generates new academic insights into supply chain management within the community-based agricultural sector. The main contributions are as follows:

1. Application of the Competency-Based Approach to Community Supply Chains, This study extends the competency-based approach commonly used in organizational and industrial contexts by applying it to community enterprises. It highlights the evaluation of actual competencies across the supply chain, from production and management to marketing and distribution.

2. Development of a Context-Specific Supply Chain Analysis Framework By examining the distinctive characteristics of pesticide-free vegetable entrepreneurs in Chiang Mai, the research proposes an analytical framework that integrates economic, social, and environmental dimensions. This framework reflects the

sustainability-oriented values of community enterprises, emphasizing social impact alongside profitability.

3. Identification of Systemic Strengths and Weaknesses in Grassroots Supply Chains, The research offers a holistic perspective on community-based supply chains, identifying critical gaps in data management, producer–consumer linkages, and technology adoption. These findings provide a foundation for policy design and practical strategies that can be scaled or adapted in other agricultural contexts.

Conclusion and Suggestion

The supply chain processes of community enterprises and chemical-free vegetable entrepreneurs in Chiang Mai Province demonstrate a high level of competency, particularly in procurement and reverse logistics, which stand out for their efficiency and consumer responsibility. However, areas such as planning and production still require further development, especially through the integration of technology and data to enhance operational performance. The analysis also indicates that all components of the SCOR model significantly influence operational success and can predict outcomes with an accuracy of up to 71.7%. Therefore, development efforts should focus on strengthening management skills, upgrading production standards, expanding market channels, and investing in human capital and collaborative networks to foster long-term resilience and sustainability for community-based enterprises.

Therefore, the researcher offers recommendations derived from the study, which are categorized into two main areas: (1) recommendations for practical application of the research findings, and (2) suggestions for future research.

1. Recommendations for Practical Application of the Research Findings

1.1 Develop Specialized Training Programs, Training should be provided to community enterprises in areas such as business planning, supply chain management, and the use of digital technologies. This will enhance their competitiveness and help build a more efficient and effective operational system.

1.2 Design a Prototype Business Model for Pesticide-Free Agriculture, The research findings should be used to design a prototype management system that emphasizes sustainability. This model should encompass production, marketing, and branding, enabling other communities to adapt and apply it effectively.

1.3 Promote Multi-Stakeholder Collaboration, Collaboration between government agencies, the private sector, and academic institutions should be encouraged. Research data can serve as a foundation for developing support projects aimed at strengthening and sustaining the local economic ecosystem.

2. Suggestions for Future Research

2.1 Study the Application of Digital Technologies in the Supply Chain, Future research should explore the integration of technologies such as ERP systems, IoT, and E-commerce platforms to enhance the efficiency of each step in the supply chain.

2.2 Compare Successful and Less-Developed Community Enterprises, A comparative study between well-established and underdeveloped community enterprises can help identify key factors influencing the sustainability of community-based businesses and lead to tailored support strategies for various contexts.

2.3 Assess the Impact of SCOR Model Development on Income and Quality of Life, Further research should evaluate the economic and social outcomes of implementing the SCOR Model in local communities. This will help assess long-term changes and validate the value of investing in the proposed supply chain development approach.

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