SUPPLY CHAIN OF ORGANIC VEGETABLE GARDEN BUSINESS: CASE STUDY OF RAK KASET SOMDUL COMPANY, LIMITED

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Abstract

This study investigates the supply chain management practices of Rak Kaset Somdul Co., Ltd., a prominent organic vegetable producer in Phitsanulok Province, Thailand. The research employs the Supply Chain Operations Reference (SCOR) model, value chain analysis, and SWOT analysis to evaluate the company's supply chain performance. Rak Kaset Somdul Co., Ltd. operates a smart farming system using closed greenhouse technology and precision irrigation to cultivate 12 varieties of organic vegetables. Data were collected through participatory observations, interviews with key personnel, and analysis of internal documents. The study examines each phase of the supply chain, including seed procurement, soil preparation, planting, harvesting, packaging, and distribution.

The results show that the company maintains an integrated system that incorporates cold chain logistics and online sales platforms to ensure product quality and timely delivery. However, the research identifies several challenges. The company faces production limitations due to reliance on imported seeds, inadequate technological integration in farming processes, and shortages of skilled labor. These constraints lead to higher production costs and reduce supply chain efficiency. The value chain analysis highlights the company's efforts in producing its own organic fertilizers and hormones, alongside marketing through direct-to-consumer sales channels. The SWOT analysis reveals strengths in product diversity and organic

certification, with opportunities in expanding online markets to meet rising consumer demand for chemical-free vegetables. The study recommends that Rak Kaset Somdul Co., Ltd. invest in technological advancements, workforce development, and collaborative partnerships to strengthen supply chain resilience and ensure long-term business sustainability.

Keywords: Organic vegetable farming, Supply chain management, SCOR model, Value chain, SWOT analysis

1. Introduction

Organic vegetable farming is increasingly regarded as a sustainable approach to addressing global concerns over food safety, human health, and environmental preservation. In many developing nations, factors such as rapid urbanization, climate change, and the pressures of globalization have intensified food security challenges - especially in peri-urban areas (Ochoa *et al*., 2020). Small-scale organic producers often face operational hurdles, including inadequate logistics infrastructure, limited market access, and inadequate technological support. Research in Spain shows that short food supply chains can overcome many of these obstacles by reducing intermediaries, lowering carbon emissions, boosting farmers' incomes, and reinforcing local food-system resilience (Raftowicz, 2024). In 2025, studies in Southern France examined how SFSCs are adapting to inflation and rising production costs by leveraging resilience strategies rooted in producer–consumer embeddedness (Deroche-Leydier, 2025).

In China, optimizing distribution networks for organic produce has become vital to meeting growing urban demand. The logistics model in Zhengzhou City, for instance, demonstrates that streamlined systems reduce costs, minimize waste, and improve delivery timeliness, critical factors for perishable goods (Wang et al., 2021). At a global scale, the cold-chain logistics market is projected to grow from USD 393.2 billion in 2025 to over USD 1.6 trillion by 2035, reflecting the urgent need for infrastructure modernization, sustainable refrigeration, and end-to-end supply chain visibility (Future Market Insight, 2025). These insights directly inform the case of Rak Kaset Somdul Co., Ltd. in Phitsanulok Province, Thailand. By developing an integrated supply chain that

combines cold-chain logistics, digital monitoring, and direct-to-consumer channels, the company can enhance operational efficiency, reduce losses, and expand its market presence.

Despite the benefits of organic farming, producers in developing nations, including Lebanon, often face high production costs, certification expenses, and marketing difficulties (Abebe *et al*., 2022). To overcome these barriers, alternative models such as agro-tourism and participatory guarantee systems have been proposed to reduce costs and improve profitability.

2. Research Objectives

2.1 To analyze the supply chain management of Rak Kaset Somdul Co., Ltd., identifying strengths, weaknesses, and opportunities for improvement in the production and distribution of organic vegetables.

2.2 To evaluate operational performance across all stages, from input procurement to final delivery, using the SCOR model, value chain analysis, and SWOT analysis.

2.3 To examine the impact of production costs, particularly those arising from the reliance on imported seeds, as well as technological, logistical, and human resource constraints that affect efficiency, increase expenses, and reduce supply chain resilience.

2.4 To propose strategic recommendations aimed at improving productivity, lowering costs, diversifying seed sourcing, and expanding market reach to ensure the company's long-term sustainability and competitiveness.

3. Literature Review

Supply Chain Management (SCM) is integral to the success of organic vegetable production and distribution, especially in developing countries. The SCM process encompasses the management of all operations involved in the production, transportation, storage, and delivery of organic vegetables to the market. According to Haddas *et al*. (2018), farmers who can directly sell to consumers capture higher profit margins than those relying on intermediaries. The success of SCM in organic agriculture

involves not only efficient logistics and transportation but also minimizing post-harvest losses and managing risks associated with perishable goods. The development of cooperative logistics networks and cold-chain infrastructure is recommended to enhance distribution efficiency (Wang *et al*., 2021). An effective supply chain integrates farmers, suppliers, distributors, retailers, and consumers to ensure the delivery of high-quality, organic produce while minimizing costs and environmental impact.

The Supply Chain Operations Reference (SCOR) Model provides a framework for analyzing and improving the supply chain in the organic vegetable sector. The SCOR model categorizes operations into five key processes: Plan, Source, Make, Deliver, and Return. For example, Wang *et al*. (2021) highlighted the importance of location optimization for distribution centers to reduce delivery time and costs, a critical factor in managing perishable products like organic vegetables. Efficient supply chain planning ensures timely procurement of organic seeds, soil management, production scheduling, and seamless product delivery to consumers. Integrating digital tools such as Geographic Information Systems (GIS) and e-commerce platforms can further streamline the SCOR processes and enhance real-time decision-making.

The value chain concept, as introduced by Porter (1985), is fundamental for understanding how organic vegetable businesses can create value at every stage of production and marketing. Haddas *et al.* (2018) emphasized that by processing vegetables into chips or sauces, farmers can increase the added value and capture higher profit margins. Ochoa et al. (2020) noted that short food supply chains (SFSCs) contribute to local economic development by reducing intermediaries and enhancing producer-consumer relationships. Developing innovative marketing strategies, including agro-tourism and farm-to-table experiences, further enhances the value proposition of organic vegetables. The framework of value chain can be explained as shown in Figure 3.

A SWOT analysis provides a strategic tool for assessing the internal and external factors affecting the organic vegetable business. However, weaknesses include high production costs and dependency on imported seeds. Opportunities lie in the growing market demand for organic produce and the potential for agro-tourism integration (Abebe *et al*., 2022). Threats include market competition, supply chain disruptions, and

regulatory hurdles. Implementing Participatory Guarantee Systems (PGS) can alleviate certification costs and increase market accessibility (Abebe *et al*., 2022).

Rak Kaset Somdul Co., Ltd., established in 2021, is a leading organic vegetable farm in Phitsanulok Province, Thailand. The company operates a smart farm using closed greenhouse systems and advanced irrigation technologies. It grows 12 types of organic vegetables and serves as a learning center for farmers and stakeholders. According to the literature, smallholder farmers in developing countries face challenges such as high certification costs, market access issues, and logistical limitations (Abebe *et al.,* 2022; Wang *et al*., 2021). Rak Kaset Somdul addresses these challenges by adopting innovative farming techniques and exploring new market channels. Collaborating with universities and government agencies for seed sourcing and technical support, the company aims to expand its production capacity and become a regional leader in organic vegetable farming.

4. Methodology

This study adopted a qualitative case study approach focusing on Rak Kaset Somdul Co., Ltd., an organic vegetable farming business located in Phitsanulok Province, Thailand. The research process began with a comprehensive review of related documents and theories concerning organic vegetable production, supply chain management, value chain analysis, and SWOT analysis. Primary data were collected through participatory observations and in-depth interviews with the company's management team, employees, and relevant stakeholders in the supply chain. The researcher engaged directly with the farm operations to observe processes from soil preparation, seedling cultivation, transplanting, care, harvesting, packaging, and delivery. Additionally, the researcher collected data on marketing practices, customer interactions, and logistical operations. Secondary data were gathered from internal company records, industry reports, and previously published studies to support the analysis. This mixed-method data collection provided an in-depth understanding of the company's supply chain activities from upstream input procurement to downstream customer delivery.

To structure the supply chain analysis, the study employed the Supply Chain Operations Reference (SCOR) model as the primary framework. This model was applied at four levels as follows:

1. At SCOR Level 1, the research identified the company's key processes, including planning, sourcing, making, delivering, and handling product returns. The study focused on analyzing the production materials used, such as seeds imported from New Zealand, locally sourced clay and loam soil, organic fertilizers, and self-made fermented water for plant care.

2. At Level 2, the study assessed the core processes, particularly supply chain planning and production (sP1 and sM2), alongside supporting processes like inventory management (EP1) and production efficiency assessment (EM1). The research team observed gaps in employee skill levels, inefficiencies in production planning, and a lack of systematic warehouse management. To address these issues, solutions such as workforce training, expansion of online sales channels, and investment in cold-chain logistics were proposed.

3. At Levels 3 and 4, detailed workflows were mapped, including delivery route optimization, order processing, and customer service management, to ensure consistency in operations and minimize costs.

Furthermore, the study incorporated a value chain analysis and SWOT framework to holistically assess the business operations of Rak Kaset Somdul Co., Ltd. The value chain analysis emphasized activities that add value to the products, such as advanced greenhouse farming techniques, strict organic standards, and direct-to-consumer sales strategies. Supporting activities included human resource management, technological upgrades like online sales platforms, and infrastructure improvements. The SWOT analysis identified strengths such as product diversity and organic certifications, while noting weaknesses in technological capabilities and market expansion. Opportunities included increasing demand for organic produce, especially during seasonal events like the vegetarian festival. Threats primarily involved pandemic-related market disruptions and logistical challenges. By combining SCOR, value chain, and SWOT analysis, the study provided a comprehensive methodology to evaluate and propose

improvements for the organic vegetable supply chain, aiming to enhance operational efficiency and business competitiveness.

5. Research Results

The results can be separated into 4 parts; supply chain management analysis, SCOR model analysis, value chain analysis, and SWOT analysis of Organic Vegetable Cultivation, as follows:

5.1 Supply Chain Management of Organic Vegetable Cultivation

Rak Kaset Somdul Co., Ltd., implements a comprehensive supply chain management system for organic vegetable production. The process starts with upstream operations, where the company procures materials such as 12 varieties of organic seeds imported from New Zealand, fertile loam and clay soil, organic fertilizers, rice husks, and fermented water that is produced in-house. These inputs are selected to meet high organic standards, ensuring that the farming process is environmentally friendly and chemical-free. As shown in Figure 1 to Figure 5, the company prepares high-quality seeds, fertile soil, organic fertilizers, and natural plant supplements that enhance crop yield and resistance to pests.

Figure 1 Organic vegetable seeds

Figure 2 Loam and clay soil

Figure 3 Organic fertilizer

Figure 4 Rice husks for soil mixing

Figure 5 Fermented water or natural hormones

The organic vegetable production process involves several stages: soil preparation, seedling development, transplanting, plant care, and harvesting. Soil is prepared by mixing equal parts of loam soil, clay, rice husks, and organic fertilizer to ensure adequate aeration and nutrient supply (Figure 6). Seedlings are cultivated by soaking seeds overnight, then planting them in seed trays for 10 days before transferring them to the main plots (Figures 7 and 8). Once the seedlings have matured, they are transplanted into the greenhouse soil beds (Figure 9). Daily care involves watering in the morning and evening and spraying natural plant hormones as needed (Figure 10). After 30 days, mature vegetables are harvested, quality-checked, and packed for sale (Figure 11).

Figure 6 Soil preparation process

Figure 7 Seed soaking preparation

Figure 8 Nursery planting of seedlings

Figure 9 Transplanting seedlings into the greenhouse

Figure 10 Watering and spraying natural hormones

Figure 11 Harvesting and quality selection

Rak Kaset Somdul Co., Ltd.'s supply chain is divided into three levels: upstream, middle, and downstream. The upstream activities include the cultivation of organic vegetables in company-owned greenhouses using selected seeds and natural materials (Figure 12). In the middle level, the company handles production activities such as fertilizer preparation, daily plant care, harvesting, and primary packaging. Vegetables are then sorted and packed according to customer specifications. Cold storage is used to preserve freshness before distribution. For the downstream level, the company delivers products directly to various customers, including restaurants such as Saradeedee and SALADD, middlemen, and companies like Prima Green Co., Ltd. and Urban Farming Co., Ltd. There are also online sales and delivery options for retail consumers.

In addition to identifying upstream, midstream, and downstream activities, the revised description specifies the duration of each stage. In the upstream process, soil preparation typically requires 3–4 days, followed by seedling development over 10–12 days before transplanting. The midstream phase, which includes plant care, daily watering, and pest control, lasts approximately 25–30 days until harvest. Harvesting, sorting, and primary packaging take 1–2 days, after which the downstream phase, distribution via refrigerated trucks or direct-to-consumer channels, takes 1 day for local deliveries and 2–3 days for longer-distance orders.

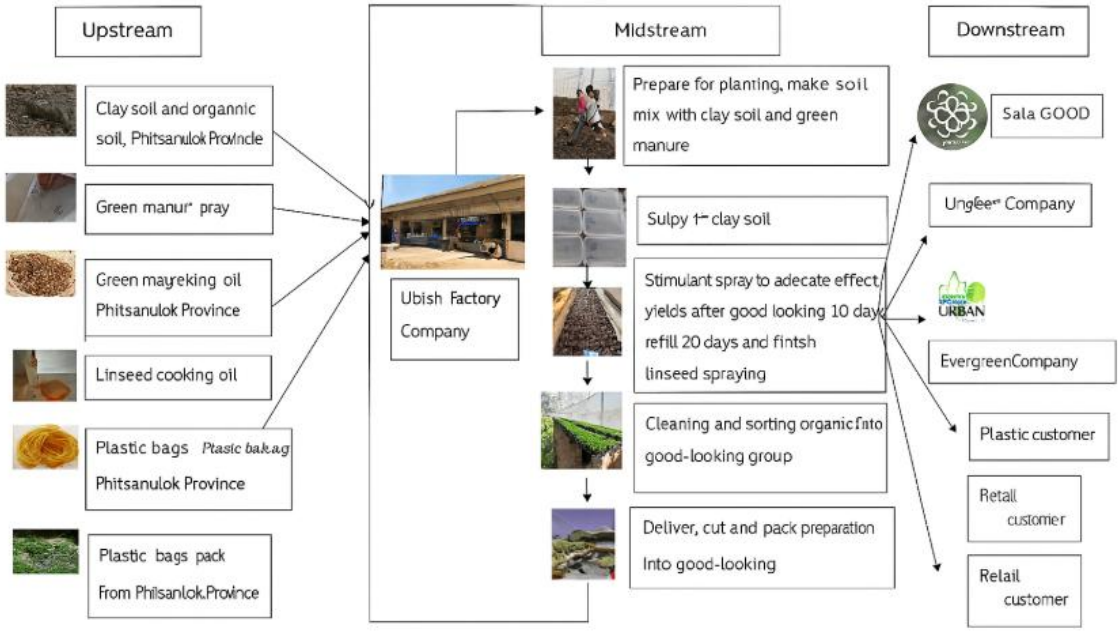

Figure 12 Supply chain management of the organic vegetable cultivation group

The company maintains flexible customer arrangements without formal contracts, relying on agreements for order volumes and delivery schedules. If the products fail to meet the quality standards, they are returned with deductions from supplier payments. This quality management system ensures that only high-standard organic vegetables reach consumers. Middlemen and restaurants plan their purchases daily, assessing the quality on delivery. If the products are not satisfactory, they are returned immediately. This system enhances transparency and maintains the integrity of the supply chain from farm to table, supporting Rak Kaset Somdul Co., Ltd.'s reputation for delivering safe, high-quality organic produce.

5.2 SCOR Model Analysis of Organic Vegetable Cultivation

Rak Kaset Somdul Co., Ltd. adopts the Supply Chain Operations Reference (SCOR) model to analyze and improve its organic vegetable supply chain. At SCOR Level 1, the company manages core supply chain components: Source, Make, Deliver, Plan, and Return. In sourcing, the company procures organic seeds, fertile clay and loam soil, organic fertilizer, rice husks, and self-produced fermented water to ensure quality and sustainability. Seeds are imported from New Zealand, but future plans include transitioning to locally sourced seeds from Maejo University to reduce costs.

The production process involves soil preparation, seedling development, transplanting, plant care, and harvesting. Vegetables are harvested, sorted, and packaged into various sizes for retail and wholesale customers. Deliveries are performed using refrigerated trucks to maintain freshness. Returns are minimized as quality control checks are conducted before delivery, and agreements with buyers ensure product acceptance in advance.

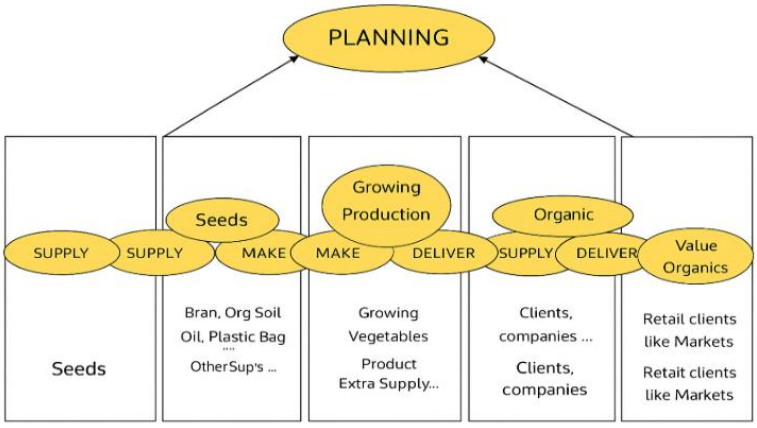

Figure 13 SCOR Level 1 of the Organic Vegetable Cultivation Group

At SCOR Level 2, the company identifies specific processes that require enhancement. These include core processes such as supply chain planning (sP1) and production for order fulfillment (sM2). Supporting processes needing improvement are warehouse management planning (EP1) and production efficiency assessment (EM1). For example, the COVID-19 pandemic led to a decline in customer demand, underscoring the need to expand online sales channels. Additionally, labor shortages have affected production capacity, making workforce training and skill development crucial. Warehouse management issues related to overstocking have also been identified, which limit space for new raw materials. These findings are summarized in Figure 14 and Table 1.

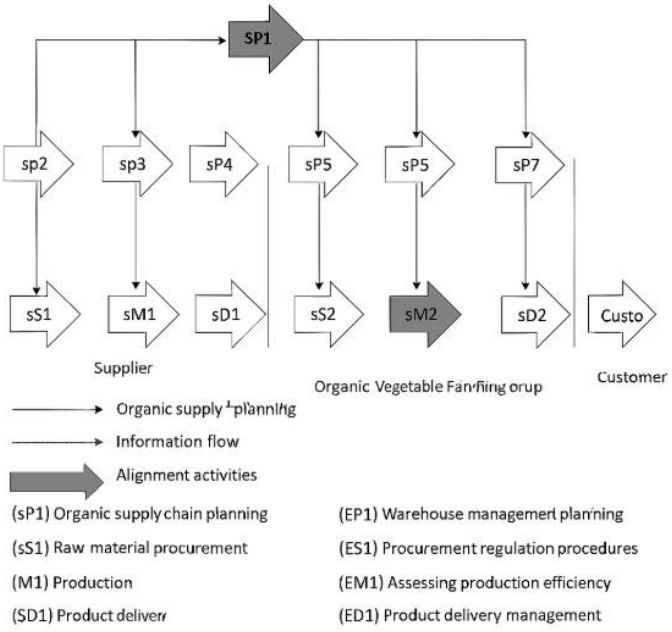

Figure 14 SCOR Level 2: Guidelines for Development in the Organic Vegetable Cultivation Group

Figure 14 illustrates the SCOR Level 2 framework as applied to Rak Kaset Somdul Co., Ltd., focusing on both core and supporting processes that require improvement. the sequential and interconnected processes involved in the organic vegetable supply chain, starting from suppliers and moving through the Organic Vegetable Farming Group to the end customer. The figure illustrates three key types of flow: solid arrows represent the main organic supply chain planning path, dashed arrows indicate the flow of information between activities, and double-lined arrows denote alignment activities designed to synchronize operations. These flows provide a clear representation of how planning drives procurement, production, and delivery stages across different entities in the supply chain.

Each process in the diagram is coded and categorized according to SCOR standards. For instance, (sP1) represents Organic Supply Chain Planning, which drives downstream activities. Supplier-related processes include (sS1) Raw Material Procurement, (sM1) Production, and (sD1) Product Delivery to the farming group. Within the Organic Vegetable Farming Group, core processes such as (sS2) Raw Material Procurement, (sM2) Production, and (sD2) Product Delivery are supported by planning

adjustments (sP5) to ensure schedule alignment. Supporting processes, (EP1) Warehouse Management Planning, (ES1) Procurement Regulation Procedures, (EM1) Assessing Production Efficiency, and (ED1) Product Delivery Management, provide the operational backbone necessary for efficiency and compliance.

Visual cues in the diagram further enhance interpretation. Dark grey arrows highlight priority areas for improvement, such as sP1 (planning) and sM2 (production), while white arrows indicate standard ongoing processes. Circular icons symbolize continuous operations like monitoring and quality checks, whereas square blocks indicate decision points that require managerial input. Arrow direction indicates workflow sequence, with solid lines for mandatory steps and dashed lines for conditional flows. Color coding distinguishes between core SCOR processes (green), supporting processes (blue), and recommended improvement activities (yellow). Together, these symbols, flows, and process codes give a structured visual summary of both the existing operations and targeted enhancements in the organic vegetable supply chain.

Table 1 Analysis of Operational Issues of the Organic Vegetable Farming Group

Process	Problem	Solution
Organic Supply Chain Planning (SP1)	Low customer demand due to the COVID-19 pandemic.	Expand online sales channels.
Production for Order Fulfillment (sM2)	Labor shortage affecting production capacity.	Provide training and upskill workers.
Warehouse Management Planning (EP1)	Overstocking causes insufficient space for raw materials.	Improve inventory inspections and management.
Production Efficiency Assessment (EM1)	Inability to assess production capacity leads to resource waste.	Train staff in capacity assessment and efficiency improvements.

SCOR Level 3 focuses on detailing internal and inter-organizational processes based on insights from Levels 1 and 2. Each process is outlined with specific components, data inputs and outputs, and performance metrics. Key performance

indicators include reliability (improving lead time adherence), responsiveness (ensuring stable production cycles), flexibility (reducing daily schedule changes), and cost management (optimizing production budgets). Rak Kaset Somdul Co., Ltd. faces challenges such as undefined roles, dependence on top management for decision-making, and reliance on untrained local labor. Addressing these issues is crucial to ensuring risk management and sustainable business operations.

At SCOR Level 4, the company implements detailed operational plans in line with the SCOR framework. As illustrated in Figure 15, the steps for delivery begin with collecting production data and receiving orders, followed by inventory checks and production planning. Next, the company determines transportation routes, collects products from the warehouse, assembles orders, checks for accuracy, verifies customer locations, processes invoices, and completes delivery. This systematic workflow ensures efficiency, reduces errors, and maintains consistency in delivering high-quality organic produce to consumers.

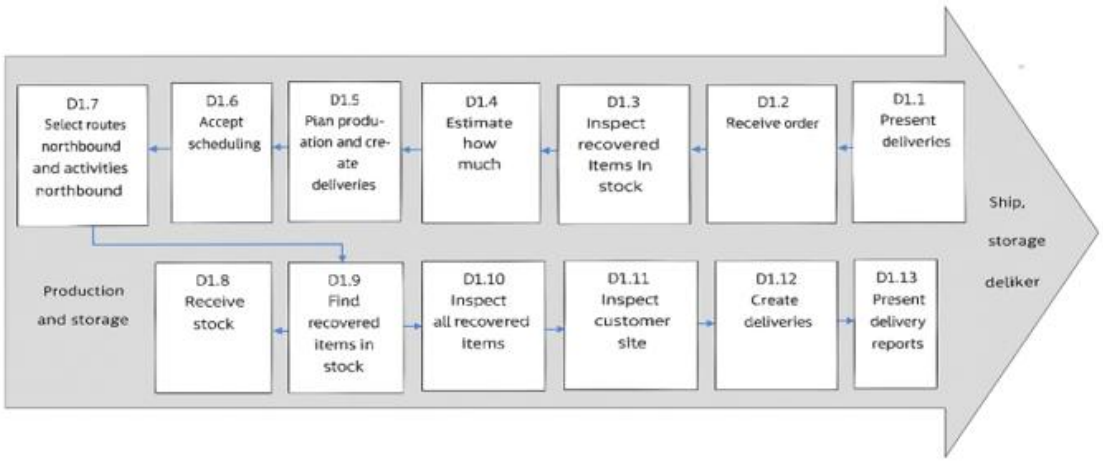

Figure 15 Example of SCOR Operation at Level 4

5.3 Value Chain Analysis of Organic Vegetable Cultivation

The value chain analysis of Rak Kaset Somdul Co., Ltd. reveals strategic activities that add value from input procurement to delivery, while also identifying opportunities for profitability improvement.

Main activities include sourcing high-quality seeds (currently imported but with plans to localize), soil preparation, greenhouse cultivation, and careful post-

harvest handling. Supporting activities include in-house production of fermented water and natural hormones, use of smartphone-based environmental monitoring, and digital record-keeping for sales and inventory.

To enhance profitability, the following strategies are recommended:

1. Reduce reliance on imported seeds by partnering with local universities and seed producers to lower procurement costs.

2. Increase labor productivity via workforce training and introducing mechanized planting and harvesting tools.

3. Expand premium direct-to-consumer sales, leveraging online platforms for higher-margin transactions.

4. Develop value-added products, such as organic vegetable chips, ready-to-cook kits, and sauces, to diversify revenue streams.

5. Optimize cold chain logistics to reduce spoilage, extend shelf life, and expand market reach.

These targeted measures directly address current cost drivers and capacity limitations, aligning with market opportunities shown in Figure 16.

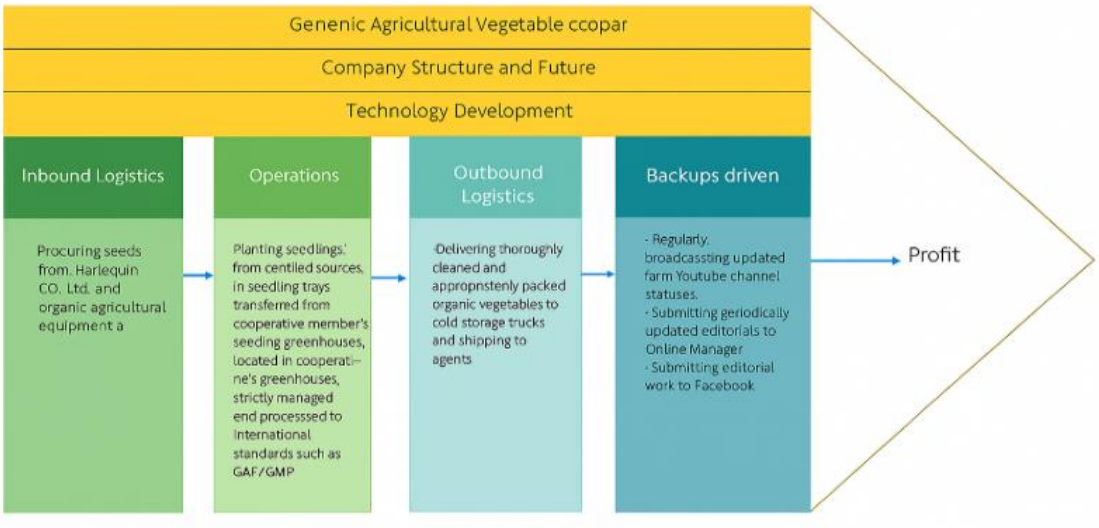

Figure 16 Value Chain of Organic Vegetable Cultivation

According to the figure above, supporting activities are essential to sustaining the farm's operations. The company produces its own fermented water and natural

hormones, helping to lower costs and reduce reliance on external suppliers. Nonetheless, challenges persist, particularly in labor management and technological adoption. High costs of mechanized tools mean the farm continues to depend heavily on manual labor for planting and harvesting, increasing labor expenses. A shortage of skilled workers further limits efficiency, with many lacking specialized expertise in organic farming. To address these issues, the company has adopted technology upgrades such as smartphone applications for environmental monitoring in nurseries and digital record-keeping for sales and purchases. Despite these advancements, the high cost of organic pest control products remains a significant burden on the value chain's cost structure.

5.4 SWOT Analysis of Organic Vegetable Cultivation

The SWOT analysis of Rak Kaset Somdul Co., Ltd. provides strategic insights into the strengths, weaknesses, opportunities, and threats facing the organic vegetable farming business. The internal strengths include the management team's over two years of experience in organic farming and the farm's ability to produce 12 different varieties of organic vegetables. Additionally, the company has developed online sales channels and achieved certification for both national organic standards and Organic Thailand standards, ensuring product quality and building consumer trust. These factors enhance the farm's competitive edge and expand its market presence as shown in Table 2.

Table 2 SWOT Analysis of Organic Vegetable Cultivation

Factors	Helpful	Harmful
Internal	**Strengths (S):** - 2+ years of management experience - 12 vegetable varieties - Online sales channels - Certified organic production - Organic Thailand certification	**Weaknesses (W):** - Lack of advanced technology - Limited manpower - Limited online marketing skills

External	**Opportunities (O):** - Growing market demand - High demand during vegetarian festivals - Preference for clean, chemical-free vegetables	**Threats (T):** - COVID-19 impacts reducing demand - Inability to expand offline channels

However, the company also faces significant internal weaknesses. There is a lack of advanced farming technology, which increases the cost of production, particularly in the procurement of raw materials. Limited manpower leads to production delays, and there is a gap in online marketing expertise that hampers the ability to reach broader markets. On the external side, the growing market demand for organic vegetables presents an opportunity, especially during the vegetarian festival when consumption spikes. Health-conscious consumers increasingly prefer clean, chemical-free vegetables, allowing the company to expand its market reach.

Nonetheless, external threats remain a challenge. The COVID-19 pandemic has reduced market demand and hindered the expansion of offline sales channels due to restrictions on in-person interactions. As a result, surplus organic vegetables have accumulated in the warehouse. To mitigate these risks, the company has shifted its focus to online sales and plans to reopen physical stores in the future as conditions improve.

6. Conclusion and Discussion

This study analyzed the supply chain management of Rak Kaset Somdul Co., Ltd. using the SCOR model, value chain analysis, and SWOT framework to assess operational efficiency and identify improvement opportunities. For Objective 1, the findings revealed a well-defined supply chain comprising upstream, midstream, and downstream processes, supported by both core and enabling activities. Regarding Objective 2, high production costs were found to be heavily influenced by the reliance on imported seeds, which increased procurement expenses and introduced supply vulnerability. Objective 3 identified key constraints, including limited adoption of

advanced technology, labor shortages, and insufficient expertise in organic farming practices. These constraints hindered productivity and increased operational costs. Cold chain logistics emerged as a pivotal factor in achieving Objective 4. In the SCOR analysis, it enhanced delivery performance and preserved product quality. In the value chain, it contributed to freshness, reduced waste, and supported premium pricing strategies. The SWOT analysis positioned cold chain logistics as both a strength and an opportunity, critical for market expansion. To address current challenges, it is recommended that the company strengthen cold chain infrastructure, invest in precision agriculture technology, and enhance workforce training to boost efficiency, reduce costs, and secure sustainable growth.

The study contributes to the broader discourse on supply chain management in organic agriculture. Rak Kaset Somdul Co., Ltd.'s model illustrates how a controlled greenhouse environment combined with innovative logistics can support food safety and sustainability goals. Moving forward, the company should invest in digital solutions such as e-commerce platforms and smart farming technologies to streamline operations and reduce labor dependency. The COVID-19 pandemic has reinforced the need for flexible distribution strategies, highlighting the importance of online and direct-to-consumer sales. Further research should compare supply chains across various regions to develop guidelines for improving efficiency and resilience in the organic vegetable sector.

7. Acknowledgement

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contributing to the advancement of knowledge in sustainable agriculture and organic vegetable production.

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