A SCOR-BASED SUPPLY CHAIN MANAGEMENT FOR SUSTAINING COMMUNITY-BASED ENTERPRISES IN THAILAND

Wirachchaya Chanpuypetch[1] and Suratin Tunyaplin[2,3]

[1]College of Maritime Studies and Management, Chiang Mai University

[2]Faculty of Logistics and Supply Chain Management, Sripatum University, Chonburi

[3]Suwanpisarn Transportation 2010 Co.,Ltd.

Received: May 19, 2021 / Revised: August 24, 2021 / Accepted: September 3, 2021

Abstract

In Thailand, the agriculture-based industrial sector plays a significant role as the growth engine for the rural economy. However, most businesses in rural areas are community-based enterprise (CBE). They typically have the limitations of an operations management and resources such as human, financial, as well as supportive technologies. Thus, this article aims to offer the direction for enhancing the competitiveness of CBEs in rural Thailand. The cases of Snakeskin Gourami (*Trichogaster pectoralis*) CBE in Ban Phaeo District, Samut Sakhon Province were investigated using semi-structured interviews and direct observation for understanding the supply chain and operations process. Then the competitive position of this business was identified using a SWOT analysis. We have found that the CBEs can produce many kinds of high-quality products. However, the quality of products is still not identified scientifically due to a lack of knowledge and equipment. Not surprisingly, they are always exploited from middlemen. Thus, collaboration with the institutions of higher education in the same area is an effective approach to help entrepreneurs in rural areas. Then this article applied the Supply Chain Operations Reference (SCOR) model for improving the supply chain and operations management of the Snakeskin Gourami CBE. The value-added processes that can be operated by the nearby institutions of higher education were added to link a CBE with research and development (R&D) units, laboratory equipment, academic knowledge as well as other modern technologies. Ultimately, a CBE can enhance its competitiveness and contribute to sustainable development.

Keywords: Supply Chain Management, SCOR, Sustainability, Community-Based Enterprise, University-Community Enterprise Collaboration

Corresponding Author

Email: wirachchaya.c@cmu.ac.th

Introduction

In Thailand, populations in rural areas predominantly earn their livelihood from agriculture-based sector. Correspondingly, to rise self-reliance of Thai local communities, the community-based enterprise (CBE) has been launched since year 2005. This business form aims to align between the sufficiency economy philosophy and the core economic sectors for management and creativity on community capital. The concept of CBE has been widely implemented in numerous communities all over the country.

CBEs have also been widely established around the world, especially in developing countries. The main goal of this business concept is to enhance social and local economy (Peredo & Chrisman, 2006). CBEs are typically founded by community members living in the same area as a group-owned enterprise. It is a mechanism that encourages a creation of community products by playing various roles such as farm, manufacturing units, and shop. Accordingly, a CBE is a valuable part that helps to generate more jobs and return benefit to the local community.

Generally, CBEs do specific operational and management system. Their operations are based on folk wisdom rather than modern technologies. Hence, all activities of CBEs are performed through low-skilled staffs with the limited technology resources, financial, and infrastructure. These limited resources are crucial factors that obstruct sustainable growth of CBEs. Guidance and other external supports are often required in promoting sustainable CBEs. Therefore, this article aims to propose a SCOR-based supply chain management for enhancing Thai CBEs' competitiveness and contribute to sustainable development.

The article is organised as follows. The next section describes the methodology used in this research. Then the supply chain and operations process of the Snakeskin Gourami CBEs where are located in Samut Sakhon Province is described in Section 3. The SWOT analysis is conducted for underlining the weaknesses and threats of the CBEs in Sections 4. The SCOR-based supply chain management for sustaining CBEs is proposed in Section 5. Finally, the article is concluded.

Data Collection and Analysis

Referring to the aim of this paper, three Snakeskin Gourami (*Trichogaster pectoralis*) CBEs where are located in Ban Pheao District, Samut Sakhon Province were selected to investigate the current situation (AS-IS). Convenience access and geographic proximity were assessed as the main criteria in selecting a case study (Tunyaplin & Chanpuypetch, 2021; Mettler & Rohner, 2009; Yin, 2014). The research design applied the SCOR model to map the supply chain and operations process of the CBEs. Accordingly, in data collection process, the interview questions were set based on the SCOR framework. The authors used the core open-ended questions as the interview guideline for semi-structured interview. This helps to ensure that data collection focuses on the research needs (Rowley, 2002; Yin, 2014). For a group of

interviewees, the head of CBEs and members who could provide relevant information were interviewed. They also play a role in the supply chain as a farmer. The length of interviews ranged from one to three hours. Simultaneously, direct observation was also performed.

After understanding the supply chain structure, the focus group discussion was conducted to carry out a SWOT analysis for brainstorming a Snakeskin Gourami CBE's strengths, weaknesses, opportunities, and threats. Then the supply chain and operations management mechanism for sustaining Snakeskin Gourami CBEs can be proposed through the SCOR-based analysis.

The Snakeskin Gourami CBE case studies in Thailand

To understand the AS-IS situation of Thai CBEs, the authors conducted a site visit at the CBEs where are located in Ban Phaeo District, Samut Sakhon Province. This geographical location supplies a large number of agricultural and marine raw materials, such as coconut, orchid, shrimp, Snakeskin Gourami, to food and agro-industrial sector. For Samut Sakhon Province, Snakeskin Gourami is one of the core agricultural products that can generate high revenue over 360 million THB in year 2019. There are 192 registered farmers that produce Snakeskin Gourami around 4,500 tons to market in 2019 (Governor's Office of Samut Sakhon Province, 2021). Not surprisingly, most farmers in this area always encounter with the price exploitation problem by traders.

To support the farmers in this area, many communities in Ban Phaeo District, Samut Sakhon Province established the CBE for producing many value-added products from Snakeskin Gourami. They will only use fish raw materials that are collected from their owned farm and the nearby farms. Moreover, these CBEs attempt to promote and share processing methods to inhabitants of the community for producing the final products from Snakeskin Gourami. It can be a way to make extra income and improve the quality of life for the communities. Nowadays, in Samut Sakhon, there are six registered Snakeskin Gourami CBEs. Four CBEs are located in Ban Phaeo District. (Department of Agricultural Extension, 2021).

The famous products of the Snakeskin Gourami CBEs in Ban Phaoe, Samut Sakhon include dried, salt pickled, as well as frozen-fishes. These are also the product champion of the province as OTOP (One Tambon (meaning district) One Product). The supply chain and their operations process flow of a Snakeskin Gourami CBE is presented in Figure 1.

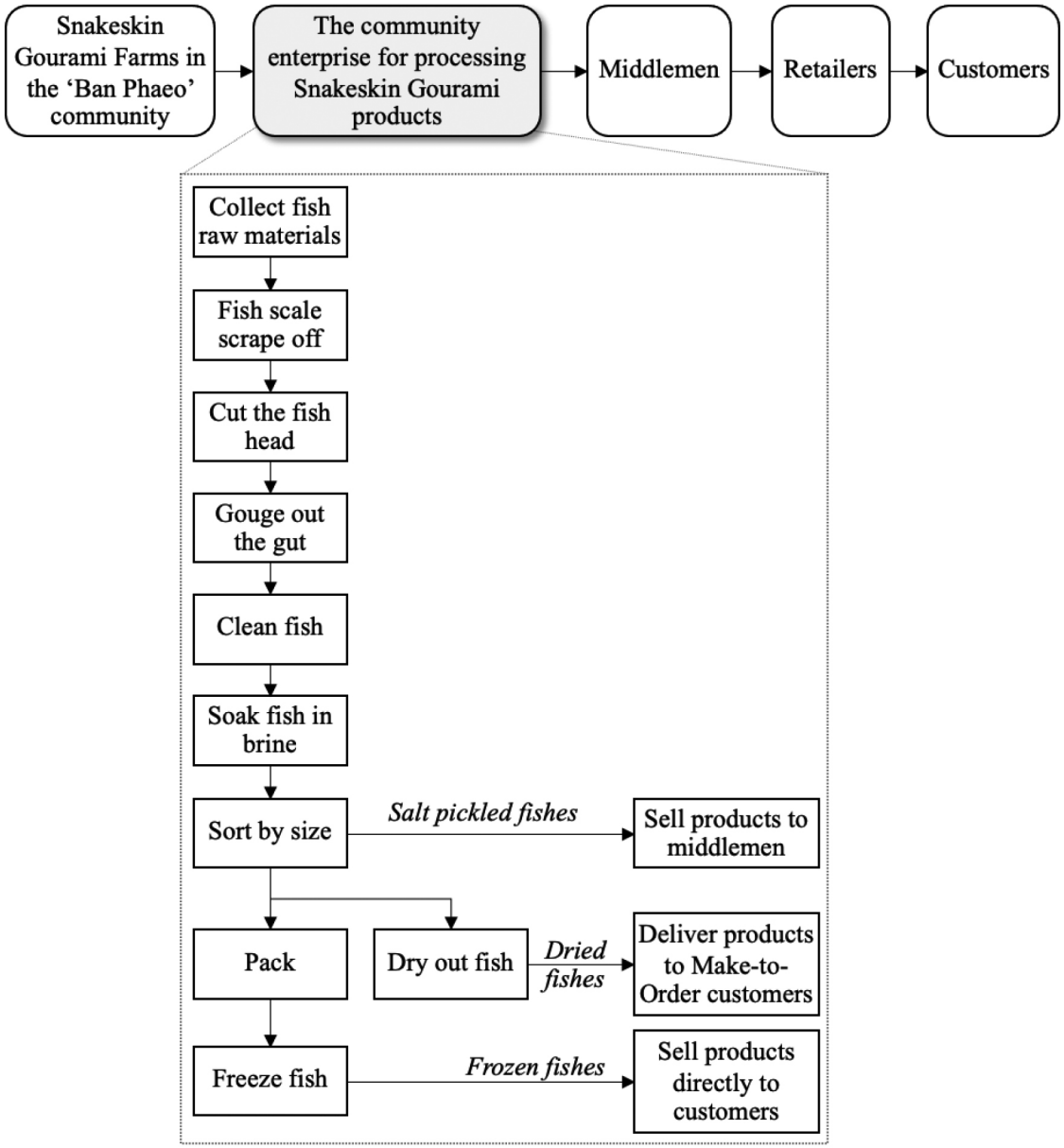

Figure 1 The supply chain and operations process of the Snakeskin Gourami CBEs in Ban Phaeo District, Samut Sakhon Province, Thailand

Although, their products can be sold continually, the CBEs still confronts with the price exploitation problem by middlemen, especially in selling salt pickled fishes. Due to the CBEs' production process still not follows a standard quality guideline for food processing such as Good Manufacturing Practices (GMP). Likewise, they lack know-how in testing a product's shelf-life. The reliability and quality of products cannot be explicitly identified with scientific evidence. Unavoidably, various defects can be found such as mould, rancidity, a wide variety and large number of invisible microbes. Consumers may presume that the products are unreliable. These crucial issues of CBEs can decrease the ability to enlarge and sustain the business. Therefore, in the next sections, the supply chain and

operations process of a Snakeskin Gourami CBE is then systematically analysed in order to provide an effective approach for sustaining a CBE in Thailand.

SWOT analysis of the community–based enterprises in Thailand

To explore the suitable direction for sustaining long run business growth of Thai CBEs, business characteristics of the Snakeskin Gourami CBEs were analysed using a SWOT analysis. It is a popular managerial instrument in both strategic planning and decision-making processes (Harris, 2018; Patel et al., 2014; Boonyarat et al., 2019). SWOT approach is used to evaluate the current position of a product or business in four aspects including strengths, weaknesses, opportunities, and threats (Helms et al., 2011; Kallioras et al., 2010). By identifying these aspects, the core competencies and new opportunities in a wide variety of business situations can be clearly recognised for building the appropriate strategies (Helms et al., 2011).

In this article, the SWOT analysis was initially performed based on the data that were collected from in-depth interviews and closely observations of the supply chain, operations process, management as well as infrastructures. Then the focus group was conducted with the heads of three Snakeskin Gourami CBEs in Ban Phaeo, Samut Sakhon and their members to discuss about internal and external environment of the supply chain.The identification of both controllable and uncontrollable issues can be described as follows.

For internal environment, four controllable issues have been raised for identifying strengths and weaknesses that support and obstruct to achieve a CBE's mission respectively. They consist of people, raw materials, process and equipment as well as products and market. According to the analysis, the weaknesses (negative) can also be found align with each strength (positive). In this community, the CBE has an intimate relationship with inhabitants in the neighbouring areas. Accordingly, they can constantly collect fish raw materials from many Snakeskin Gourami farms. The CBEs can produce many kinds of high-quality product. Besides, there is a small plant for producing high quality sun-dried salted fish products. Nowadays, their products are famous as one of the product champions of Samut Sakhon Province. However, in their processing, most CBEs do not implement a standard food manufacturing control such as GMP, Hazard Analysis Critical Control Point (HACCP). The reliability and quality of both raw materials and final products is still not inspected scientifically. Due to a lack of laboratory equipment for analysing chemical components, physical characteristics as well as microbial contamination. Likewise, the CBE's members lack specific knowledge and the best practices on food processing, product and packaging development. Hence, several defects can be found on their products. It may lead to hazardous to consumers' health. The CBEs cannot improve their business and eliminate these problems by themselves.

Likewise, external environment issues

that the CBEs cannot control have been listed including opportunities (positive) and threats (negative). Similar to the analysis of internal issues, two main points have been identified. In term of process and equipment, while the products of CBEs are now famous, most customers also require a good quality control inspection as a prerequisite. Therefore, their market size is no able to expand. The production process needs more control and improvement to meet this crucial requirement for both national and international markets. Regarding products and market growth, the price exploitation problem has occurred from the mechanism of middlemen in the supply chain. Although, the CBEs can recognise their own weak points, a direction for problem-solving cannot be initiated by themselves. They cannot connect to experts or consultants in the related fields who can help an entrepreneur for enhancing the business. Moreover, the CBEs cannot reach some budget or grant from a government sector for product research and development as well as business improvement.

However, various opportunities (positive) of these CBEs can be identified. The CBEs is able to expand and win new position on agro-food market. They should further develop new value-added products from their high-quality raw materials. Additionally, an appropriate packaging is needed to be designed for food preservation and giving a good image to customers. In processing process, the CBEs should employ a good quality control throughout their operations in order to increase the reliability and quality of products. Besides, the products of CBEs have the potential to export into global market. The effective capacity should be planned for expanding to meet demand growth.

According to the SWOT analysis, the weaknesses and threats of the Snakeskin Gourami CBEs have been underlined from the focus group discussion. These negative issues are needed to be solved and eliminated for underpinning the CBEs' strengths to accomplish the business opportunities. All aspects of SWOT are summarised and presented in Table 1.

Table 1 The SWOT analysis of the Snakeskin Gourami CBEs in Thailand

Internal environment (Controllable)	
Strengths (Positive)	**Weaknesses (Negative)**
People • The CBEs and the inhabitants in the same community are in unity. Raw materials • Raw materials can be constantly collected in the nearby areas. Process and equipment • There is a small plant for producing high quality sun-dried salted fish products. Products and market growth • There are many kinds of high-quality product. • The CBEs' products are famous as one of the product champions of the province.	People • A lack of specific knowledge and the best practices on food processing, product and packaging development. Raw materials • The CBEs cannot inspect the quality of raw materials scientifically. Process and equipment • There is no standard food manufacturing control in their processing. • A lack of laboratory equipment for analysing chemical components, physical characteristics and microbial contamination. Products and market growth • The reliability and quality of products is still not identified scientifically. • Various defects can be found on their products and they cannot solve/eliminate problems by themselves.
External environment (Uncontrollable)	
Opportunities (Positive)	**Threats (Negative)**
Process and equipment • Process improvement for increasing the reliability and quality of products. • Expansion of capacity to meet demand growth. Products and market growth • Development of new value-added products and packaging. • Expansion and win new position on market. • Exporting the CBEs' products into the global marketplace. • Overcoming the price exploitation problem from the mechanism of middlemen.	Process and equipment • Both national and international customers require a good quality-control inspection as a prerequisite. • The process needs more control and improvement. Products and market growth • The price exploitation problem by middlemen. • A lack of connection with experts/consultants in the related fields for enhancing their business. • A lack of budget or grant support from a government sector for product research and development/business improvement.

A SCOR–based supply chain management for sustaining Thai CBEs

Based on the SWOT analysis, a collaboration among CBEs and institutions of higher education in surrounding areas has been suggested as an effective mechanism. This approach helps local entrepreneurs to access university resources for building sustainable community wealth in neighbourhoods (Harkavy et al., 2017). Thus, the way of collaboration is proposed in this section.

In this study, the authors applied the SCOR model in order to construct a comprehensive supply chain and operations management mechanism for Thai CBEs by presenting through the case of Snakeskin Gourami CBE. SCOR can be used to align supply chain flow among the partners covering the Plan, Source, Make, Deliver, and Return for collaborating and coordinating management of the supply chain (Rotaru et al., 2014). This standard framework has been widely adopted in both academic and industrial settings (Georgise et al., 2012; Lockamy lll & McCormack, 2004). Then the case study data were further analysed through the SCOR framework. The analysis aims to provide the mechanism of institutions of higher education-community partnership in standard form.

According to the data collection, the macro process of a Snakeskin Gourami CBE was determined based on the first level of the SCOR model (see in Figure 2). Five major business processes can be mapped as follows. Plan: A CBE plans to source their raw materials and production resources to meet their customer requirements.

Source: The source process is a collection of fish raw materials from farms in the community.

Make: The make process of a CBE includes both 'Make-to-Stock' (salt pickled and frozen-fish productions) and 'Make-to-Order' (dried-fishes production).

Delivery: The process of delivering products is made based on a customer order. Mostly, products are packed, loaded and then directly shipped to the end customers by their own carrier. In term of middlemen, they receive products at the CBE by themselves.

Return: There is the process of source return defective raw materials.

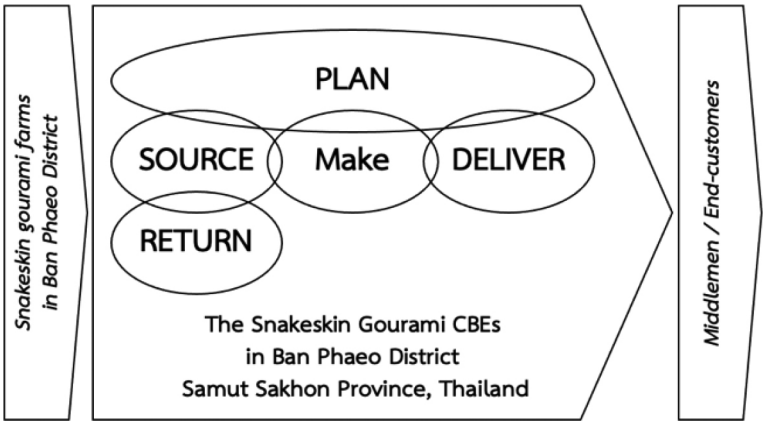

Figure 2 The SCOR-based major business processes of the Snakeskin Gourami CBE in Thailand (SCOR Level 1)

Then the authors mapped the sequence of the CBE's AS-IS workflow (see in Figure 1) to the related SCOR reference processes. The activities of each process can be identified sequentially in the standard form. This approach also helps an entrepreneur to improve their current operations processes. A lack of crucial activities that should be done can be recognised for business process redesign. Likewise, the standard business processes from SCOR lead to the relevant best practices, enabling technologies as well as performance metrics. Institutions of higher education can support a CBE by providing knowledge transfer, R&D units, and scientific laboratory services. These collaboration activities bring up a CBE's strengths and opportunities. Besides, the performance metrics for measuring the performance of a CBE were listed based on SCOR. The possible metrics that a CBE can easily understand and practical use were identified through a consensus-based approach by the heads of Snakeskin Gourami CBEs in Samut Sakhon province. These key performance indicators (KPIs) can be used to track and improve the progress of business performance against expected goals. Consequently, the SCOR-based supply chain and operations management for a CBE in Thailand can be represented through the case of Snakeskin Gourami CBE as shown in Table 2.

Table 2 The SCOR-based supply chain and operations management: The case of Snakeskin Gourami CBE in Thailand

AS-IS Business Processes of Snakeskin Gourami CBEs		SCOR-based Business Processes	Description	Roles of Institutions of Higher Education for supporting a CBE	SCOR-based KPIs for a CBE
Plan (P)	Plan for raw materials used in production and production process	P1: Identify Product Requirements P2: Identify Product Resources P3: Establish Sourcing Plan P4: Establish Production Plan	• Identifying all sources of demand for products • Planning supply resources to meet production requirements	• Provide knowledge regarding bill of material control, supply chain optimisation, supplier research, vendor collaboration, strategic sourcing, publish production plan	• Order fulfilment cycle time • Return on supply chain fixed assets

Table 2 The SCOR-based supply chain and operations management: The case of Snakeskin Gourami CBE in Thailand (Con.)

AS-IS Business Processes of Snakeskin Gourami CBEs		SCOR-based Business Processes	Description	Roles of Institutions of Higher Education for supporting a CBE	SCOR-based KPIs for a CBE
Source (S)	Collect fish raw materials	S1: Identify Sources of Supply S2: Select Final Supplier and Negotiate S3: Schedule Product Deliveries S4: Receive Product S5: Verify Product S6: Transfer Product S7: Authorise Supplier Payment	• Identifying and qualifying the potential of supplier capable • Identifying final supplier (s) and generating a contract. • Scheduling and managing the requirements for product deliveries • Receiving raw materials to contract requirements • Determining conformance of raw materials to requirements and criteria • Hygienically transfer accepted raw materials to the suitable stocking location • Authorisation of payments and paying suppliers for raw materials	• Provide knowledge regarding supplier evaluation, alternative supplier benchmarking, raw material receiving process, vendor collaboration, production line sequencing, receiving goods inspection, self-invoicing, 3-way delivery verification, GMP	• Order fulfilment cycle time • Perfect order fulfilment • Source cycle time • Direct material cost • Inventory days of supply–raw material
Return (R)	Return defective fish raw materials	R1: Identify Defective Product Condition R2: Return Defective Product	• Identifying business rules and product operating conditions inspection as criteria to identify and confirm that raw materials is excess to requirements defective.	• Provide knowledge regarding logistics management, GMP. • Encourage laboratory services for testing raw materials	• Current supplier return order cycle time • Current source return volume • Percentage defective inventory • Cost to return

Table 2 The SCOR-based supply chain and operations management: The case of Snakeskin Gourami CBE in Thailand (Con.)

AS-IS Business Processes of Snakeskin Gourami CBEs		SCOR-based Business Processes	Description	Roles of Institutions of Higher Education for supporting a CBE	SCOR-based KPIs for a CBE
Make (M)	-	M1: Schedule Production Activities M2: Issue Material/ Identify Resource	• Give plan for the production of products in specified quantities. • Hygienically operating physical movement of raw materials from stocking location.	• Provide knowledge regarding production line sequencing, production scheduling, lean manufacturing, Kanban, Lot tracking, GMP.	• Yield • Make cycle time • Cost to make • Direct material cost • Indirect cost related to production • Direct labour cost • Recyclable waste as % of total waste
	Fish scale scrape out	M3: Produce and Test	• The series of activities performed raw materials/in-process product to convert it from the raw or semi-finished state to a state of complete and a greater value.	• Provide knowledge regarding lot tracking, lean manufacturing, GMP	
	Cut the fish head				
	Gouge out the gut				
	Clean fish				
	Soak fish in brine				
	Sort by size				
	Dry out fish				
	Freeze fish				
	Pack	M4: Package	• The series of activities that containerise completed products for storage or sale to end-users including cleaning or sterilisation.	• Provide knowledge regarding lot tracking, lean manufacturing, GMP. • Encourage research and development unit for packaging design.	
	-	M5: Release Product to M6: Deliver Waste Disposal	• Activities associated with post-production documentation, testing, or certification required prior to delivery of finished product to customer • Activities associated with collecting and managing waste in production process.	• Provide knowledge regarding lot tracking, perfect pick put away, waste management, GMP. • Encourage laboratory services for testing products, creating certificate of analysis.	

Table 2 The SCOR-based supply chain and operations management: The case of Snakeskin Gourami CBE in Thailand (Con.)

AS-IS Business Processes of Snakeskin Gourami CBEs		SCOR-based Business Processes	Description	Roles of Institutions of Higher Education for supporting a CBE	SCOR-based KPIs for a CBE
Deliver (D)	Deliver products to customers	D1: Process Inquiry and Quote D2: Receive and Validate Order D3: Reserve Inventory and Determine Delivery Date D4: Consolidate Orders D5: Build Loads D6: Route Shipments D7: Select Carriers and Rate Shipments D8: Pick Product D9: Pack Product D10: Load Vehicle and Generate Shipping Documents D11: Ship Product D12: Receive and Verify Product by Customer D13: Invoice	• Receive order from the customer • Inventory is identified and reserved for specific order and a deliver date is committed and scheduled. • Analysing order to determine the groupings that result in least cost and transportation. • Selecting carriers, routes, transportation modes, and building efficient loads. • Picking, sorting/ combining, packing the products, paste labels and delivering to the shipping area for loading • Loading product onto modes of transportation, and generating the documentation including invoice to meet internal, customer, carrier and government needs • Shipping the product to the customer site. • Receiving the shipment by the customer and verifying that the order was shipped complete and meets delivery terms. • Receiving payment from the customer.	• Provide knowledge regarding customer relationship management (CRM), pricing management, lead-time validation, inventory management, order management, transportation route planning, logistics management, packing, material handling, cold chain management, quality management, GMP	• Perfect order fulfilment • Order fulfilment cycle time • Deliver cycle time • Delivery volume • Order management cost • Order delivery cost • Inventory days of supply-WIP • Inventory days of supply-Finished goods

Conclusion

This article discloses the existing phenomenon of Snakeskin Gourami CBEs in Thailand through fieldwork visits to the CBEs where are located in Ban Phaeo District, Samut Sakhon Province. According to the data collection, the communities established the CBE to avoid an interference of middlemen in agricultural trade. The CBEs directly collects fresh fishes that are raised from farmers in the same area for adding value as the community products. Although, their production is not complicated, many kinds of good quality products are most famous. Besides, most CBEs play a significant role as the growth engine for the rural economy.

According to the SWOT analysis, it indicates that the CBEs are still suffering from a lot of weaknesses and threats. Due to they normally operate their business by trial and error based on folk wisdom without any outsider's intervention. An encouragement in term of up-to-date knowledge, modern equipment and technologies as well as subsidy has been all along required. But the CBEs cannot reach or perform these crucial things by themselves. Hence, to achieve the CBE's opportunities, all of negative points must be seriously concentrated to eliminate them throughout the business system.

Consequently, to fulfil Thai CBEs, the mechanism of supply chain management has been proposed based on the SCOR model in this article. Institutions of higher education, especially a university, would form strong relationships with the communities that surround their campuses. According to the SCOR-based supply chain and operations management approach presented based on the case study data, anything that the CBE is incapable can be taken from higher education institutions. As mentioned by McKeon (2013), in developing and sustaining a successful of small businesses ecosystem, universities must take a leadership role. Thus, the mechanism among CBEs and education institutions in the same area should be intensively promoted in Thailand. It helps to match the institutions' capabilities in order to solve the community's problems. This is also one mission of a full-time professional in public universities. Ultimately, Thai rural communities can enhance their quality of life and societies and contribute to sustainable development.

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Name and Surname: Wirachchaya Chanpuypetch
Highest Education: Ph.D. (Logistics and Engineering Management), Mahidol University
Affliation: Chiang Mai University
Field of Expertise: Logistics and Supply Chain Management

Name and Surname: Suratin Tunyaplin
Highest Education: Ph.D. (Logistics and Engineering Management), Mahidol University
Affliation: Sripatum University, Chonburi Suwanpisarn Transportation 2010 Co.,Ltd.
Field of Expertise: Logistics and Transportation Management