

Supply Chain Management Model Based on the SCOR Framework for Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province

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Abstracts

This study examines supply chain management (SCM) practices of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province through the Supply Chain Operations Reference (SCOR) model framework. The research objectives were: (1) to analyze current SCM processes; (2) to identify key problems and obstacles; and (3) to propose strategies for improving supply chain performance. A mixed-methods approach was employed. Quantitative data were collected from 385 respondents using structured questionnaires, and analyzed with descriptive statistics and multiple regression analysis. Qualitative data were obtained through in-depth interviews with 15 key informants, including community enterprise leaders, entrepreneurs, and SCM experts, complemented by document reviews, field observations, focus group discussions, and participatory learning forums.

Findings indicated that overall SCM performance was at a good level, especially in sourcing and delivery, where raw material management and transportation were effective. However, weaknesses were observed in planning and production, notably in demand forecasting, market information, access to modern technologies, labor availability, and waste management. These issues reduced supply chain efficiency. The study recommends strategies such as strengthening data-driven planning systems, enhancing flexibility in procurement and production through technology and workforce development, and fostering collaborative networks among local entrepreneurs. These strategies are expected to improve supply chain efficiency

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and competitiveness, supporting the sustainable growth of organic agriculture in the region.

Keywords: Supply Chain Management; Community Enterprises; Organic Vegetable Growers

Introduction

In recent years, the demand for safe and environmentally friendly food has steadily increased among both domestic and international consumers. Among such products, pesticide-free vegetables have gained particular attention as they significantly align with health-conscious trends and sustainable consumption patterns. These vegetables not only offer nutritional value and health safety (Khachatrya, et al., 2023), but also resonate with the principles of the green economy and sustainable development (Kasztelan, 2017). Despite national and local-level policies in Thailand promoting the production and consumption of pesticide-free vegetables, several challenges remain in practice particularly in the management of the supply chain. This is especially evident among community enterprises and small-scale entrepreneurs, who often face issues related to planning, production, inventory management, logistics, and distribution (Kitchaicharoen, 2024).

Chiang Mai Province, known for its high agricultural potential, particularly in the cultivation of pesticide-free vegetables, is home to numerous smallholder farmers, community enterprises, and micro-entrepreneurs. These actors play a vital role in driving the local grassroots economy. However, their supply chain management practices remain diverse, lacking standardization and efficient interconnectivity. These limitations have led to recurring problems such as market oversupply during certain periods, price drops, delays or quality issues in deliveries, and inconsistencies in meeting end-market demands. To address these challenges, it is essential to develop a standardized and context-appropriate supply chain management model tailored to the needs of pesticide-free vegetable producers (Pinta, 2022). The Supply Chain Operations Reference (SCOR) Model is an internationally recognized framework for analyzing, designing, and improving supply chain performance. It encompasses five key processes: 1) Plan, 2) Source, 3) Make, 4) Deliver, and 5) Return. This model can be systematically applied to evaluate and improve the operations of community enterprises and entrepreneurs within the

pesticide-free vegetable sector, aiming to enhance efficiency, reduce costs, improve quality, and respond more effectively to consumer needs. Nevertheless, within the context of community enterprises and small-scale entrepreneurs in Chiang Mai Province, there remains a lack of comprehensive studies applying the SCOR Model to pesticide-free vegetable supply chains. Existing research tends to focus on isolated aspects such as production, marketing, or certification, often neglecting the integrated perspective required for effective supply chain management. As a result, the overall system efficiency remains suboptimal due to the absence of a holistic and coordinated approach.

Therefore, this research on the supply chain management model based on the SCOR framework for community enterprises and pesticide-free vegetable entrepreneurs in Chiang Mai aims to: examine operational models according to SCOR processes; analyze challenges and obstacles in each stage; and propose practical management strategies that can be adopted in real-world settings. Ultimately, this study seeks to enhance the management capabilities of community enterprises and strengthen the grassroots economy through improved organizational structures, resource utilization, technological systems, and market network integration.

Research Objectives

1. To study the supply chain management processes of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province based on the SCOR (Supply Chain Operations Reference) Model framework.
2. To analyze the problems and obstacles in the supply chain management processes of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province based on the SCOR Model framework.
3. To propose guidelines for improving the supply chain management of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province.

Research Methodology

This research employed both quantitative and qualitative approaches, with the research procedures outlined as follows:

Quantitative Research

1. **Population and Sample** The population and sample consisted of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province.

As the exact population size was unknown, the researcher employed Yamane's formula (1967) for sample size calculation, which is suitable when the total population is unspecified. A confidence level of 95% and a margin of error of 5% were used, resulting in a sample size of 385 participants.

2. Research Instrument The main instrument used in this study was a questionnaire based on the Likert Scale, developed from a review of theories, concepts, and related literature, and validated through consultation with academic advisors. The questionnaire was divided into five parts: (1) General information of community enterprises and entrepreneurs (2) Supply chain management processes based on the SCOR Model, which includes: 1) Planning 2) Sourcing 3) Production 4) Delivery 5) Return A 5-point Likert scale was used for evaluation, ranging from:

1.00–1.80: Strongly Disagree

1.81–2.61: Disagree

2.62–3.42: Neutral

3.43–4.23: Agree

4.24–5.00: Strongly Agree

Instrument validation consisted of three steps: (1) Content validity was assessed by three experts using the Index of Item-Objective Congruence (IOC), with scores ranging from 0.68–1.00. (2) The questionnaire was revised according to expert suggestions. (3) A pilot test was conducted with a group of 30 participants, and Cronbach's Alpha was used to ensure the instrument's reliability and suitability for field application.

3. Data Collection Upon receiving approval from the Graduate School of Maejo University, the researcher sought support from the Chiang Mai Provincial Agricultural Office to distribute 385 online questionnaires to the targeted community enterprises and organic vegetable entrepreneurs. Once responses were collected, the researcher reviewed the questionnaires for completeness and consistency to ensure adequate and high-quality data for analysis.

4. Data Analysis The quantitative data obtained from the questionnaires were analyzed and presented in table format with descriptive explanations to highlight both overall trends and detailed findings. Descriptive statistics were used, including: 1) Percentage: to illustrate proportions 2) Mean: to show central tendency 3) Standard Deviation: to measure variability 4) F-test: to compare differences between groups The results were then used to compare and analyze supply chain

management processes of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province, within the framework of the SCOR Model, in order to develop a suitable supply chain management model tailored to the local context.

Qualitative Research

1. Population and Sample, The qualitative aspect focused on in-depth study from the direct experiences of individuals involved in supply chain management for community enterprises and organic vegetable businesses in Chiang Mai. The Key Informants included: 1) Representatives of community enterprises engaged in organic vegetable production 2) Organic market entrepreneurs 3) Academics or experts in supply chain and sustainable agriculture, A total of 15 informants were selected through purposive sampling, based on their experience, expertise, and practical roles in supply chain development within the study area.

2. Research Instruments, The main tool for qualitative data collection was a semi-structured interview form, designed to explore key issues aligned with the SCOR Model while allowing participants to share insights and experiences in depth. Additional tools included an observation record form and a focus group discussion guide, used to gather data from the actual field context.

3. Data Collection, Data were collected using a triangulation approach to enhance credibility and completeness. Methods included: 1) Document analysis related to supply chain management, community enterprises, and organic agriculture, In-depth interviews, Field observation of actual practices by community groups and entrepreneurs, Focus group discussions, along with learning exchange forums to foster dialogue, gather feedback, and generate further insights from relevant stakeholders

4. Data Analysis, Qualitative data were analyzed using content analysis, following a three-step process: Transcription and data organization according to themes based on the SCOR Model, Thematic analysis to extract key points, synthesize common and unique issues, Categorization and interpretation to derive policy recommendations and development strategies that align with the local context

Results

The researcher conducted a study on the topic: “Supply Chain Management Model Based on the SCOR Framework for Community Enterprises and Organic

Vegetable Entrepreneurs in Chiang Mai Province.” The findings of the study can be summarized according to the following steps:

Section 1: General Information of the Respondents, The findings show that entrepreneurs are fairly balanced by gender, with 52.20% male and 47.80% female, reflecting increasing female participation in agriculture. Most respondents are middle-aged, particularly 41–45 years (27.79%) and 46–50 years (25.19%), indicating both experience and capacity to drive organic agricultural businesses. Only 5.97% are over 55 years old, suggesting limited involvement of elderly labor in modern agriculture. In terms of education, nearly half hold a bachelor’s degree (45.97%), followed by diploma/vocational and high school levels, while 4.68% possess higher qualifications. This highlights that most entrepreneurs have a solid educational foundation, with growing interest from younger and more highly educated individuals in the organic agriculture sector an encouraging sign for sustainable development in Chiang Mai.

Section 2: Analysis of the Supply Chain Management Processes of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province Based on the SCOR Model Framework, with an Overview Summarized for Each Component as Follows:

The Supply Chain Management Process of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province According to the SCOR Model Framework.	\bar{X}	S.D.	Interpretation of results
1. Planning	3.98	0.67	high level
2. Procurement	4.17	0.68	high level
3. Production	3.71	0.69	high level
4. Delivery	4.12	0.77	high level
5. Returns Management	3.58	0.71	high level
Total	3.91	0.70	high level

Table 1 Supply Chain Management Process of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province According to the SCOR Model Framework

According to the research findings, the overall supply chain management process of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province is at a very high level, based on the SCOR Model framework, which encompasses five key dimensions: planning, sourcing, production, delivery, and

return. The overall average score was ($\bar{X}= 3.91$, S.D.=0.70). The most outstanding aspect was sourcing, reflecting the ability to effectively select high-quality raw materials and manage procurement efficiently. The next most prominent dimension was delivery, indicating effective transportation management and timely, quality-preserving delivery of goods. However, despite all dimensions scoring highly, production and return scored comparatively lower. This suggests existing gaps in areas such as production processes, technology, and quality control, as well as waste management and the return of non-standard products. Therefore, it is recommended that support be provided in innovation, management processes, and after-sales service systems to ensure that all dimensions of supply chain management are fully efficient and contribute to long-term sustainability for the entrepreneurs.

Section 3 : Analysis of Problems and Obstacles in the Supply Chain Management Process of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province Based on the SCOR Model Framework. The analysis of each component is as follows:

The SCOR Model Framework	Problems/Challenges
1. Plan	<ul style="list-style-type: none"> - Lack of up-to-date and clear market information - Absence of tools for demand forecasting - Limited knowledge in business planning, especially among small enterprises - No continuous monitoring and evaluation system for project plans
2. Source	<ul style="list-style-type: none"> - The sources of raw materials are uncertain in both quality and quantity. - There is a lack of a joint procurement system, resulting in high costs and weak bargaining power. - Relationships with suppliers are unstable. - There is no unified standard for raw material quality control.
3. Make	<ul style="list-style-type: none"> - Lack of appropriate knowledge and skills in production technology - Absence of a systematic Quality Control (QC) system - The majority of the labor force consists of elderly workers, with a shortage of skilled younger labor - Problems related to plant diseases, pests, and environmental control within the farm

The SCOR Model Framework	Problems/Challenges
4. Deliver	<ul style="list-style-type: none"> - The transportation system is not yet well-organized and lacks logistics infrastructure. - There is no efficient delivery routing system. - Packaging does not meet standards, leading to product damage during transit. - Delivery time management remains uncertain and inconsistent.
5. Return	<ul style="list-style-type: none"> - There is a lack of a system to support products that do not meet standards or have post-sale issues. - Entrepreneurs are unfamiliar with the product return process. - There is an absence of databases and indicators for analyzing the causes of product returns.

Table 2 Analysis of Problems and Obstacles in the Supply Chain Management Process of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province

Section 4: Proposed Approaches to Supply Chain Management for Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province Based on the SCOR Model Framework. First, systematic supply chain planning (Plan) should be promoted by encouraging community enterprises to analyze market demand through the collection of historical data, assessment of production seasons, and formulation of production plans that genuinely align with consumer needs. The government should play a role in developing planning tools, such as community-level demand forecasting systems, as well as organizing training programs to enhance farmers' and entrepreneurs' knowledge in production planning, cost management, and risk management. This aims to increase efficiency and reduce losses within the supply chain system.

Second, comprehensive development and strengthening of sourcing, production, and distribution mechanisms (Source – Make – Deliver) should be emphasized by promoting group purchasing of production inputs to reduce costs, encouraging the use of organic inputs, and establishing standardized production systems such as GAP or Organic Certification. Concurrently, the application of technology for quality control and traceability should be supported. Moreover, community-level collection and distribution centers should be established, alongside

the development of marketing networks such as green markets or online channels to ensure the efficient and transparent delivery of organic vegetables to consumers.

Finally, systematic management of waste and product returns (Return) should be prioritized by supporting the utilization of surplus produce through processing into new products or recycling, such as composting unsold vegetables into organic fertilizer. Additionally, the establishment of systems for reusable packaging should be encouraged to reduce costs and environmental impact. The government and supporting organizations should take an active role in designing environmental incentive measures, managing renewable resources, and waste management at the community level to promote the sustainability of the organic vegetable supply chain.

Discussion

Based on the findings of the study titled “Supply Chain Management Model Based on the SCOR Framework for Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province” the following points are available for discussion.

1. Analysis of the Supply Chain Management Process of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province Using the SCOR Model Framework. The overall findings indicate that entrepreneurs demonstrate a high level of performance across all supply chain processes. This reflects that, despite being small-scale operators and community enterprises, they strive to manage their supply chains systematically in order to remain competitive in the continuously growing safe agricultural market. A detailed examination reveals the following: 1) Source: This aspect received the highest average score, indicating that entrepreneurs place great emphasis on selecting quality raw materials and cultivation sources. This may stem from an awareness of contemporary consumer demands prioritizing food safety, which compels producers to exercise quality control from the upstream stage. These results align with the research of Wendt, M. C., & Weinrich, R. (2023), which identified the ability to select raw material sources and maintain quality control at the origin as critical factors influencing consumer confidence in organic vegetable products. 2) Deliver: This dimension received the second highest average score, demonstrating efforts in logistics management. Despite resource constraints, entrepreneurs utilize route planning and cooperative group deliveries to reduce costs and enhance efficiency. This is consistent with Nitzko, S. (2024), who emphasized that

effective delivery capabilities are key to competitive advantage in the fresh food market. 3) Plan: The planning aspect also received a high average score, reflecting the importance placed on aligning production planning with market demand. Although there remains a lack of precise demand forecasting tools in some cases, having close consumer networks and direct sales through local organic markets helps mitigate risks of overproduction to some extent. 4) Make: The production process scored high on average but was comparatively lower than other aspects. This may indicate limitations in production technology, quality control, or insufficient labor capacity, particularly in community enterprises that still primarily rely on household labor. These findings correspond with Mbonyane, et al. (2023), who reported that small enterprises often face production efficiency challenges due to limitations in capital, technology, and expertise. 5) Return: The returns process received the lowest average score among all aspects. Although still rated as high, it reveals weaknesses in after-sales service, which is a relatively new area for many small-scale entrepreneurs. Specifically, community-based agricultural systems often lack formal product return mechanisms or clear channels to manage defective or problematic products.

2. Supply Chain Management of Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province According to the SCOR Model Framework. The operations of community enterprise groups and organic vegetable entrepreneurs still face obstacles at every stage of the supply chain, from planning, sourcing, production, delivery, to product returns. This reflects the necessity of developing a systematic and sustainable management system. A key issue is that community enterprise groups lack knowledge and tools for strategic management, particularly in market analysis, demand forecasting, and quality control throughout all stages of production and distribution. Consequently, they are unable to respond to market demands promptly and efficiently. This study's findings align with the research by Moyi, E. D. (2003), which investigated logistics management in community enterprises and found that small-scale entrepreneurs possess insufficient knowledge of supply chain management and lack effective technological tools. Additionally, the study by Filimonau, et al. (2024) suggests that the absence of a modern centralized information system is a significant barrier to supply chain management, especially for farmers and small entrepreneurs who tend to rely more on experiential decision-making than on strategic data analysis for production and quality control.

Furthermore, the research by Brzozowski, L., & Mazourek, M. (2018), focusing on organic agricultural production, identified technical production challenges, pest control issues, and an aging labor force as obstacles to establishing safe agricultural product standards. Regarding delivery and logistics, they pointed out that the lack of an efficient transportation management system results in product damage during transit and failure to deliver goods on time, which clearly corresponds with this study's findings. Lastly, concerning product returns, although this process is not emphasized among small enterprises, the lack of a system to manage defective or substandard products may negatively impact consumer confidence in the long term. In summary, the discussion of these research results underscores the necessity of integrating knowledge, technology, and collaboration among government sectors, private sectors, and civil society. This integration is crucial for enhancing the capacity of community enterprises to manage their supply chains effectively in accordance with the SCOR Model principles, thereby improving the competitiveness of organic agricultural products at both local and national levels.

New Knowledge

The synthesis of the research titled “Supply Chain Management Model Based on the SCOR Framework for Community Enterprises and Organic Vegetable Entrepreneurs in Chiang Mai Province” has provided the researcher with new insights. This synthesis has led to a renewed understanding of supply chain management in the agricultural sector at the community level, highlighting the following key points:

Application of the SCOR Model to Community Enterprises: The research findings demonstrate that community enterprises and organic vegetable entrepreneurs can effectively adopt the SCOR Model commonly used in large-scale businesses and adapt it to fit their own operations in accordance with local contexts, including available resources and management structures.

Strengths in Procurement and Delivery: New knowledge reveals that community enterprises exhibit high capabilities in procurement and delivery, resulting from the development of community networks and collective delivery arrangements that enhance bargaining power and reduce costs.

Systematic Supply Chain Management Capability: Although these are small-scale entrepreneurs, they are able to plan, control quality, and manage logistics effectively overall. This has generated a new perspective that supply chain

management does not always require advanced technology but can sustainably incorporate community participation and local wisdom.

Knowledge from Synthesizing the SCOR Model into the Local Context: The application of the SCOR Model in organic agriculture can be developed into a new operational framework for community enterprises nationwide. This framework emphasizes flexibility in implementation according to local resources and conditions, such as group purchasing or delivery cooperatives, and a focus on building strong consumer relationships.

Conclusion and Suggestion

The research findings indicate that the supply chain management processes of community enterprises and organic vegetable entrepreneurs in Chiang Mai Province, based on the SCOR Model framework, are highly efficient in all dimensions, particularly in the areas of sourcing and delivery. These areas stand out due to effective procurement of high-quality raw materials and efficient transportation systems. However, weaknesses remain in the areas of production and return management, which require further development especially in the adoption of quality control technologies, processing procedures, and post-sales management—to ensure completeness across all aspects of the supply chain.

Furthermore, the analysis of problems and obstacles reveals that each process within the SCOR Model still faces certain limitations, such as a lack of up-to-date market information, inaccurate demand forecasting, underdeveloped collaborative procurement systems, and labor shortages, particularly in terms of skill level and aging workforce. The proposed development strategies thus encompass a wide range of actions, including promoting data-driven planning, establishing standardized procurement and production systems, leveraging technology and online marketing, and implementing systematic waste and product return management. These strategies aim to enhance the sustainability of the organic vegetable supply chain at the community level in a comprehensive and meaningful manner.

Based on the findings of this study, the researcher offers recommendations categorized into three main areas: policy recommendations, recommendations for practical application, and recommendations for future research.

1. Policy Recommendations

1.1 The government should establish a community-level market information and demand forecasting center to support production planning in alignment with market needs and to reduce issues of oversupply or shortage of goods.

1.2 Promote the consolidation of community enterprises in procurement and resource management to increase bargaining power, reduce costs, and establish common quality standards for raw materials.

1.3 Formulate policies that support the adoption of production and logistics technologies at the community level, including systems for product returns and waste management, to ensure the sustainability of the supply chain system.

2. Recommendations for Practical Application

2.1 Utilize the SCOR Model process assessment results as a tool for evaluating and developing community organizations, focusing on improving inefficiencies such as production and product return processes.

2.2 Apply the development guidelines in each area to training programs aimed at enhancing the capacity of entrepreneurs, particularly in planning, quality control, and online marketing.

2.3 Promote the establishment of community-level distribution centers and expand distribution channels for organic vegetables through fresh markets, green markets, and online platforms.

3. Recommendations for Future Research

3.1 Future studies should explore the linkages between the supply chain and consumer behavior to enable production and distribution planning that truly aligns with market demand.

3.2 Conduct comparative research between successful and struggling enterprises to identify best practices in supply chain management.

3.3 Investigate the feasibility of integrating digital technologies such as product traceability systems or blockchain into community enterprises to enhance efficiency, transparency, and credibility of products in the modern market.

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