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Food Value Chain in ASEAN:

Case Studies Focusing on Local Producers

Edited by

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Rice terraced fields in the Northern Midlands and Mountains of Vietnam. Photo by Lam Thi Bui.

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Overview

The bottom-up perspective of the global value chain (GVC), centrally argued in this publication, puts weight on activities of suppliers and their upgrading in domestic value chains and GVCs. It can be a core question for the bottom-up development of the food value chain (FVC) of how agri-food producers, mainly characterised by small-scale and unstable management, can improve their profitability by participating and utilising the chain. Such a question has also been associated with issues on poverty reduction and on the development of small and medium-sized enterprises in agri-food industries and has been actively argued in the literature of value chain development.

This publication aims to contribute to economic development and poverty reduction in agri-food sectors in countries of the Association of Southeast Asian Nations (ASEAN) by identifying the policy implications obtained from case studies of selected FVCs. Different case studies commonly seek pathways by which agri-food producers and processors can increase their profit by utilising the FVC. Each study focuses on functions of various actors vertically linked with producers or processors, and of stakeholders supporting the construction of the FVC.

The major analytical method is the description of the FVC's structure, which includes distribution channels of products and functions of actors within and surrounding the chain. Some case studies focus on cost–benefit structure, product price, and explicit coordination of key players. Others emphasise the structural characteristics of the FVC and detect opportunities and chokepoints buried in the chain. Those analyses are based on both primary data collected through interviews or sampling and secondary data obtained from various sources.

Chapter 2 describes the theoretical background of the FVC and the transition of the FVC in Thailand, mainly focusing on fresh vegetables and broiler value chains. Chapters 3 and 4 explore feasible solutions to generate more value added and allocate more suitable benefit among actors in the chain through case studies of high-quality rice and fresh milk in Viet Nam. Chapter 5 considers how to improve the profitability of dairy farmers by investigating their marketing channel of fresh and processed milk in Malaysia. Chapter 6 seeks opportunities and challenges in the value chain of seafood in Indonesia, which is the second-largest producer of marine fish in the world. Policy implications obtained through case studies are as follows.

Increase in Productivity and Product Quality

To drive the transition from the traditional to the modern value chain corresponding to higher requirements of consumers and buyers, producers need to reduce production and marketing costs and ensure high-quality products through good farming practices.

The most challenging issue is to devise the appropriate food safety rules or institution and incentives acceptable to all stakeholders. The development and dissemination of the traceability system and documentation, which allow consumers and retailers to trace

products back to the farm, would also contribute to overcoming a bottleneck in the export of agri-food products. Such rules should be enforced at reasonably low costs for all stakeholders in the FVC.

The collective action realised through community enterprises or cooperatives can share input costs, especially that of labour cost, within the FVC. That would be a major means for small-scale producers who do not have enough assets to respond to various issues arising with the transition of the FVC. New types of agri-food production and marketing based on modern digital technologies, such as precision farming and marketing utilising social media, would also increase the level of automation and reduce input costs.

The Rise in Resilience against External Shocks

Companies should quickly adopt new technologies and maintain a tight control of information flowing within their companies to adapt to new requirements and the changing consumer preferences on social, environmental, and animal welfare concerns.

Risk-sharing arrangements within the FVC would reduce farmers' risks of heavy debt and bankruptcy against serious external shocks such as bird flu outbreaks. The government and the industry need to constantly monitor possibilities of such external shocks and establish an effective warning and preventive system. The GVC can also be actively used as a competitive strategy to be a winner of the intensifying international competition and to avoid risks of import restrictions.

Enhancement of Vertical Collaboration

Strengthening the marketing actor's functions in the FVC would increase value added and farmers' income. The case study of high-quality rice in Viet Nam shows how the cooperative of paddy collectors significantly contributed to the increase in value added through the exploration and quality control of products. Secondary actors or relevant stakeholders not directly involved in the FVC, such as provincial governments and non-government organisations (NGOs), can also play important roles for poverty reduction, improvement of the livelihoods of local people, and multi-faceted rural development by intervening in the FVC.

An illegal action, deliberately mixing ordinary types of rice with high-quality rice, is reported in the case study in Viet Nam. Such action would be caused by under-exploitation of main products and by-products due to outdated processing technology and lack of innovation. Upgrading the current technology in processing and paying more attention to innovative higher-value product are recommended. Furthermore, increasing awareness of the long-term benefit of quality and customer service is necessary.

Results of the cost–benefit analysis show that farmers can benefit when they can manage production cost well, even if they cannot get high cash receipts. Thus, this study emphasises

the importance of contracts between buyers and suppliers which can contribute to cost reduction and efficiency of farm management.

Expansion of Market Channels Particularly of Small-scale Producers

Many small-scale farmers and their labour shortage seem to restrict the production of high-value products according to the case study in Malaysia. The purchasing prices of milk and its products in the formal market or milk collection centres may not be fully profitable for small-scale farmers producing a limited volume of products. Small-scale farmers are required to seek informal or niche markets on their own, and that sacrifices time and money in managing farms. It would be helpful if the government formulate intervention strategies in assisting these farmers to establish contacts with niche markets.

Furthermore, the establishment of an efficient cold chain system, including transportation and storage for milk and dairy products, is crucial since most small-scale dairy farms are located in rural areas, away from large consumer markets.

Improvement in Distribution and Production Systems to Fully Utilise Resources

Value addition to seafood highly relates to technologies on processing and distribution, and systems to introduce and manage those. The case study of seafood in Indonesia repeatedly mentions the necessity of the cold chain system in the entire FVC – from handling in the fishing boat, landing, processing, to distributing – to maintain freshness and better hygiene. Improvement of technologies to ensure a high survival rate is also needed from capture to distribution of live lobster and many live maricultural products, such as grouper, which are sold at high prices.

Resource management to enable sustainable production is a problem specific to the capture of fish. Our case study suggests the importance of investment for production resources, technology development, and sufficient consideration on policies for fully utilising and saving resources.

We should not easily generalise policy implications without careful consideration since the study sites and target items vary and are limited. Despite that, this study sheds light on obstacles for developing FVCs, which would exist in many ASEAN member states, and provides ideas to solve those obstacles. This study's outputs can be a clue to deeper arguments and contribute to improving the FVC and profitability of agri-food producers in ASEAN.

Chapter 1

Introduction

Eiichi Kusano

1. Background

Global value chain (GVC) can roughly be argued from the top-down and bottom-up viewpoints, according to the classification of Gereffi (2014). The top-down approach focuses on governance of firms vertically related in the GVC and tends to stress the importance of the lead firm's functions, such as a source of technological spillover, to realise higher competitiveness among industries and nations.

The bottom-up perspective of the GVC, centrally argued in this publication, puts more weight on activities of suppliers or producers and their upgrading [1] in domestic value chains and GVCs. It can be a core question for the bottom-up development of the food value chain (FVC) of how agri-food producers, mainly characterised by small-scale and unstable management, can improve their profitability by participating and utilising the chain. Such a question has also been associated with issues on poverty reduction and the development of small and medium-sized enterprises in agri-food industries and is actively argued in the literature of value chain development.[2]

For the ASEAN region, the development of the FVC is a key challenge to ensure food security and nutrition and to improve the livelihoods of farmers. ASEAN adopted the ASEAN Integrated Food Security Framework and Strategic Plan of Action – Food Security (SPA-FS) 2015–2020[3], and set strategic thrusts such as trade activation, dissemination of new technologies and practices, and investments in food and agri-based industry to develop the FVC in line with the ASEAN Economic Community Blueprint 2025. Similar strategic thrusts in the Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Fisheries 2016–2025 (VSP-FAF)[4], and Strategic Plans of Action for ASEAN Cooperation (SPA) on Crops

[1] Humphrey and Schmitz (2002, p.3) define upgrading as increasing incomes of producers accompanied with an increase in 'the skill content of their activities and/or move into market niches'.
[2] Mainly argued by donor organisations such as GTZ (2007) and M4P (2008). See Stamm and Von Drachenfels (2011), Nang'ole et al. (2011), and Donovan et al. (2013) for more information.
[3] The ASEAN Integrated Food Security Framework (AIFSF) and Strategic Plan of Action – Food Security (SPA-FS 2015–2020) were developed based on the AIFSF and SPA-FS 2009–2013, which were adopted by the ASEAN Summit of 2009 to ensure long-term food security and to improve the livelihoods of farmers in ASEAN.
[4] The Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Fisheries 2016–2025 (VSP-FAF) was endorsed by the 37th ASEAN Ministers Meeting on Agriculture and Forestry (AMAF) in September 2015.

(SPAC), Livestock (SPAL), and Fisheries (SPAF).[5] Those strategic plans mention the necessity of FVC development which will contribute to food security and better nutrition, and higher competitiveness of small-scale farmers and small and medium-sized enterprises.

2. Aims and Scope

This study aims to contribute to economic development and poverty reduction in agri-food sectors of ASEAN countries by identifying the policy implications obtained from the case studies of selected FVCs. Different case studies commonly seek pathways by which agri-food producers and processors can increase their profit utilising the FVC. Each study focuses on the functions of various actors vertically linked with producers or processors, and of stakeholders supporting the construction of the FVC.

The major analytical method is the description of the FVC's structure, which includes the distribution channels of products and the functions of actors within and surrounding the chain. Some case studies focus on cost–benefit structure, product price, and explicit coordination of key players. Others emphasise the structural characteristics of the FVC and detect opportunities and chokepoints buried in the chain. Those analyses are based on primary data collected through interview or sampling and secondary data obtained from various sources.

3. Study Sites and Target Items

The study sites were selected from Thailand, Viet Nam, Malaysia, and Indonesia. Target items such as vegetable, livestock, and aquatic products vary by studied sites. Table 1.1 and Figure 1.1 show information on the study sites, target items, and the corresponding chapters in this publication.

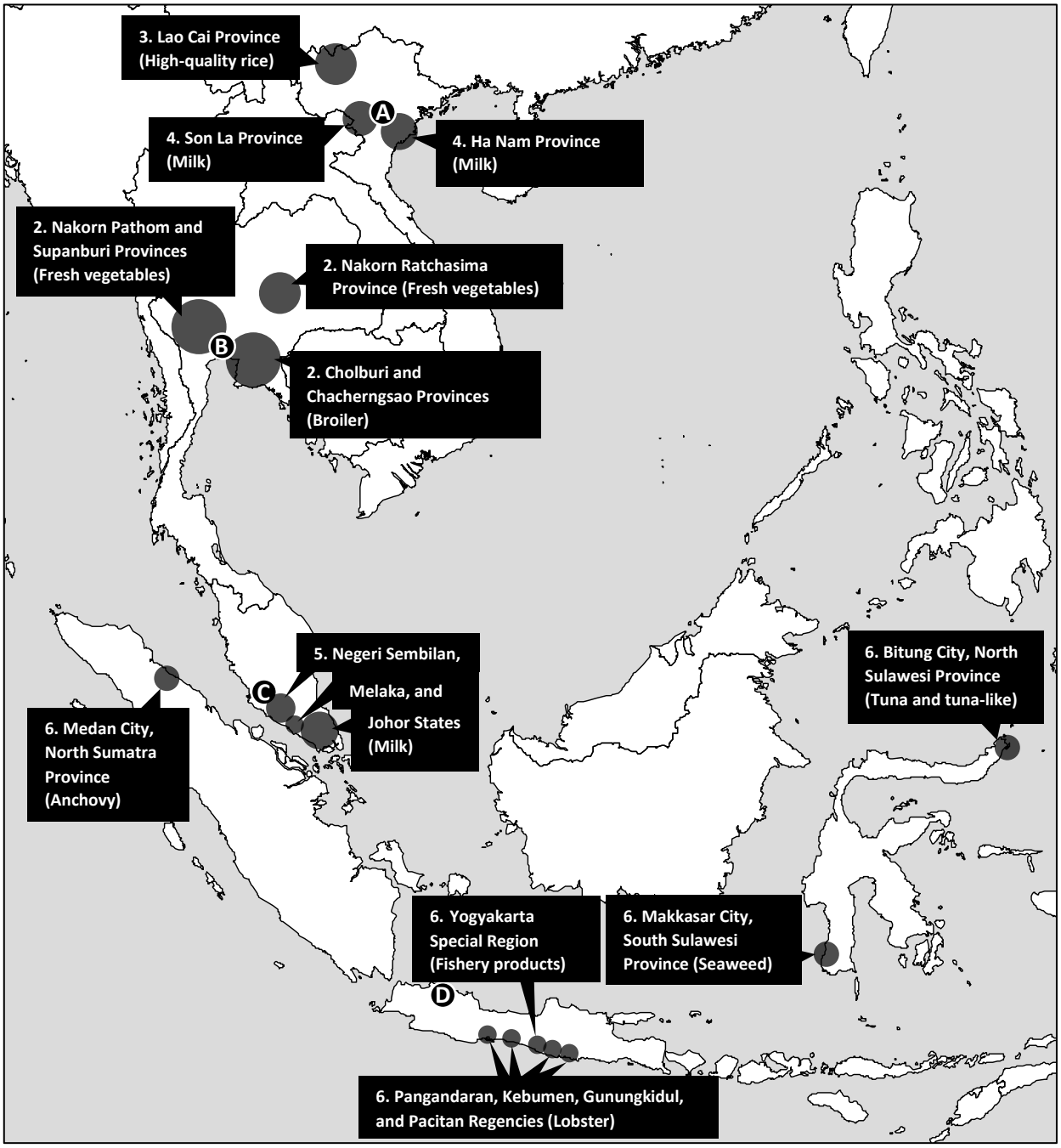
[5] Strategic plans of action (SPAs) were developed for the implementation of the VSP-FAF and adopted by the 38th AMAF in October 2016.

Table 1.1: Study Sites in Each Chapter

Country	Chapter	Study Site	Industry	Characteristics of the Industry
Thailand	2	Nakorn Pathom, Supanburi, and Nakorn Ratchasima Provinces	Fresh vegetables	Dominated by traditional value chain (VC); gradually transitioning to modern VC
		Cholburi and Chacherngsao Provinces	Broiler	Vertically integrated large-scale export-oriented industry
Viet Nam	3	Lao Cai Province	High-quality rice (Seng Cu rice)	Typical high value product contributing to poverty reduction in the Northern Midlands and Mountains
	4	Son La and Ha Nam Provinces	Fresh milk	Significantly growing demand, although new industry in Viet Nam; heavily dependent on import
Malaysia	5	Southern Zone of Peninsular Malaysia (Johor, Melaka, and Negeri Sembilan)	Fresh and processed milk	Significantly growing demand, although production is stagnating; heavily dependent on import
Indonesia	6	Regencies of Pangandaran, Kebumen, Gunungkidul, and Pacitan; Southern coasts of Java	Lobster	High-value product captured by small-scale fishery using fishing fleet; expanding market
		Medan City, North Sumatra Province	Anchovies	High-value processed product; decreasing production after the prohibition of trawling in 2015
		Makassar City, South Sulawesi Province	Seaweed	Major and rapidly growing industry as raw materials of carrageenan extraction in South Sulawesi
		Yogyakarta City, Yogyakarta Special Region	Fishery products	The largest traditional wholesale market of raw materials, including fishery products
		Bitung City, North Sulawesi Province	Tuna and tuna-like	The main commodities landed at the Bitung port; production dropped after the regulation in 2015

Source: Author.

Figure 1.1: Location of Study Sites



Notes: Location of capitals: A = Ha Noi, B = Bangkok, C = Kuala Lumpur, D = Jakarta.
Source: Author.

Thailand

Chapter 2 describes the theoretical background of the FVC and its transition in Thailand, mainly focusing on fresh vegetables and broiler value chains. The first part of this chapter summarises the theory of the FVC in the context of the arguments of the GVC. Then the chapter presents an overview of the characteristics of the modern and traditional FVCs in Thailand. It is argued from multiple aspects how farmers can reap the benefits through the modernisation, strengthening, and stabilisation of the FVC. Two case studies of the FVC of fresh vegetables and broiler are employed.

- Fresh vegetables (Chapter 2 [2.5]): The transition from the traditional FVC to the modern FVC is 'gentle' in the fresh vegetables sector where the traditional chain is dominant. This section specifies obstacles during the transition and seeks ways to boost it by involving small-scale producers. Surveys on vegetable farmers, contractors, and producer groups were conducted in the central plains provinces, Nakorn Pathom and Supanburi, and a northeastern province, Nakorn Ratchasima.
- Broiler (Chapter 2 [2.6]): Broiler is a vertically integrated and export-oriented 'star' industry in Thailand. The dynamism of the FVC structure mainly driven by external shocks, such as bird flu, are highlighted in this section. This study stresses the importance of resilience in FVC actors against external shocks. Study sites are two eastern provinces, Cholburi and Chacherngsao.

Viet Nam

Chapters 3 and 4 explore feasible solutions to generate more value added and allocate more suitable benefits among actors in the chain through case studies of high-quality rice and fresh milk in Viet Nam. Both studies focus on functions and cost–benefit structures of FVC actors around producers in line with the methodology of value chain development analysis.

- High-quality rice (Seng Cu rice) (Chapter 3): Seng Cu, a high-quality aromatic rice in the Northern Midlands and Mountains (NMM) of Viet Nam, is a typical high value-added product contributing to poverty alleviation. This chapter highlights the functions of FVC actors mainly linking with Seng Cu rice farmers by comparing the FVCs in different geographical environments in Lao Cai Province, NMM.
- Fresh milk (Chapter 4): The demand for milk has been rapidly growing in Viet Nam, although most of its supply depends on foreign countries. The milk industry, which has a short history in Viet Nam, is facing challenges in production quantity and quality, attributed to the loosened linkages of stakeholders in the chain. Case studies of fresh milk value chains were done in Moc Chau district of Son La Province which is dominated by a large milk company, and Ly Nhan and Duy Tien districts in Ha Nam Province where no dominant company exists.

Malaysia

Chapter 5 summarises milk value chain in Malaysia, which depends more on foreign sources for milk than Viet Nam. Dairy products have been consumed more and more in Malaysia, although its domestic production has stagnated. This study looks into how to improve the profitability of dairy farmers by investigating their marketing channels of fresh and processed milk.

- Fresh and processed milk (Chapter 5): This chapter summarises the transition of policies relating to dairy production in Malaysia and describes the marketing channel and ex-farm price of fresh milk, yoghurt, and other dairy products. The study site is the Southern Zone of Peninsular Malaysia comprising the states of Johor, Melaka, and Negeri Sembilan.

Indonesia

Chapter 6 seeks opportunities and challenges in the seafood value chain of Indonesia, which is the second-largest producer of marine fish in the world. The first part of this chapter explains the whole picture of seafood value chain from consumption, retail markets, and food regulation in Indonesia. Then different types of seafood businesses including capturing fishery, mariculture, and wholesale markets are summarised through maps of the distribution channels based on interview surveys.

- Various seafood (Chapter 6): Different actors comprising the seafood value chain are emphasised depending on the items and locations, such as fishermen of the lobster chain, fishermen and fishing companies producing anchovies, a processing company of seaweed, a traditional wholesale market of raw materials including fishery products, and large-scale fish-processing companies mainly dealing with tuna and tuna-like products. Study sites are widely distributed in the southern coasts of Java, North Sumatra, Yogyakarta Special Region, and North and South Sulawesi.

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Chapter 2

Development of Food Value Chains in Thailand

Nipon Poapongsakorn, Phunjasit Chokesomritpol, and Kamphol Pantakua

1. Introduction

The development of the food value chain (FVC) is an important part of the agricultural transformation process. With few exceptions, countries that have moved towards the middle-income status have been initially driven along the path of economic growth enabled by the transformation of their agriculture sector. For Thailand, the transformation has resulted in a declining share of agricultural gross domestic product (GDP), specialisation in and diversification towards high-value crops, and dietary changes and supermarket revolution that highly penetrated modern trade. Yet with rising per capita income, the agribusiness – which provides inputs to the farm sector and links it to consumers through handling, processing, logistics, and marketing and distribution – has a large and rising share of GDP across developing countries. Its contribution to GDP growth has been driven by changes in consumer demand and rapid technological and institutional innovation (World Bank, 2007).

Such transformation improved Thailand's competitiveness – from being the 23rd largest agricultural exporter in the 1960s to the 11th to 13th largest exporter in the mid-2010s. This, combined with the developments of several modern value chains, allowed exporters to sell safe food that complies with rigorous international standards requirements, thus acquiring competitive advantage. In fact, Thailand has become one of the world top exporters of rice, sugar, shrimp, chicken, fruits and vegetables, canned tuna and canned pineapple, among others. The competitiveness of these FVCs has been driven by the economies of scale of the agro-enterprises and their capacity to respond to the globalisation of the FVC, thanks to the governments' laissez faire policy. This chapter explains how the modern FVCs in Thailand have evolved, focusing on the pattern and drivers of induced innovation, particularly institutional change.

Though modern FVCs drive the sector's growth, market forces do not guarantee smallholder participation, which is essential to link agricultural growth to inclusive development. Thus, this chapter explores how the modern FVCs provide access of smallholders to the high-value export and domestic markets. A study of FVC development and its determinants has important policy implications.

This research draws heavily from previous studies. To complement the analysis, this research uses secondary data. The study team conducted three focus group interviews with

agribusiness executives and social enterprises, and in-depth interviews with executives in the chicken and vegetable sectors, and leaders of community enterprises engaging in safe vegetable chain. Since there are serious problems of data availability, this study mainly employs the qualitative approach.

2.. Objectives and Research Questions

This chapter aims to (i) briefly explain the theoretical framework of the FVC, its definition, benefits, and emergence; (ii) focus on the FVC development in Thailand, emphasising institutional arrangements, technological change, and drivers; and (iii) analyse two FVC case studies on the vegetable value chain and the importance of farmer groups, and on broiler value chain and how it dealt with external shocks by building resilience.

To guide through the details of each section, a common theme is established to answer the following research questions:

- What explains the induced innovation of the FVCs (i.e. technical and institutional changes)?
- What are the important drivers of the FVCs?
- What factors help link smallholders and farmer groups to the high-value markets?
- What are the barriers?
- What is the performance of traditional and modern FVCs?

3. A Brief Theoretical Framework of the FVCs

To explain the emergence and drivers of the FVCs, one needs to have a working definition on the salient characteristics of modern FVCs, as well as a framework to compare the benefits and costs of the modern FVCs with those of traditional FVCs.

Definitions

Gomez and Ricketts (2013) describe the FVCs as comprising 'all activities necessary to bring farm products to consumers, including agricultural production, processing, storage, marketing, distribution, and consumption. Value chain analysis considers linkages between participating actors (e.g. farmers, manufacturers, retailers, consumers) and examines the flow of foods from farmers to distributors and to retailers.

However, to understand the emergence and performance of the value chains, one needs to have a theoretical framework. Scholars in commerce are perhaps the pioneers in advancing the analysis of supply chain management (SCM).[1]

According to Vorst et al. (2007), 'a supply chain (is) a sequence of (decision-making and execution) processes and (material, information, and money) flows that aim to meet final consumer requirements, that take place within and between different stages along a continuum, from production to final consumption'. The definition emphasises the continuum of processes and three types of flows, which are the critical characteristics that distinguish the modern supply chain management from the traditional supply chain (like the spot markets of rice, cassava, etc.).

Additionally, 'supply chain management is the integrated planning, implementation, coordination and control of all business processes and activities necessary to produce and deliver, as efficiently as possible, products that satisfy market requirements (Vorst et al. 2007).

But the concept of 'value chain' in business management was first described by Michael Porter in his 1985 bestseller, *Competitive Advantage: Creating and Sustaining Superior Performance*. A value chain is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market (Porter, 2008). Value is defined as the amount consumers are willing to pay for what the producers and retailers provide.

In analysing the global production network, T.J. Sturgeon (2001) defines value chain as 'a larger constellation of activities and dynamic configurations embodied in a production network. In addition to this organisation scale, there are other dimensions of value chains, i.e., spatial scale, productive actors and governance style'.

This study uses some of the above characteristics to describe the FVCs in Thailand.

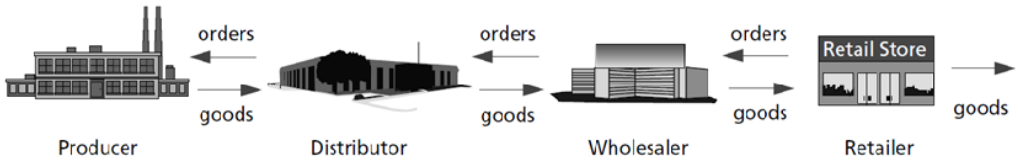
Benefits of the Modern SCM over the Traditional SCM: The Bullwhip Effect in the Beer Distribution Game

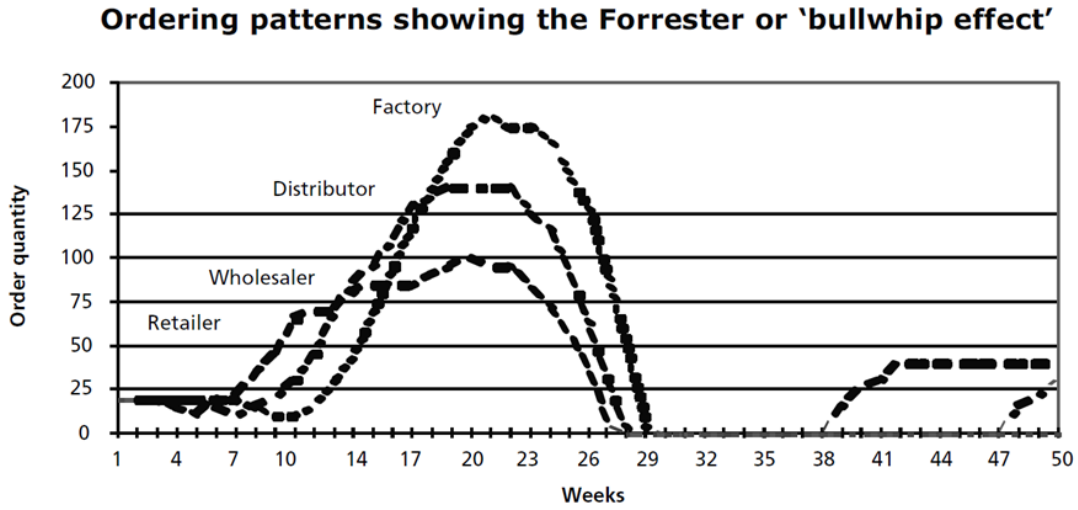
The MIT game (Lee et al., 1997) first illustrates the major weakness of traditional SCM. Due to the lack of coordination and timely information on demand changes among chain actors, the traditional supply chain would face huge order fluctuations and oscillations. The producer-received demand would be amplified by 900% from the original retail demand fluctuation, resulting in huge stock-outs at the retail level (Figure 2.1).

[1] The term 'supply chain management' was first coined by Keith Oliver in 1982, but the concept was introduced in the early 20th century, especially with the creation of the assembly line (Handfield and Nichols, 1999). In fact, the earliest form of supply chain management may have come from military science, which deals with the military logistics.

The modern value chain improves this through organised SCM that relies heavily on ICT. As a result, the modern value chains can minimise inventory cost (also known as 'just-in-time') and reduce order fluctuations.

Figure 2.1. Beer Supply Chain and the Bullwhip Effect





Source: Vourst, et al. (2007).

Modern SCM also allows for a larger volume of connection between actors, which enable smallholder farmers into the modern value chain. Timely flow of information also supports appropriate risk sharing according to the risk-management capacity of the actors. As a result, farmers can shift price risk to the contractors or retailers, thus, stabilising market price for consumers. The process improves the chain efficiency and increases the total net revenue of actors in all stages but does not necessarily increase the per-unit profit of a product.

What Explains the Emergence of the FVCs?

New institutional economics uses transaction costs to explain transaction arrangements between various players. In the agricultural value chains, farmers enter into contracts or supermarket procurement systems through networks of suppliers, farmer groups, and non-governmental organisations (NGOs) to supply standardised products.

There are five types of value chain governance: market, modular, relational, captive, and hierarchy (Gereffi et al., 2005). These different types of governance are determined by three factors: (i) complexity of transactions and knowledge transfer, (ii) codifiability and efficient transmission of information and knowledge without transaction-specific investment, and (iii) capabilities of current and potential suppliers.

Governance shift according to these factors is often a reflection of the higher requirements of international trade. For example, the vegetable importers of the United Kingdom (UK) had linked the operation with their relational suppliers in Thailand and Kenya to introduce new items, assure quality control and a year-round stable supply, as well as compliance to food safety regulations and other standards, along with processing of products towards ready-to-eat foods.

The transformation is driven by export and domestic demand from a rising middle-income populace which shifts the dietary pattern (Bennett's Law[2]) from cheap staple food towards high-value protein, fresh fruits, and vegetables. Modern retailers captured this emerging market by introducing the supermarket revolution.[3] Such production means the modern FVCs would require a higher degree of coordination and closer relationship among importers, exporters, and suppliers through regular monitoring and auditing. Their interactions became more complex and relational, which also reduced the number of players involved. Fortunately, the transformation is supported by new technological change especially ICT, digital technology, and biotechnology.

4. Development of the FVC in Thailand

After briefly summarising the characteristics of Thai FVCs, this section describes the major developments of the FVCs and the benefits and costs of linking smallholders to the modern markets and analyses the efficiency of modern and traditional value chains.

The Characteristics of Thai FVCs

The structure of Thai FVCs is dualistic – some are traditional (with spot markets), others are modern chains. The structural classification is based on three criteria: (i) product differentiation, (ii) coordination between buyers and suppliers, and (iii) a shorter chain that links farmers with suppliers or retailers directly.

[2] Bennett's Law implies income and price elasticity is higher for preferred products (i.e. meat income elasticity is more than bread income elasticity).

[3] A term referring to the modernisation of retails that started in the 1940s and continued on to the 1970s in developing countries. The trend began in Southeast Asia in the late 1990s and rapidly matured by the mid-2000s.

The distinction between the traditional supply chain and the modern supply chain, along with the disruptive factors that stimulate the transition, is summarised in Table 2.1. The distinction between modern and traditional value chains is based on seven characteristics: (i) market structure of the products, (ii) marketing channels (or distribution), (iii) technology, (iv) nature of the products, (v) flow of information, (vi) logistics, and (vii) capital and risks. Three disruptive forces are identified: (i) change in consumption pattern, (ii) international trade requirements, and (iii) technology.

Table 2.1 shows that the traditional value chains (spot markets) still dominate a large portion of the agriculture sector – including most commodities such as rice (except organic rice), cassava, shrimp, and most vegetables and fruits (durian, longan, mango), beans, etc. These products are homogeneous but can be classified into different grades and types. Traditional value chains are governed by the highly competitive spot markets dominated by smallholders and small traders at various stages of exchange. Thus, the price risks are mostly borne by farmers. While the information flow in traditional chains is between the two direct trading parties, the information in the modern chains flows directly from the retailers (or exporters) to the farmers. The modern SCM, often linked to the international market or modern retailers, includes most safe fruits and vegetables for the high-end market, such as banana, mango, durian, organic rice, broiler, and dairy products. The trading relationship is long term; thus, the farmers and processors/retailers tend to share risks. But the market structure is oligopolistic, and the products are differentiated. In contrast, the traditional chains are very long chains of fragmented transactions and involving many parties. The logistics is often also performed by small transport companies or agents who have small warehouses, while the logistics in the modern chains is dedicated and carried out by large logistic companies with economies of scale. Unlike the farmer fellows in the traditional chains who have access to credit from agricultural banks or cooperatives, those in the modern chains usually borrow from commercial banks, thanks to their scale of operation and transaction value.

Table 2.1: Comparison between the Traditional and Modern Supply Chains in Thailand

Characteristic	Traditional Supply Chain	Disruptive Factors	Modern Supply Chain
Market structure, organization, and competition	High competition between farmers and middlemen	**Consumption**	High competition under an oligopolistic setting
	Wholesale and retail spot markets	Increasing income per capita	Vertical integration, or under contracts
	Simple trade, sometimes under credit terms	Concerns over quality and health	Contract farming between farmers and contractors to control both quantity and quality
	Transactions through middlemen	International trade requirements	
		Concerns over carbon footprints and other social problems	
Marketing Channel	Wet market, traditional retails	The rise of supermarkets and modern retails	Modern trade
			Central procurement
			Elimination of middlemen
Production and technology	Chemical intensive	**International trade requirements**	Sustainable production, organic farming, animal welfare, and environmental protection
	Technology, research, and extensions often provided by governmental officials, input providers, and a few forward-thinking farmers	Trade and investment growth of high-value and safety foods in the export markets	Technology transfer from private companies
		Protectionism policies	technology transfer from private companies
			Modern farm management (GAP, GMP) and traceability system
Products	Inputs bought from local stores or from agents	Technology	Inputs provided by contractors
	Commodity production	Breeding and processing technologies	Produced to match standards and consumers preferences

	Mixed grade, no standards or quality control		Value added through packaging and branding
		Information and communication technologies	Extension services provided by contractors and exporters
			Information transfer from retails to farmers
		Management and Institutions	
Flow of information	Inputs advertisement	Contract farming	
	Using price as a market signal	GAP, GMP, HACCP, quality control, standards, and traceability system	
Logistics	Middlemen collects products from farmers and transport in bulk to processors or exporters	Central procurement and distribution centre	Dedicated logistics and distribution centre
			Cold chain
Capital and risks	Credit from BAAC/middlemen		Credit from banks
	Trade mostly by cash		Supermarket/exporters get 30-90 days credit term
	Volatile farm-gate price		Advance pricing
	Speculation for profit		Quality for profit
	Retail price adjusts to margin		Retail price adjusts to willingness to pay

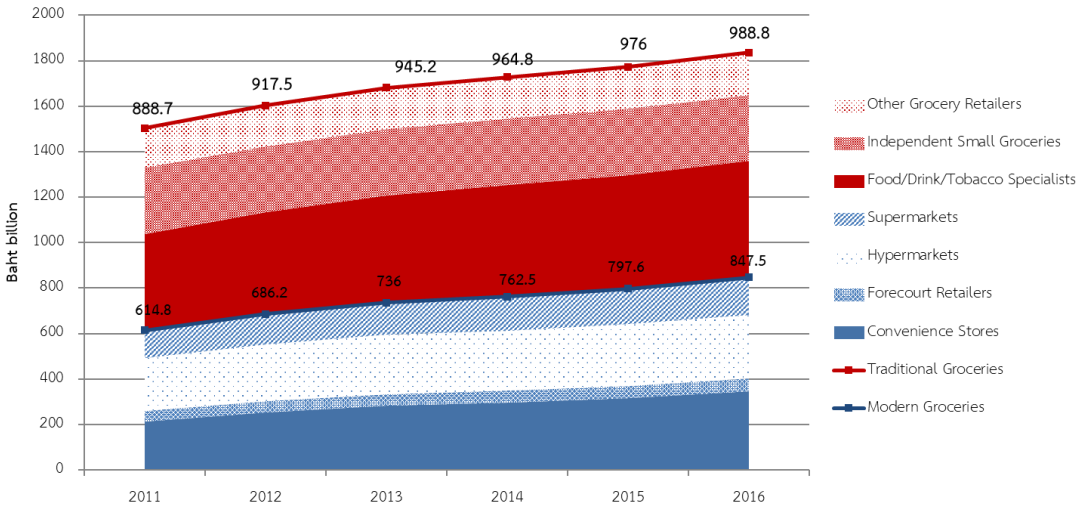
BAAC = Bank for Agriculture and Agricultural Cooperatives, GAP = Good Agricultural Practice, GMP = Good Manufacturing Practice, HACCP = Hazard Analysis and Critical Control Points.
Source: Poapongsakorn et al. (2010).

Four Major Developments of Modern FVCs in Thailand[4]

There are four major developments of modern FVCs in Thailand: (i) the rise of contract farming in the mid-1970s and 1980s, driven by export opportunity; (ii) the rise of the middle class and foreign supermarkets in the mid-1990s, resulting in the re-emergence of farmer groups (Figure 2.2); (iii) the export threats in the late 1990s and early 2000s; and (iv) the new institutions and channels that link smallholders to the market.

[4] This section draws heavily from Poapongsakorn and Tey (2016).

Figure 2.2: Sales Volume and Share of Traditional and Modern Groceries



Share by Value	2011	2012	2013	2014	2015	2016	Growth (2011–2016)
Modern Groceries	40.9%	42.8%	43.8%	44.1%	45.0%	46.2%	5.98%
Traditional Groceries	59.1%	57.2%	56.2%	55.9%	55.0%	53.8%	2.11%

Source: Compiled by the authors. Data from Euromonitor Passport (accessed January 2017).

- Contract farming as the first means of vertical integration of the FVCs

Perhaps it could be argued that contract farming is the first stage of FVC transformation in Thailand because it was the first time that the agribusiness (contractors) established a vertical link with the farmers using the non-market coordination mechanism.

Contract farming was first introduced to produce chicken and tomato in the mid-1970s. Charoen Pokphand was the first company that introduced the new biotechnology to grow high-yield broiler and recruited smallholders to grow the new variety of chicken through contract farming. The contractual arrangements were a copy of one employed by Arbor Acres Co. with the American chicken growers. The contract was the effective extension means to recruit small growers to grow a modern variety of chicken, which required new farming know-how and new arrangements of risk sharing between the growers and the agribusiness company. While the new technology brought about a better feed conversion ratio, the contract also guaranteed the price and quantity that the company promised to buy, thus providing strong incentive for the growers to join the scheme. As a result, the company has successfully used the non-market vertical coordination to expand its production to satisfy the planned export. In effect, the biological technological change in the late 1970s and 1980s, which can be called the Green Revolution in the poultry industry, is an important driver of such vertical coordination (Schrader, 1986).

The average farm size was 3,000–5,000 birds in the 1980s; it then increased rapidly to 20,000–30,000 birds in the early 2000s, thanks to the introduction of evaporative housing technology[5] and farmers' access to credit for farm expansion. Now there are a few dozens of both contract farms, independent farms, and corporate farms with 100,000–200,000 birds because of the increasing labour shortage since the late 1990s.

The main driver of chicken contract is the export opportunity to Japan. The company received the promotional privilege for export-oriented production from the Board of Investment. But the most important promotional measure was permitting Charoen Pokphand to establish the slaughterhouse for export. In those days, all operators of animal slaughterhouses had to transfer the ownership rights to the provincial administration. Since the slaughterhouse was owned and operated by the private company, Charoen Pokphand had the incentive to invest in modern slaughterhouse technology, thus exploiting economies of scale and increasing processing efficiency.

At the same time, the government, with assistance from the United States Agency for International Development (USAID), encouraged poor rice farmers in the northeast to grow contract tomato for the American company Adam. The objective is poverty reduction and to prevent the spread of communism. Contract farming was part of the irrigation development project aimed at generating rural employment and boosting the income of poor rice farmers who could grow only one crop of wet season rice. With irrigation, farmers can grow more than one crop per year.

Since then contract farming has been adopted to produce several products, i.e. vegetables (such as asparagus, baby corn, morning glory, etc.); chili; Japonica rice; corn seed; and others. Perhaps the 1990s and 2000s were the golden era of contract farming, thanks to abundant family labour and minimal government regulations on contract farming. The agricultural census showed that the number of contract farms increased from 0.16 million farms in 1993 to 0.26 million farms in 2003, then declined amidst labour shortage.

As discussed below, since the late 1990s, other institutional arrangements have linked the farmers to the market

- The rise of the middle class and foreign supermarkets

In the mid-1990s, after markets in the developed countries were saturated, foreign supermarkets began to invest in Thailand, thanks to rising per capita income (as a result of sustained rapid economic growth since the 1960s) and investment liberalisation. As argued by Reardon and Timmer (2012), Thailand was among the first group of countries that saw the rise of foreign investment by the supermarkets. They are TESCO-Lotus, CARREFOUR, and

[5] Short for evaporative cooling system housing, this is a type of housing that uses large fans and water to cool down the housing to maintain temperature and moisture suitable for broiler growth.

Ahold Delhaize. These supermarkets introduced the central procurement system which imposes the service level and product standards on their suppliers of fresh products, thanks to an advancement of information technology (Schrader, 1986). The use of ICT started in the 1990s with the progress of computer technology. The early ICT included the use of bar codes and automated warehouse which supermarkets used to reduce inventory costs and quickly respond to consumer demand.[6] Yet, at the beginning, the supermarkets did not have direct links with smallholders because of extremely high transaction costs of buying from hundreds of smallholders. Instead, they established business links with a few food suppliers who must comply with the service level requirements. Later, some supermarkets began to source directly from the farmer groups, thanks to corporate social responsibility. Gradually, successful business relations enabled some farmer groups to expand the contract production with other farmer groups. For example, one farmer group which successfully produced and supplied banana to convenient stores and supermarkets had been transformed into a company and expanded the contract production with many farmers and farmer groups.

At the same time, some religious groups and NGOs also organised farmer groups to produce organic rice for export (more discussion below).

As a result, the share of modern groceries jumped from 10%–20% in the early 2000s to 46% in 2016 (Figure 2.2).

- Adaptation to the threats against food export

In the late 1990s and early 2000s, a series of threats to Thai export of chicken and shrimp to the United States (US) and European Union (EU) markets led to an institutional transformation in the FVC. Thai export of chicken and shrimp to the US and the EU were found to contain excessive chemical residues, i.e. nitrofuran. The fishing methods of shrimp export to the US were also accused to have killed sea turtles. The outbreak of bird flu in 2004 also led to the loss of chicken meat export as importing countries banned all imports of fresh chicken from Thailand. The export threats forced the private sector and the government to cooperate and introduce new food safety measures and laws as well as to establish a new public organisation, the Bureau of Agricultural Commodity and Food Standards, that would be responsible for the export of safe and standard products. The private companies and farmers that grow chicken and shrimp also rapidly adopted the biosafety and close farming system. Composition of chicken exports also changed significantly from fresh and chilled meat to cooked meat and ready-to-eat products. Thus, the industrial structure became more concentrated as some companies and farms went out of business.

[6] In the 1970s when Walmart began to expand its branches into the small cities, it used the cross-docking technique to reduce the cost of distributing small lots of merchandises to its stores. Later on the Efficient Consumer Response system was developed by the processed food distribution industry in the United States to recover competitive strength.

- New channels linking small farmers to the high-value markets

In addition to contract farming, three new channels can link smallholders to the high-value markets: (i) re-emergence of farmer groups and new community enterprises, (ii) sustainability certification, and (iii) public–private–producer participation.

Re-emergence of farmer organisations and cooperatives: Since the late 1990s, some high-end supermarkets have begun to procure safe vegetables from a few pioneer farmer organisations, especially those supported by civil society organisations, NGOs, and cooperatives. The collective action of farmer organisations resulted in scale economies in purchasing inputs and selling products, as well as in gaining some market power. It should be noted that most successful farmer organisations in Thailand tend to engage in activities with high profit margin (i.e. providing credit), or in activities with some degree of market imperfection, or perishable products (milk, banana) (Siamwalla et al., 1995).

The success of farmer organisations is attributed mainly to the ability and dedication of the group leaders, which beg a question of sustainability. Since most of these products are perishable, farmers are forced to form an effective organisation to achieve speed and scale economies. Yet their effectiveness can be limited by legal constraints, corruption, and weak governance due to the lack of a prudent regulation framework, as well as the lack of clearly defined property right assignments (Kherallah and Kirsten, 2002; Poapongsakorn and Tey, 2016). Excessive government subsidy also weakens the competitiveness of many farmer organisations.

This means the government should introduce a prudential regulation law and begin work to rationalise the regulations by, for example, (i) allowing cooperatives to function like a business firm in which one dollar is one vote; (ii) encouraging cooperatives to merge to take advantage of scale economies; and (iii) avoiding unnecessary subsidy especially those used in any activities that speculate on the market.

Sustainability certification: Sustainability certification is an impartial, third-party endorsement of the agricultural products of smallholder groups. It enables farmers to tap into niche markets with higher prices and reduces trade barriers. Smallholders must comply with the principles and criteria established by the ratifying organisations. The requirements include Good Agricultural Practice (GAP) and other business management practices encompassing economic, social, labour, and environmental criteria. Examples of sustainability certification, such as Fairtrade, Utz, and Rainforest Alliance, are the key mechanisms that link smallholders to international value chains.

However, the costs of obtaining certifications can be high even if smallholders are already grouped to reduce management costs. This is why some certification organisations, such as the Forest Stewardship Council, have established a smallholder support fund. Yet, there are some problems with sustainability certification. For example, participants in some schemes

are locked into sizeable investment and cannot easily switch to other crops. Moreover, the sustainability certifications reduce reliance on peer pressure as a joint guarantee, as well as the enforcement rights of sponsoring organisations. There are also problems of uneven business relationships between farmers and their buyer/certification organisation.

In effect, food safety and quality problems cannot be handled solely by 'technical means'. Peer pressure is an effective means of reducing violation of contract terms. Trust, therefore, becomes pivotal to the development of high-value modern chains.

Public–private–producer participation (PPPs): Since the domestic markets are rapidly modernising while export markets remain under the purview of many large-scale suppliers, the government and private companies, especially multinational corporations, have reached a consensus on the vital need for an inclusive business model using the PPP approach. PPPs focus on improving the weakest link in the value chains between smallholders and institutional buyers such as supermarkets.

An example is FrieslandCampina which coordinates a dairy development programme to meet the needs of governments, farmer groups, local communities, consumers, as well as the companies' business. Its technical support to dairy farmer groups spans production, processing, to marketing.

Another example is the Pracharat Committee on Agriculture (PCA), a joint public–private programme established in 2016. The movement aims to enhance productivity and reduce the costs for smallholders through multiple PPP projects. Most companies that are members of the PCA are large agribusiness. The PCA is co-chaired by the Minister of Agriculture and a former president of the Thai Chamber of Commerce, but the activities are carried out by the companies with support from government agencies.

However, there is caution against the PPP approach since the PPPs may crowd out public fund for farmers, while some companies may use the programme to influence both public opinion and public policies.

Benefits and Costs of New Institutions Linking Smallholders with the Market: Contract Farming as an Enabler

Eaton and Shepherd (2001) argue that contract farming is the institution that successfully links famers to the market. One reason is that, until 2018, the Thai government had never excessively intervened in the contract arrangements between agribusiness and farmers, allowing agribusiness firms to introduce different types of contract farming with farmers who grow a variety of crops. In fact, in the 1980s, the government tended to favour the use of contract farming as a means to reduce rural poverty because contract farming allowed farmers to switch from low-value crops such as rice to higher-value products, such as Japonica rice, Basmati rice, exportable vegetables, chicken, etc.

The benefits of contract farming come primarily from continuing contractual relations between contractors and farmers that transfer technologies and knowledge to improve yield and production efficiency. Perhaps the most important incentive for the farmers is the guarantee price which is higher than the market price and guarantee quantity of purchase by the contractor. Another important aspect of contract farming is the risk sharing that buffers farmers from price fluctuations. As a result, the net income of contract growers is higher than that of farmers who grow similar crops but sell in the traditional spot markets (Poapongsakorn et al., 1996). However, Reardon and Timmer (2012) find that the farmers' higher income from participation in the modern value chain is associated with their endowments of non-land assets, particularly education, access to irrigation, product quality differentiation, and quality control, while the effect of their farm holding size is not as clear.

For contractors, contract farming often enlarged their supply base and provides reliable sources of supply for desired quality products that are either not readily available or thinly traded in the open spot market. Moreover, contract farming allows these agribusinesses to ramp up production quickly, stabilise production outputs, and reduce the cost of investment in adjusting to seasonal and irregular changes. Some contractors benefit through internalising technological spillovers by charging higher prices for the quality inputs and extension services or use a tie-in sale of inputs as well as a planned production to match the predetermined orders and market demands. With relatively low risks, contractors can scale up quickly to exploit scale economies in processing and distribution networks, which eventually enable large-scale high-value production for the export markets.

Despite various benefits, some risks are associated with employing contract farming. First, contract farming can be broken by opportunistic behaviours on both sides. Usually when such problem arises, smallholder farmers lack the capacity and resources to invoke a legal process to enforce the contractual undertakings. Secondly, while a contract can reduce the market risk for farmers by shielding them from fluctuating prices, it does not protect them from external risks. In the case of the broiler industry post–bird flu, new public regulations forced growers to invest in new facilities, incurring heavy capital investments. Yet when there are output problems, the contracting firms do not share any output risks. Thus, smallholders may not be able to service their debt.

Contract farming is not a panacea. It can be adopted only for specific types of products which require specific technology, being niche products for the high-end market or subject to government regulations and restrictions. It cannot be applied to commodity products such as rice, cassava, or maize whose transactions are carried out in the competitive spot markets. Also, there are both cases of successful and failed contract farming, which highlight the importance of best practices for the Thai agriculture sector.

Since contract farming is a long-term 'relational contract' that encompasses an adjustment process of a more thoroughly transaction-specific and ongoing administrative kind, it will survive only if it is built on trust. Government regulations should be neither too rigid nor

biased in favour of one side or the other. They should aim at building long-term trust between smallholders (who have weaker bargaining power) and the large-scale agribusiness and include a clause that helps resolve any conflicts should one occur.

Efficiency of Modern and Traditional Value Chains

The benefits of modern fresh vegetable value chain come from improved information flow which enables coordinated activities between actors in the chain. Improved coordination enables the transfer of technologies, knowledge, and good practices from suppliers to smallholder farmers. As a result, the modern FVC is highly efficient and produces higher value added for participants through product differentiation, quality assurance, and made-to-order production that adapt to the changing preferences of consumers.

This is highly relevant to specific niche products such as fresh fruits and vegetables, proteins, and organic produce because there are many aspects to improve and add value. For others produced in mass for the commodity market, value-adding strategy may not be valid for such simple and highly competitive products. Therefore, only some aspects of the modern value chain can be applied to reduce the cost of production.

The adaptation from traditional to modern value chains is, therefore, a transitive spectrum rather than a clear path with common destination. Most transition in Thailand occurred naturally, often led by a few innovative entrepreneurs and industry leaders who foresaw opportunities to take risks and, if successful, make profits. This is why modern value chains in Thailand are highly efficient because cost–benefit analysis has already been included in the decision process by these first movers.

One particular benefit to the farmers and agriculture is the potential for risk and cost sharing between smallholder farmers and suppliers. This is highly important because agriculture is a risky business and market price fluctuation is something most farmers cannot adjust to due to the lack of market knowledge. The modern value chains, with their new organisational structures, provide a degree of buffer and a mechanism at which market knowledge can be realised. As a result, modern value chains can provide a steady source of income for farmers and utilise local employment to create values. Thus, the rise of modern value chains in Thailand is also accompanied by the rise of these new organisational structures (Table 2.2).

Table 2.2: Number of Farmer Groups and Cooperatives by Type (2013–2017)

	2013	2014	2015	2016	2017	Growth, %
Agricultural cooperatives	3,796	3,881	3,822	3,779	3,639	-1.1
Crops	3,628	3,712	3,650	3,613	3,473	-1.1
Fishing	77	79	82	77	77	-0.3
Settlement	91	90	90	89	89	-0.6
Farmer group	4,277	4,296	4,214	4,088	4,930	2.3
Community enterprise	5,100	5,934	7,459	16,174	26,866	43.3
Goods	4,390	4,972	6,383	14,147	23,303	43.8
Service	710	962	1,076	2,027	3,563	39.7

Source: Compiled by the authors. Data from Department of Agricultural Extension (DOAE).

Aside from risk reduction, farmers in the modern chains enjoy higher net income than those who sell to the traditional chains (Reardon and Timmer, 2012; Poapongsakorn et al., 1996).

For the exporters, supermarkets, and modern suppliers, these new organisational structures such as social and community enterprises, farmer groups, and cooperatives provide important services. The aggregation of workforce introduces economies of scale and economies of scope ranging from production, collection, packaging, and logistics. It also saves the cost of monitoring and enforcement of standards and practices to fulfil the contracts.

For agribusinesses, operating within the modern chain allows them to improve their value-adding activities. Poapongsakorn et al. (2010) show that factors affecting the outcome of value-adding activities include (i) shifting consumer preferences, (ii) reliable source of quality raw materials, (iii) chain upgrading, and (iv) business cooperation and integration (Table 2.3).

This econometric model clearly shows that better flow of information and enhanced cooperation would improve the outcome and profit of agribusinesses in the value chain. Cooperation and integration between businesses lead to knowledge and technology transfer which improves production efficiency and increases value added. Furthermore, these enable economies of scale and higher negotiating power. Shifting consumer preferences is another factor that agribusiness must adjust to accordingly and timely to increase product value.

Another important factor is the business practice of business partners within the chain. Good relations and cooperation between producers and suppliers can help secure reliable source of quality raw materials, a crucial prerequisite for high-quality production. Long-term trust would also reduce the cost of monitoring and auditing.

While fluctuating demands can adversely affect business operation and profit and seriously hamper the payback period after heavy investment, digital technologies could play a vital role in providing timely information that the businesses can anticipate and adapt to.

Table 2.3: Factors Affecting the Outcome of Value-adding Activities

	(1)	(2)
Fluctuating demands	-0.324*	-0.364*
	(-1.700)	(-1.710)
New products enter the market	0.057	0.022
	(0.330)	(0.120)
Shifting consumers' preferences	0.416***	0.405**
	(2.710)	(2.450)
Reliable source of quality raw materials	0.537***	0.540***
	(2.860)	(2.780)
Chain upgrading	2.151***	1.992**
	(2.800)	(2.470)
Business cooperation and integration	0.957***	0.787**
	(2.650)	(1.990)
Ability to add value		0.295
		(1.020)
Ability to reduce production losses		0.265
		(0.940)
Ability to communicate information		0.081
		(0.220)
Dummy variable (type of products)	Yes	Yes
N	163	143
Wald Chi2	20.310	21.500
Pseudo R2	0.093	0.110

*p<0.1, **p<0.05, ***p<0.01.

Note: The dependent variable is the impact of an improvement in firm's activities on its value added 3 years after the change, measured by the Likert scale, i.e. 1 = the worst decline in value added, 2 = worsen value added, 3 = no change in value added, 4 = better value added, and 5 = highest increase in value added.

Source: Poapongsakorn et al (2010).

Poapongsakorn et al. (2010) further show that similar factors also affect the outcome of loss reduction activities. These are (i) quality improvement by competitors, (ii) reliable source of quality raw materials, (iii) chain upgrading, and (iv) business cooperation and integration (Table 2.4).

Table 2.4: Factors Affecting the Outcome of Loss Reduction Activities

	(1)	(2)
Fluctuating demands	-0.377**	-0.376**
	(-2.370)	(-2.060)
New competitors enter the market	-0.264*	-0.342**
	(-1.730)	(-1.990)
Quality of products in the market improve significantly	-0.341	-0.235
	(-1.330)	(-0.720)
Quality improvement by competitors	0.886***	0.892**
	(2.810)	(2.210)
Reliable quality of raw materials	0.752***	0.693***
	(3.410)	(2.760)
Chain upgrading	2.907***	2.937***
	(2.940)	(2.790)
Business cooperation and integration	1.079***	0.991**
	(2.950)	(2.440)
Ability to add value		0.555*
		(1.930)
Ability to reduce production losses		0.025
		(0.070)
Ability to communicate information		0.184
		(0.530)
Dummy variable (type of products)	Yes	Yes
N	144	120
Wald Chi2	30.790	29.750
Pseudo R2	0.161	0.171

*p<0.1, **p<0.05, ***p<0.01.

Note: The dependent variable is the impact of an improvement in firm's activities on its cost 3 years after the change, measured by the Likert scale, i.e. 1 = the highest increase in cost, 2 = higher cost, 3 = no change in cost, 4 = lower cost, and 5 = lowest cost reduction.

Source: Poapongsakorn et al. (2010).

For loss reduction activities, business competition can adversely affect agribusinesses. New competitors entering the market can take away some market share especially if they are more efficient because of new technologies. However, once competitors begin to improve the quality of the products, the entire market would adjust to meet the new market standards. Therefore, those who have invested heavily into specific assets and technologies would find adaptation challenging and must shift their strategies to answer these disruptive forces.

The modern chains seem to have higher production efficiency out of necessity because they have higher requirements and demand high flexibility to fluid markets. However, this does not mean that the traditional commodity chains are not efficient in their own right. Due to

high competition in the market, the traditional commodity chains in Thailand are more efficient than those of neighbouring countries. This is evident by the fact that Thai rice farmers can buy inputs at lower prices and sell outputs at higher prices than farmers in Cambodia, Lao PDR, Myanmar, and Viet Nam, according to a 2016 World Bank rice value chain survey. The depth of fertiliser and seed markets and availability of seeds are also better in Thailand (Table 2.5).

Table 2.5: Input Supply Efficiency of Rice Value Chains in CLMV

Measure	Indicators	Cambodia	Lao PDR	Myanmar	Thailand	Viet Nam
Access to affordable fertilisers	Urea price at farm gate, $/ton	425	450	460	426	357
	Ratio of price of urea to price of dry paddy	1.8	1.6	2.3	1.1	1.6
Depth of fertiliser market	% of farmers using fertiliser for paddy production	70 (100)	40	90	100	100
	% of farmers using NPK fertiliser for paddy production	80	20	30	90	100
Availability of seeds	Number of new rice varieties released during 2009–2014	3	n/a	19	18	34
	% of demand met by supply of good seeds	10	9	0.4	100	100
Depth of seed market	% of farmers using purchased seeds	20 (80)	10	9	60	53

CLMV = Cambodia, Lao PDR, Myanmar, and Viet Nam.
NPK = nitrogen, phosphorus, and potassium – three common components of fertiliser.
Note: Data in parentheses for Cambodia are for the dry season. All other data are either for the monsoon season or for all seasons on average where seasonal differences are small.
Source: World Bank (2016).

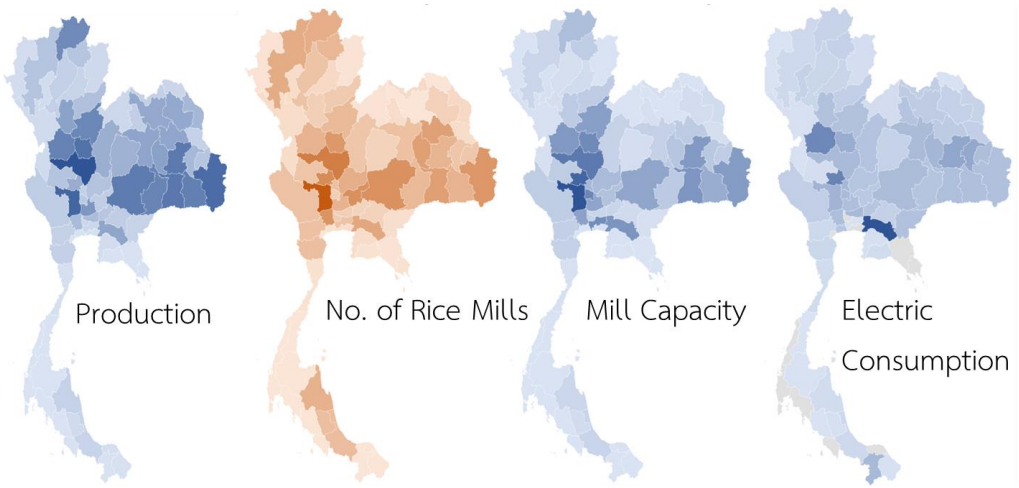
Furthermore, clustering of agricultural production has resulted in the clustering of input suppliers and processing plants in the main production areas. In addition to the impact on competition and efficiency in both the output and input markets as explained above, the clusters also bring about higher value added. The best way to illustrate this is to observe how rice is produced in Thailand.

Rice production in Thailand is clustered at the Central and the Northeastern regions (Figure 2.3), thanks to the delta plains and flat land. Production in the central region relies heavily on

the irrigation networks, allowing the production of dry-season rice around four to five cycles in 2 years. For the Northeastern region, however, the lack of irrigation system means many farmers have to produce low-yield high-quality Hom Mali rice only during the monsoon season.

The heat maps shown in Figure 2.3 clearly show that rice production is clustered only in some parts of the countries. The number of rice mills and their mill capacities seem to reflect the production volume. Chachoengsao, a province in the lower eastern part of the country, has a relatively high electric consumption compared to existing mill capacity. This indicates the high utilisation rate and better resource procurement system, mostly because the province is linked logistically with both sources of production clusters in the central and Northeastern regions. Furthermore, it is also close to the base of consumers in the capital city of Bangkok and to the export ports in the eastern seaboard areas.

Figure 2.3: Thailand Rice Cluster



Source: Compiled by the authors. Data from Office of Agricultural Economics (OAE), Department for International Trade, and Provincial Electricity Authority.

To further investigate this, two regression models (Tables 2.6 and 2.7) are used to calculate the effects of production cluster on the rice value added in each province. The results, as shown, indicate a positive effect of the number of rice traders and millers in the area on the local value added.

Table 2.6. Effect of Clustering on Provincial Value Added of Rice (Model 1. Pooled OLS)

Source	Sum of squares	Degree of freedom	Mean squares
Model	113944595	3	37981531.6
Residual	181167651	850	213138.413
Total	295112246	853	345969.808

Number of obs	=	854
F(3, 850)	=	178.20
P-value > F	=	0.0000
R-squared	=	0.3861
Adjusted R-squared	=	0.3839
Root mean square error	=	461.67

raVArice	Coefficient	Standard error	t-statistic	P-value>|t|	[95% Confidence	interval]
lahhw	-239.6496	25.23587	-9.50	0.000	-289.1815	-190.1177
latraders	108.7294	14.31538	7.60	0.000	80.63178	136.8271
lamillers	293.4287	20.60203	14.24	0.000	252.9919	333.8655
constant	2996.083	292.7515	10.23	0.000	2421.482	3570.683

Note: raVArice = real value added of rice production in the province
lahhw = natural log of the number of rice farmer households in the province
latraders = natural log of the number of rice traders in the province
lamillers = natural log of the number of rice millers in the province
obs = observations
Source: Calculated by the authors. Data from OAE and Department for International Trade.

Table 2.7: Effect of Clustering on Provincial Value Added of Rice (Model 2. Pooled OLS)

				Number of obs	=	854
Random-effects GLS regression				Number of groups	=	58
Group variable: Provinces				Obs per group: Min	=	10
R-squared:	Within	=	0.1356	Average	=	14.7
	Between	=	0.3465	Max	=	15
	Overall	=	0.3158	Wald $chi^2(3)$	=	157.31
Autocorrelation (u_i, X) = 0 (assumed)				P-value > chi^2	=	0.0000

raVArice	Coefficient	Standard error	Z-statistic	P-value>|Z|	[95% confidence	interval]
lahhw	-400.1579	49.12737	-8.15	0.000	-496.4458	-303.87
latraders	84.99586	11.34136	7.49	0.000	62.76722	107.2245
lamillers	139.0519	31.84827	4.37	0.000	76.63044	201.4734
constant	5293.058	533.7844	9.92	0.000	4246.86	6339.256
$sigma_u$	390.87574					
$sigma_e$	263.71584					
rho	0.68719435		(fraction of variance due to u_i)			

Note: raVArice = real value added of rice production in the province
lahhw = natural log of the number of rice farmer households in the province
latraders = natural log of the number of rice traders in the province
lamillers = natural log of the number of rice millers in the province
obs = observations
Source: Calculated by the authors. Data from OAE and Department for International Trade.

5. Value Chain of Fresh Vegetables

This section is a case study on the value chain of fresh vegetables, drawing heavily from the research report prepared for the National Economic and Social Development Board (Poapongsakorn et al., 2017). It focuses on the following research questions:

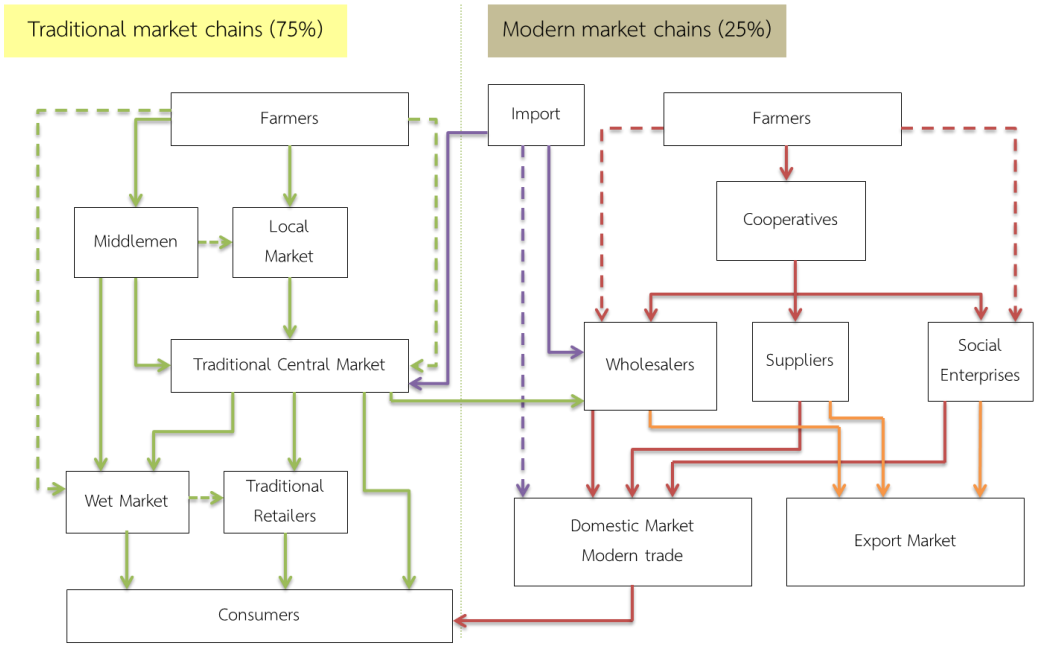
- What are the characteristics of the Thai vegetable value chain?
- Why has the transition from traditional value chain towards modern value chain been gradual?
- What is the strategy to speed up transition and drive growth?
- What are the challenges and policy implications?

The case study partly draws on the author's previous research (Poapongsakorn et al., 2017) which was based on a brain storming with a few vegetable suppliers and traders, a questionnaire survey of 20 vegetable producers, interviews with vegetable farmers, a medium-scale vegetable contractor (who is also an exporter), and three vegetable producer groups (one of which is a community enterprise). The questionnaire surveys and interviews of farmers and farmer groups were carried out in two central plains provinces, Nakorn Pathom and Supanburi, and Nakorn Ratchasima, a northeastern province. The surveys and interviews were taken in 2016 and 2018.

Value Chain Characteristics

Most interesting about the Thai vegetable value chain is its dualistic structure – with approximately 75% of the market share being traditional, and another 25% being modern (Figure 2.4).

Figure 2.4. Dualistic Structure of the Thai Vegetable Value Chain



Source: Poapongsakorn et al. (2017).

The traditional fresh vegetable chain in Thailand still relies heavily on local markets and middlemen as key marketing channels. Most production comes from smallholder farmers who on average have less than 5 *rai* of area (0.8 hectare) and sell their produce in bulk. Farmers grow monocrop or multiple crops depending on seasonal variations and market demands. Examples of monocrop farms are chili and asparagus which are 3-to-5-year crops. Most farmers who grow short-lived vegetables prefer to grow a few crops in one season (if they have large farm holding) or switch from one crop to another.

The smaller scale of production means that the production pattern is often planned and suggested by the middlemen who regularly buy from farmers. Value creation of the middlemen is based on their knowledge and market insights, which facilitate an informal flow of information between actors in the market. These transactions, while are not under contracts, happen regularly, and tend to operate on long-term relationships and trust.

In contrast, the modern chain relies on the formal flow of information and guarantees stable supply through contract farming. The main difference between the traditional and modern chain is highlighted by high-quality products that are supplied to modern retail channels such as supermarkets and exports. The production scale of farmers is similar to those in the traditional chain, but economies of scale are achieved as these individual farmers grouped to undertake other value-adding activities, such as pre-processing, packaging, branding, and marketing.

Of particular interest in the modern chain would be organic and residue-free vegetable products that have lower yield, incur more production cost, and, therefore, are sold at a higher market price. Food safety and traceability, quality assurance, and freshness are the primary attributes that set these products apart to attract higher income consumer.

To achieve these attributes, the modern chains took a more coordinated approach to procurement, utilising contract farming or other organisational structures to manage production and to transfer technologies and knowledge. Agribusinesses as modern suppliers link smallholder farmers to modern supermarkets by setting up a network of farmers and investing in local pre-processing and packaging operations.

The rigorous trade requirement and the need to maintain freshness and shelf life necessitate cold chains throughout the entire logistical process. The logistic chains also employ air transport because production of different vegetables can spread across various locations due to weather, suitable soil, and available labour. Vegetable value chain, both in traditional and modern chains, is highly labour intensive. This defines the practices of the industry, making the transition from traditional chain towards a modern chain very difficult since improved production management means a higher level of attention and care from highly skilled workers is needed.

Transition from Traditional to Modern Value Chain

While modern vegetable chains are increasing, traditional vegetable chains still dominate most of the market. Transitions have been gradual due to various limitations, but most notably due to a relatively higher price of vegetables that consumers are not willing to pay for.

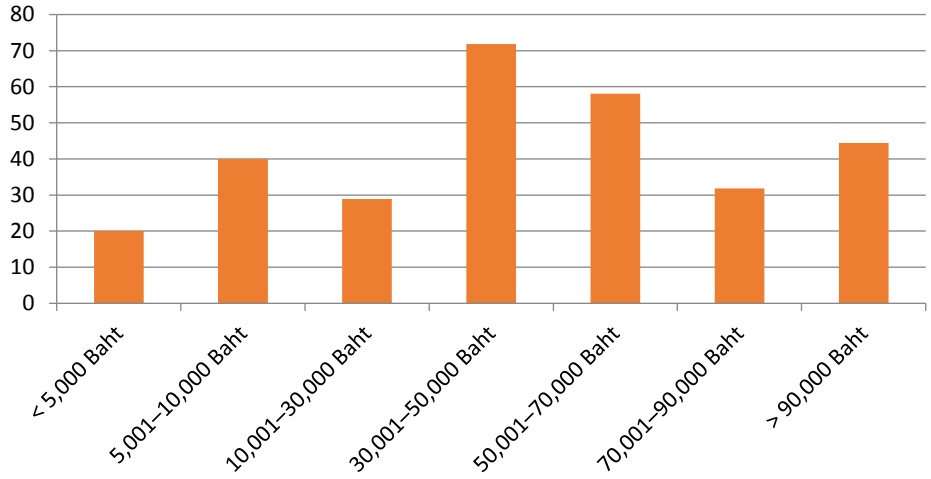
The modern vegetable value chain was first initiated by a religious group called Santi Asoke and a few agribusiness companies that used contract farming to produce temperate vegetables for export to Japan and the EU in the 1990s. Santi Asoke was driven by social, rather than economic, considerations as the group produces and sells safe vegetables to encourage healthy living and a simple way of life. In contrast, vegetable contract farming to Japan and the EU is driven purely by the emerging export markets which can potentially result in more value added.

Since the 1990s, many modern vegetable value chains have been operated by agribusinesses with varying success. The transition towards an entirely modern value chain has been gradual because growth is limited by the domestic market. While more urban consumers are attracted to the convenience that modern retailers bring and the cheaper prices offered as a result of supermarkets' supplier-squeezing tactic, during the early stage of the supermarket revolution in Thailand, Thai consumers still preferred to buy vegetables and fruits from the wet markets, according to a Thailand Development Research Institute study (1999). This is because supermarkets sold vegetables at higher prices and most Thai consumers perceive supermarket vegetables as not as fresh as those sold in wet markets. The production of vegetables in the traditional chain remains significantly cheaper than in the modern one because quality monitoring and assurance by the modern chain add to the cost of production and distribution, while the use of chemicals by smallholders in the traditional chain can reduce labour intensity and costs. On top of this, consumers do not perceive the benefits of higher quality and safer products, and still prefer inspecting the products themselves. A survey of urban samples (Poapongsakorn et al., 2010) shows that 58.5% of consumers had tried products with food safety standards. Among them, about half had tried organic vegetables[7] while the other half had tried residue-free vegetables.

[7] There are no official data on production and sale of vegetables. Between 2000 and 2015, production of organic vegetables declined from 3,518.75 million baht (B) to B3,1612.19 million (www.greennet.or.th/article/organic-farming/Thailand).

By the late 2000s, the share of vegetables sold by supermarkets had exceeded that in the traditional chains, thanks to the rise of the middle-income class. Moreover, the demand for safe and organic vegetables has begun to surge rapidly due to the demand from the young generation who is very health conscious and adopts the modern lifestyle. Figure 2.5 shows that willingness of consumers to buy safe vegetables is correlated with their income. This implies that higher per capita income is positively associated with consumers' health consciousness and, hence, higher demand for food safety.

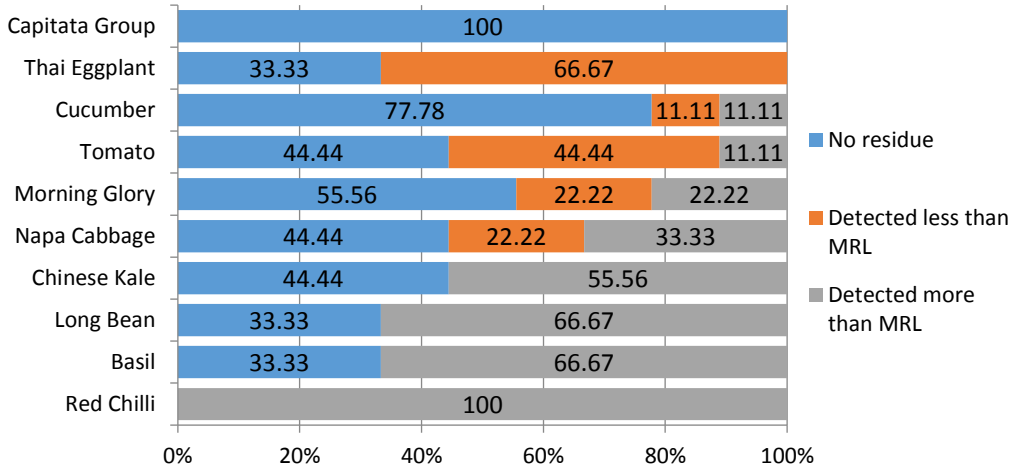
Figure 2.5: Percentage Increase of Those Willing to Buy Safe Vegetables at High prices, by Income Group



Source: Poapongsakorn et al. (2010).

Yet the market for safe and organic vegetables is still highly concentrated in the supermarkets, particularly the high-end ones. This is partly because organic vegetables are still very expensive, and partly because consumers still do not trust these vegetables to be safe. Surveys show that a high incidence of excessive chemical residue is detected in the vegetables sold in all markets (Figure 2.6), including products from farms that are supposed to comply with the safety or organic standards (Figure 2.7). In recent years, most suppliers of high-value and safe vegetables have resorted to use brand names, thanks to the government policy and the initiative of the business associations (more discussion below).

Figure 2.6: Survey of Chemical Residuals of Fresh Vegetables in 2016, by Type[a]

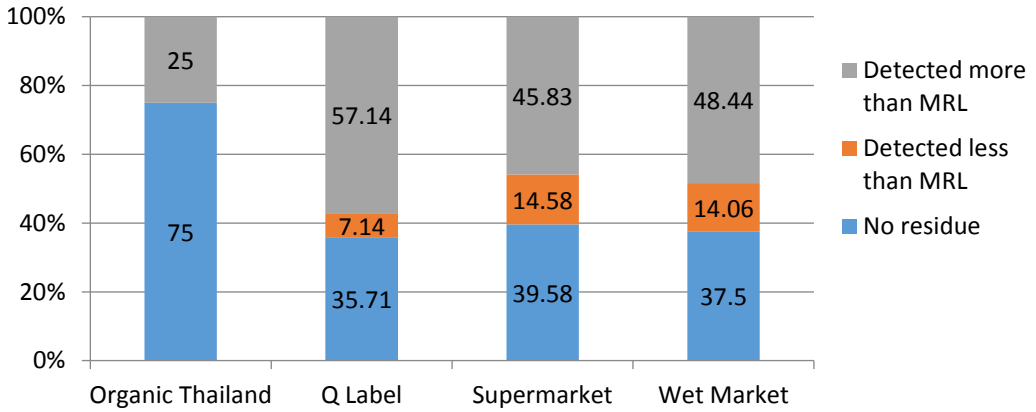


[a] Sample size may be too small to give conclusive degree of chemical residuals of vegetables in Thailand; however, it indicates that the problem exists.

Note: MRL = maximum residue limits as indicated by the CODEX ALIMENTARIUS international food standards.

Source: Thai Publica (2016).

Figure 2.7: Survey of Chemical Residuals of Fresh Vegetables in 2016, by Standard and Marketing Channel[a]



[a] Sample size may be too small to give a conclusive degree of chemical residuals of vegetables in Thailand. However, it indicates that the problem exists.

Note: MRL = maximum residue limit, as indicated by the CODEX ALIMENTARIUS international food standards.

Source: Thai Publica (2016).

This problem persists because whenever there is shortage, some suppliers tend to fill their orders by sourcing from the traditional wholesale markets and re-labelling products with standards to make their products appear safe and of high-quality. They use this quality-shrinking tactic to meet the constant demands of modern retailers. Shortage of safe

vegetables is common because producing these without chemicals is difficult; seasonal variations also plays a role to cause fluctuations in yield.

As urban consumers shifted to modern supermarkets and convenience stores, the role of traditional markets also changed. Most wet markets in Bangkok shifted to wholesale fresh fruits and vegetables in bulk to various restaurants and food stalls. In response to urban consumers' needs for cheap price and convenience, there is also the rise of *Pumpuang* mobile shops[8] – pick-up trucks retrofitted as mobile markets (Figure 2.8) (The Nation, 2018). These vehicles would source products from the wholesale market and travel to local communities every day, providing convenient access of fresh and cheap vegetables for consumers.

At the same time, convenience stores and express stores[9] have begun to sell pre-processed and ready-to-eat fresh fruits and vegetables in their many outlets, targeting young office workers who do not have time to go shopping (Figure 2.8).

Figure 2.8: *Pumpuang* Mobile Market and Ready-to-eat Vegetables Sold in Convenience Stores

Source: The Nation (2018).

Strategy to Speed Up Transition and Drive Growth

In addition to the rise of the middle-income class and increased health consciousness among the young generation, the growth of demand for safe vegetables has also been driven by the NGOs, the government, efforts by the business associations, particularly the Thai Chamber of Commerce, the collective action by the agribusiness and the farmers, and the response of restaurants to the increasing demand for organic foods.

[8] *Pumpuang* pick-ups sell produce at low prices to people in low-income areas. One of its sources of vegetable supplies are the vegetables that cannot be sold at the end of the day and are thrown away by the vegetable suppliers at the wholesale markets because it is not worth carrying them back. The practices help reduce food waste in urban areas.

[9] Larger than convenience stores but smaller than traditional supermarkets. Often located at high-rise condominiums and communities with access to parking space.

As mentioned, the religious groups pioneered in advocating and providing extension services for farmers to grow organic rice and vegetables. But it was Greennet, an NGO, that seriously launched the projects to commercialise organic vegetables. In 1993, Greennet established its first Cooperative Natural Food Store to sell safe vegetables produced by farmers in the north, central, and south. Then, in 1995, it initiated the capacity building for farmers to produce organic food under the International Federation of Organic Agriculture Movements standards in 1995 and became the first fair trade producer of rice in 2002 (www.greennet.or.th).

After the initial success of the NGO, the Thai government also adopted policies to support the production of organic farms. Among these measures are free advice and free licensing of GAP and organic farm standards. Realising its resource constraints, the Department of Agriculture, responsible for the licensing of GAP, began to privatise licensing services to private firms, which are required to be accredited by the department.

Another strategy to reduce the cost of production is to lower the cost of standards. The Thai Chamber of Commerce developed a cheaper version called the 'Thai Gap'. In 2004, the Chamber of Commerce, in cooperation with the Kasetsart University, launched the Thai GAP standards, which aimed at developing a traceability process for the production of fruits and vegetables using the Euro-Retailer Produce Working Group's GAP. Later, it became known as the ThaiGAP standards, which were developed and adapted from the GLOBAL G.A.P. of the European retail group. The Chamber of Commerce also set up the ThaiGAP Institute to promote the standards, and actively provide ThaiGAP training courses to farmers by collaborating with a local university. The institute also cooperated with supermarket groups and fresh market operators to launch a project of marketing products with ThaiGAP standards and training programmes for farmers.

By 2013, the private sector had begun to support the production and marketing of safe agricultural products. Three associations – the Federation of Thai Industries, the Thai Chamber of Commerce, and the Thai Banking Association – joined forces to introduce the 'Quality Mark (Q-Mark)' label. Q-Mark is not a label of quality assurance but a recognition of the social responsibility of small and medium-sized enterprises – both producers and suppliers.

On the production side, the main strategy to speed up transition and drive growth of the modern chain is to reduce the cost of production and ensure high-quality products through good farming practices. As mentioned, production of safe vegetables can fluctuate a lot due to seasonal variations and the limited use of chemicals. The solution by the agribusiness firms to this problem requires collective efforts and coordinated production management by the farmer groups.

Improving production management requires a planting schedule that considers factors in seasonality and weather irregulars. To do this, farmers in the same area must combine into farmer groups, community enterprises, or cooperatives to (i) share labour and knowledge; (ii)

reduce risk from market price fluctuations; (iii) achieve scale economies which reduce operating costs, increase their bargaining power when buying inputs or when selling products, and reduce the cost of biosecurity between farms; (iv) allow them to apply for income tax exemption; and (v) serve as a means of building consumers' trust through local branding and marketing.

Contract farming is also an essential part in securing a stable supply for modern suppliers, while providing reliable income for the farmers' group. Often the production management plan and good practices are transferred from agribusinesses to farmers under contracts. Contracting community enterprises are allowed to sell vegetables to other wholesalers or suppliers as long as they supply the required order to the contractor first. This extra production volume provides stable sourcing capacity for the contractors and additional income for contracted farmers. Therefore, contract farming provides a formal flow of information and risk sharing between value chain actors.

Aside from this, some agribusinesses have invested in a packing house and pre-processing area for the farmers' group. This value chain upgrading for local farmers extends from mere collection to grading, packaging, pre-processing, and logistics and is highly suitable because it generates year-round employment and increases values for rural communities. Farmers can undertake these activities after their primary farm duties in the early morning. These value-adding activities also benefit the agribusinesses. By moving the packing stations and pre-processing areas close to the local area of production, the suppliers can maintain freshness, improve lead time, and extend shelf life.

Grouping also encourages good practices between farmers as they start to cross-check each other since their reputation relies on collective efforts. Penalties are imposed on those who do not comply to standards or good practices. Grouping also lowers the cost of monitoring and enforcing standards and contracts and reduces the cost of getting safety standard certification and setting a traceability system. This is particularly important because the cost of getting international standards such as the 'Global Gap' or the private supermarket standards can be too high for smallholders.

Aside from grouping, a new rising trend among young farmers is to be independent. Equipped with precision technologies, many young farmers grow high-value crops, such as melon and tomato, and other high-value vegetables. They use modern digital technology, especially precision agriculture, and social media as a marketing channel. They form an alliance with other young farmers or university professors to share technological information.

On the consumption side, chemical residue and contamination remain to be the top problems that undermine consumers' perception of safe vegetables. Promotion of safe food production and health campaign is a basic strategy to drive domestic demand growth. Recently, there has been a new wave of growth driven by the young generation. Two reasons are (i) Bennett's Law where the higher income consumers are more willing to pay for the

higher prices of fruits and vegetables, and (ii) a rise in health consciousness among urban consumers as shown by the increase in sports activities and fitness trend. Many young consumers are now willing to pay higher prices for good health.

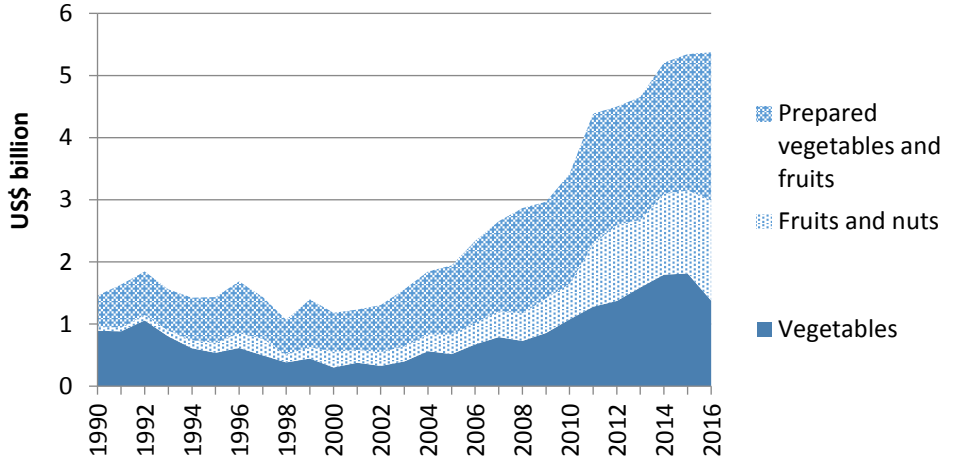
A strategy to induce domestic demand growth can come from restaurant use. A particular example is Ohkajhu, a popular restaurant chain in Chiang Mai and Bangkok that serves dishes with organic vegetables using the 'from farm to table' concept (Figure 2.9). This restaurant chain has been very popular among young urban consumers.

Figure 2.9: Ohkajhu Restaurant Chain

Source: www.ohkajhuorganic.com

For Thailand, the export of fresh vegetables and fruits has enjoyed steady growth (Figure 2.10). While the annual growth of fresh vegetable export in 1990–2016 is at 3.51%, the annual growth of fruits export is much faster at 11.54%. Currently, the largest market is China, followed by Japan, ASEAN, and the EU (see Annex).

Figure 2.10: Thailand Export Value of Fresh Fruits and Vegetables (1990–2016)



Growth Rate (1990–2016)	%
Vegetables	3.51
Fruits and nuts	11.54
Prepared	5.91

Source: Compiled by the authors. Data from United Nations Comtrade (https://comtrade.un.org/).

The main obstacle to export growth is rigorous trade requirements. For example, agribusinesses that want to supply high-quality fresh vegetables to supermarkets in the UK require (i) farm standards such as the Global Gap certification, Tesco Nurture, and Leaf Marque; (ii) production standards such as the Good Manufacturing Practice, Hazard Analysis and Critical Control Points, and British Retail Consortium; and (iii) management standard such as the Ethical Trading Initiative. These standard certifications span from food safety to social and environmental concerns.

All processes in the value chain require a traceability system and documentation that allow consumers and retailers to trace products back to the farm of origin. With the help of modern digital technologies, the traceability system is online, accessible via QR code and embedded with spatial location of the farm.

The supermarkets in the UK see fresh produce as strategic – the product line that could persuade consumers to shift from competitors to them. To facilitate procurement, UK supermarkets prefer a few suppliers that can deliver on time and in bulk. Therefore, a 'single basket' strategy is used by 'KCFresh', a Thai agribusiness that began to source some vegetables from Zimbabwe and Ethiopia and combined these with those from Thailand to create a single basket for the supermarkets. This strategy takes advantage of the global value chain by optimising the supply mix from places with high comparative advantages. In this particular case, KCFresh chose Africa due to lower costs of production, lesser problems on insects and pests, and quicker and more efficient local institutions. Similar contract farming is used to link local farmers.

Challenges and Policy Implications

Most Thai small exporters still export to the low-end markets in Europe and China because the requirements are not as strict as those demanded by high-end markets in the EU and the UK. The government needs to provide incentives for small exporters to upgrade their operations so that higher value added can be realised.

Producing organic fresh vegetables without chemicals can be difficult particularly in tropical countries where pests are the big issue. Coupled with seasonal variations, the yields fluctuate and supply becomes volatile, thus, resulting in cheating by farmers and wholesalers. The lack of trust among domestic consumers is the biggest concern that needs to be addressed to increase domestic consumption. However, public investment in domestic food safety is too small relative to export by large companies. To fix this, close cooperation between the government, private sector, civil society organisations, and NGOs is required. The most challenging issue is to devise the appropriate food safety rules (institution) and incentives that are acceptable to all concerned stakeholders. Unless the rules are enforceable at reasonably low costs, the prices to the consumers would be too high.

Another important challenge is labour shortage as Thailand already has an ageing society and most young people do not wish to work on farms. To solve this problem, community enterprises or cooperatives can be established to share labour costs. Alternatively, modern technologies, particularly precision farming, can be used to increase the level of automation.

The key takeaway from the dualistic nature of the Thai vegetable value chain concentrates around the issue of value. Strategy in value chain development always focuses on increasing the value added through upgrading with new activities, or value creation through product differentiation and quality assurance. However, value chain development must follow the markets, particularly on the purchasing power and preferences of consumers. It is important to add value, but it is useless to add value if the products cannot sell.

6. Broiler Value Chain

The research questions in this section are as follows:

- What are the characteristics of the Thai broiler value chain?
- How did the industry adapt to external shocks and build resilience capacities?
- What are the strategies to secure high-value markets and to integrate local and regional markets?
- What are the challenges and policy implications?

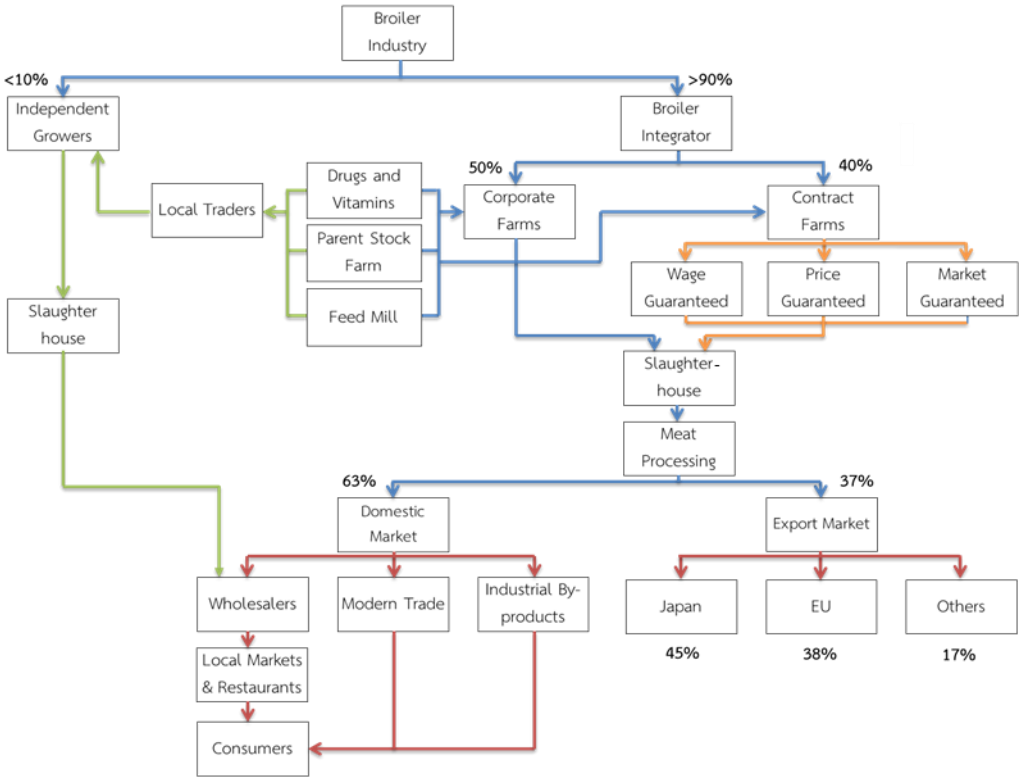
The information for this case study is from a study by Poapongsakorn et al. (2017). The data used in that study was from the focus group workshops with the broiler industry and the

association of corn traders. A survey questionnaire among 40 broiler growers and interviews with corn suppliers in two eastern provinces, Chonburi and Chachoengsao, were carried out in 2016.

Value Chain Characteristics

The Thai broiler value chain is vertically integrated by integrators who dominate the market share by more than 90% (Figure 2.11).

Figure 2.11: Vertical Structure of the Thai Broiler Value Chain



EU = European Union.
Source: Adapted from Poapongsakorn et al. (2017).

The Thai broiler value chain is considered a 'star' among the Thai livestock sector, being the first to transition from backyard farming towards a fully industrialised production. Large-scale production and scale economies were captured and led to highly successful exports to Japan and the EU. While different cuts of some high-value parts were exported, other parts of the chicken were dumped in the domestic market, effectively making chicken meat the most affordable protein source for Thai consumers.

To ensure high-quality production and stable output, the broiler industry has been vertically integrated since its inception. The 'integrators' had established a foothold in the industry by

securing strong links to inputs (feeds mills, breeders, drugs) and to outputs (slaughterhouses, processing plants, and modern retails). The early success of the broiler industry can be attributed to four enabling conditions:

The first condition is contract farming, which serve as a buffer that reduces growers' loss. For integrators, contract farming provides a mechanism that allows them to scale up production rapidly yet shielding them from the risks of investing heavily. Furthermore, contracts allow the integrators to adjust the volume of production flexibly to seasonal and irregular changes. For farmers, contract farming provides them with substantially higher yield at guaranteed price, risk sharing, knowledge transfer, and access to high-value international market.

Under contract farming, new technologies were transferred from Arbor Acres in 1970 and were adopted quickly. The introduction of poultry genetics and the 'CP707' commercial breed enabled a high-yield, low-death-rate chicken suitable for intensive farming. On top of this, the industry used ready-mixed feed to improve growth and raise the feed conversion ratio to save production cost. The rate at which farmers adopted new technologies was extraordinary as a result of contract purchase requirements.

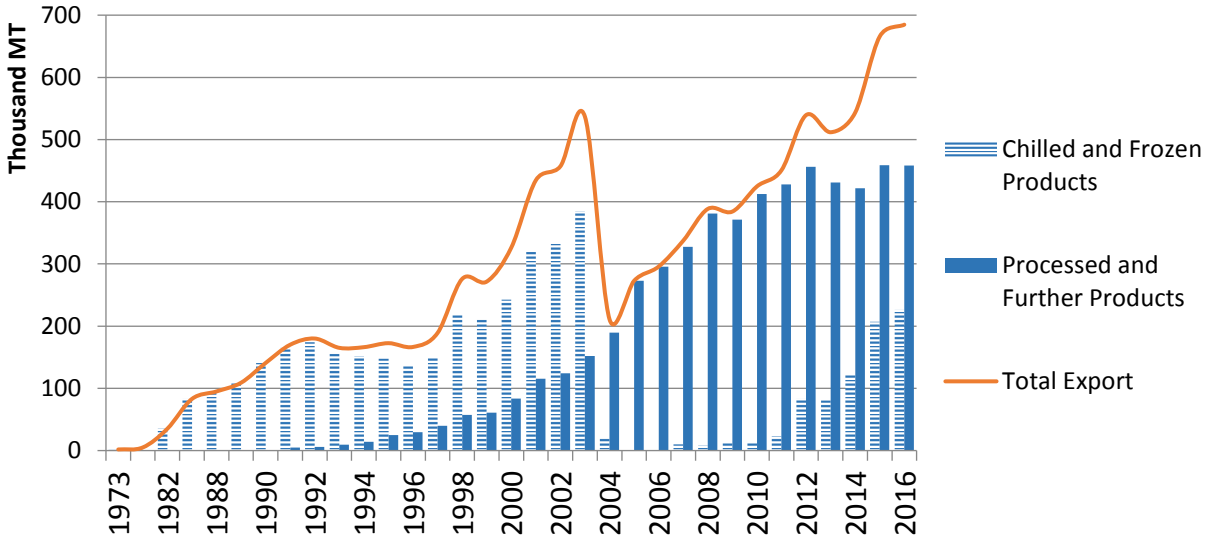
Another important factor in the initial stage of broiler value chain development was cheap labour and abundance of feeds that provide the industry with huge comparative advantages in the region. The short distance between Thailand and high-income countries, such as Japan, has resulted in cheap logistical and transport costs that competitors in the US and Brazil do not have.

Lastly, investment promotion was one important factor that positively encouraged the transition of broiler value chain, allowing Charoen Pokphand to establish the modern slaughterhouse for export without having to transfer the ownership rights to the local government, as stipulated in the law at that time. The Thai government's laissez-faire attitude towards regulation gave freedom that encourages the private sector to self-regulate and adopt its own standards to compete in the international market. New investment promotion privileges were aimed at large-scale production and, thus, were applicable to companies with more than B50 million of working capital. This ensured scale economies and an oligopoly structure of the industry.

Building Resilience

The broiler industry has always been adaptive to changes, quick to adopt new technologies and continuingly seeking new markets. During the development of the modern value chain, the Thai broiler industry has encountered technological and competitive shifts, a shortage of raw materials (particularly maize), an economic shock, avian influenza outbreaks, and environmental concerns. This section describes the series of shocks that adversely affected the industry and investigates how they were overcome.

Figure 2.12: Broiler Industry Export Growth and Shocks



Source: Chokesomritpol, et al. (2018).

Figure 2.12 shows industry export growth since 1973 when the modern value chain started. Between 2004 to 2006, a series of bird flu outbreaks hit the industry, resulting in export bans of chilled and frozen chicken from various trade partners. However, the industry was protected by the export of processed and further products[10] which did not face the same treatment. From then on, many agribusinesses shifted their operations from exporting frozen chicken to processed and further products.

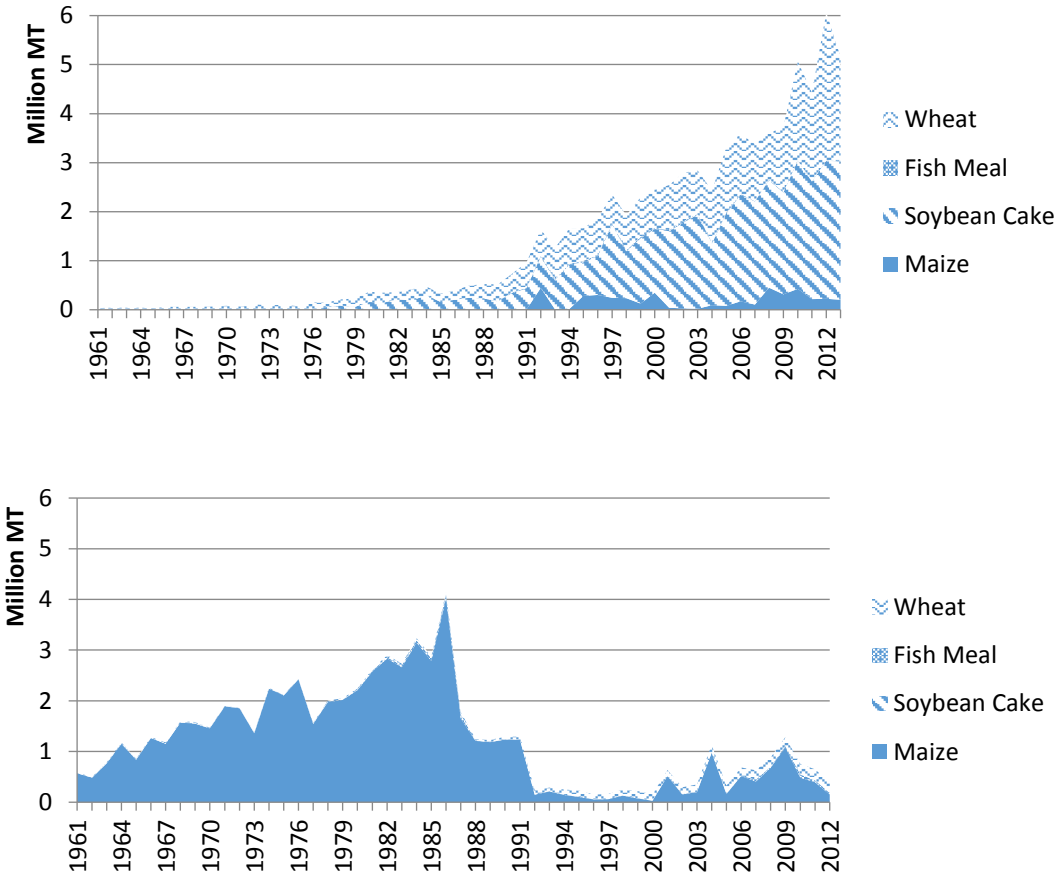
The processing capability and know-how did not come in a day. Continuous efforts to counter various shocks and changes were exerted, which aim to both increase value and improve resilience. Before the bird flu outbreaks, several events already determined the outcome for the post-bird flu restructuring.

The first event was the lack of feed supply. In the late 1980s, the scale of broiler production and other livestock sub-sector had become so large that it exceeded feed production capacity. In response, the industry began to import feeds (Figure 2.13), thanks to the gradual phase-out of the trade-related investment measures to comply with the agreement of the World Trade Organization and the free trade agreements with countries that export maize, such as Australia. Moreover, some Thai companies have introduced contract farming with farmers in Myanmar and the Lao PDR to grow maize, thanks to the Ayeyawady-Chao Phraya-Mekong Economic Cooperation Strategy scheme. Yet the government's price support policy for maize had increased the costs of imported feed, which hampered competitiveness of the Thai broiler industry.

[10] Short for further processing of products (i.e. cooking and seasoning).

To reverse the situation, some agribusinesses introduced new value-adding activities by using the then-cheap labour to pre-process and cut certain high-value parts of chicken (such as breasts). The new line of products attracted the high-income Japanese consumers, allowing the industry to compete in the international market.

Figure 2.13: Thailand's Feed Imports (top) and Exports (bottoms) (1961-2013)



Source: Chokesomritpol et al. (2018).

The second event is the rising wage in the 1990s. The industrial boom began to attract many workers from the agriculture sector, resulting in a decline in the size of agricultural labour force and rapid increase in real wage rate in the early 1990s. Thailand's competitive advantage began to disappear while other Asian competitors with cheaper labour costs such as China began to catch up on exports with an added advantage from closer proximity to Japan.

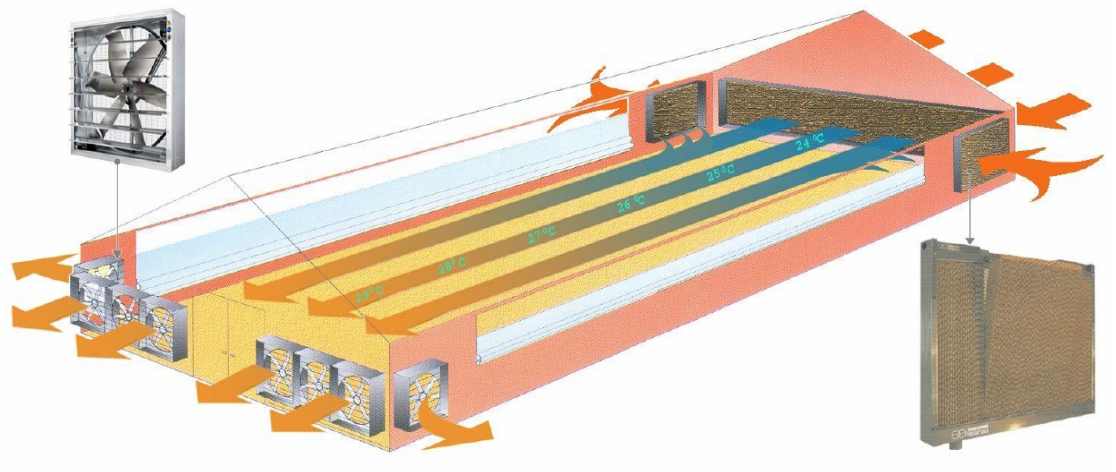
Around this time, the Thai industry began to shift to higher-value processed broiler products, shifting from frozen boneless chicken to processed and pre-cooked chicken in the form of ready-to-eat and ready-to-reheat products. These new lines of products had become an important export that had grown steadily since 1991. By 2000, the exports of processed

chicken were at 69,329 tons, amounting to 22.5% of the total export quantity and 36% of the total export value of chicken.

The third event is the introduction of the evaporative cooling system in poultry houses and automated feeding system. Thailand is not really suitable for intensive broiler farming because high temperature and humidity stress the broilers, which affect the growth and resistance to disease of chickens. The import and modification of EVAP housing from the US helped concentrate as many as 5,000 to 10,000 birds in a single house and increase the scale of production. The EVAP system in Thailand uses large fans and water to cool down the housing to around 28^0C. These lower temperatures significantly reduce stress, resulting in increased growth and lower mortality rates. Thanks to the labour shortage and increasing labour cost, large family farms and company farms have been automated through the adoption of automated feeding systems, for example.

The closed system also provides disease control, removes bugs, and allows more chickens to be raised per square meter. Unlike the EVAP systems in the US, Thai EVAP houses do not use full automation but use more labour to host more chickens most likely because labour cost in Thailand is much lower.

Figure 2.14: Evaporative Cooling System Housing



Source: www.parakaset.com (see in Khunrak 2017).

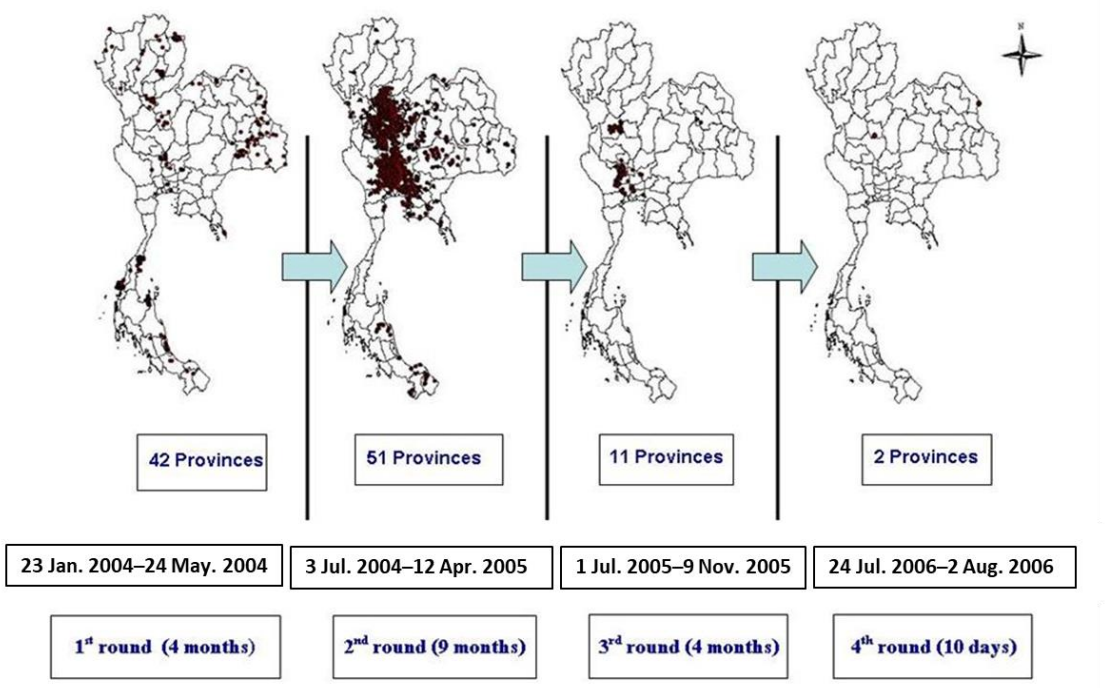
The fourth event is the increasing trade requirements in the early 2000s. Driven by food safety and animal welfare of the EU markets, many Thai exporters initially view these measures as protectionism. But in 2002, nitrofuran and dioxin were detected in broilers exported to the EU, causing a massive shift in practice among agribusinesses and regulations by the Department of Livestock Department. At the same time, the market for antibiotic-free broilers in Japan was emerging. As a result, the Department of Livestock Development imposed a new farm standard to comply with these issues, effectively turning many farms to EVAP housing. Many integrators began to shift from sourcing chicken via contract farming to

an in-house production to increase control over all input uses. This is to ensure a 'from-farm-to-table' traceability scheme.

As a result of these shocks, the industry continuously adapted and modified its standards while bringing a larger share of production processes in-house. By doing so, integrators would have better control on all inputs used. The shifting of some of the production lines of companies towards pre-cooked and processed products was seen as a value-adding activity to overcome higher production costs. This approach was later recognised as the way out during the serious bird flu shocks.

The Avian influenza (known informally as bird flu) outbreaks between 2004 to 2006 (Figure 2.15) forced a swift and decisive response from the government. Strict regulations were issued to stomp out all affected animals while AI vaccination was banned. While the approach incurred significant losses, the industry was able to contain further spread of the disease; consumers also gained better trust of the Thai chicken. New farm standards have been issued so that all farms will be upgraded to closed evaporative systems. Quarantine and movement control were applied nationwide, together with an intensive surveillance program known as 'X-ray'.

Figure 2.15: Bird Flu Outbreaks in Thailand



Source: Santiwattanatam (2005).

Post–avian flu restructuring following destructive shocks saw a huge transition from contract farming towards in-house production. Many integrators downgraded themselves by combining the lowest value-adding activities such as chicken raising as part of the compartmentalisation strategy which monitored the entire production processes. Multiple compartmentalised production zones were constructed distantly separate from each other for biosecurity. This is to ensure that when one compartment is compromised, others can still maintain integrity and export with the trade partners.

Even after the outbreak was gone, the export of chilled or frozen chicken to high-value market did not pick up. These products, along with other low-value parts, were diverted to lower-value domestic and regional markets in ASEAN.

The outbreak of highly pathogenic avian influenza (HPAI) also initiated a transformation of poultry processing. At the time of the ban, frozen/fresh products accounted for about two-thirds of exports by weight. Following the HPAI outbreaks, in just 3 years, the volume of exported pre-cooked and processed chicken almost doubled while fresh products made up less than 1% of the total. In some sense, the structural shift towards pre-cooked products had been under way for some time to comply with some importers' food safety and animal welfare requirements in the mid- to late-1990s. However, the HPAI outbreaks were the call to action for many industry leaders to accelerate the transition in order to survive.

As a consequence, the broiler industry has substantially transformed and became more concentrated at all levels.[11] The average farm size has increased to more than 20,000 birds per house. Many broiler farms are now growing more than 100,000 birds at a time, thanks to the adoption of the closed farm system. Since the industry is characterised by the vertical integrated structure, a few integrated companies now dominate fresh and cooked chicken in the domestic and export markets. Only two major brands of chicken products are now sold in the supermarkets in Bangkok. Smaller firms with small processing plants can serve the small markets in the rural areas. Yet the number of chicken processing plants for export had increased from 25 factories in 2004 to 27 in 2018, while the total number of processing plants sharply increased from 400 to 1,089 factories in the same period,[12] according to the Department of Livestock Development. Although there are still about a dozen export firms, the number has declined from the pre–bird flu era.

[11] No official information on market share and number of commercial farms in Thailand is available, resulting in the difficulty of analysing the industrial structure, conduct, and performance. In 2015, Prachachart Business Online reported that the production share of the seven largest chicken integrators in chicken processing was 80%. Since then, the second-largest firm has gone bankrupt, and the third-largest company has aggressively and rapidly expanded its business.

[12] The increase is partly because most, if not all, processing plants must register with the Department of Livestock Development.

Strategies to Secure High-value Markets and Market Integration

The Thai broiler industry was so successful and highly resilient because the industry was able to maintain its existing markets by adapting quickly to new trade requirements and changing consumer preferences – in particular, their social, environmental, and animal welfare concerns. Not only has it been able to maintain export competitiveness, the industry's strategic successes come from the continuing efforts to seek new emerging markets. By doing so, these companies have been moving for greater profits, while diversifying their risks.

To cope with the shocks, these companies adopted new technologies quickly and maintained a tight control of information flowing within their companies. A business-to-business strategy is used to link foreign trading firms with a high-quality made-to-order product. Following trade disruptions, the government unit also employed government-to-government negotiations to mend the broken links between the Thai companies and the trade partners.

The expansion of Thai production has been accompanied by investment in foreign, often emerging, markets where there are trade risks from either competition or protectionism. In recent years, the industry is moving into ASEAN countries to capture domestic markets, but investment is still at an early stage. The approach to investment varies differently according to local contexts, such as market preferences and local demands for meat, infrastructure readiness, local resource availability, and government policies and regulations.

The Charoen Pokphand Group, for example, is using the Sri Racha model of the mid-1970s in the developing countries of ASEAN, investing in feed businesses, and employing local contract farmers to scale up production gradually at the same pace as local demands. In ASEAN, the company's expansions were also facilitated by local financial institutions and were often granted privileges through direct negotiations with the local governments. In contrast, the investment decisions into the more developed economies, such as the US and Turkey, had been in the direction of rapid growth through mergers and acquisitions.

Challenges and Policy Implications

FVC development is not only about 'developing'; it is also 'sustaining'. Thus, it is equally important to improve resilience capacities. The role of government (in this case, the Department of Livestock Development) is very vital to the industry's success especially when facing unexpected shocks. While production is moving away from contract farming towards in-house production, this implication may be industry-specific only to livestock sub-sectors.

Despite all the successes, the industry faces four major challenges. The first, and perhaps the most important, is the haze in a few northern provinces and neighbouring countries where contract farmers grow maize on untitled forestlands. Some agribusiness companies now adopt a policy not to buy maize from those areas. But it will seriously affect poor farmers' income because maize is probably the most convenient crop for them. Although burning corn

cobs is not the only cause of haze, the problem is extremely difficult to solve since most farmers there are very poor.

The second challenge is the price support for maize which affects the production cost. The government is now promoting the growing of maize as the second crop after rice so that farmers will earn a higher net income than from the dry-season rice. But the current trade war between the US and China may result in lower world maize price, which will benefit the animal feed producers and chicken processors but will affect the farmers' income unless the government will subsidise the farmers.

The third challenge is the unexpected shocks, such as bird flu, which will seriously affect the farmers and the agribusiness companies. The main concern is how the contractors will help share such risks with the farmers. Without such risk-sharing arrangements, many farmers may face heavy debt and go bankrupt in the next major bird flu outbreak. In addition, the government and the industry must constantly monitor the bird flu situation and establish an effective warning and preventive system.

The last challenge is the fierce challenge from the Brazilian broiler industry, which is more competitive than that of Thailand, thanks to the abundant feed supply and economies of scale from very large farm holdings and processing. In the past, the Brazilian industry did not have much interest in the Asian markets because it has large markets in Europe and Middle East. Since the Chinese market has been growing rapidly, Brazil in now penetrating this market. In addition, it will not only compete in the market of fresh chicken but also in the further products market, which is Thailand's competitive edge. One Brazilian company is investing in Thailand probably to get accustomed to, acquire more experience in, and enter the market for further products in Asia, particularly China and Japan. To compete successfully, the Thai broiler industry will have to adopt a new competitive strategy, such as investment in research and development.

7. Conclusion

This paper uses the theoretical framework of the FVC to explain the development and characteristics of modern FVCs in Thailand, emphasising institutional arrangements, technological change, and key drivers. Two FVC case studies – vegetables and broiler value chains – are described. The paper describes major developments of modern FVCs: the first one initiated by contract farming in the mid-1970s, and the second, by the supermarkets in the mid-1990s. The main drivers are access to export markets, rising per capita income, technological change, and increasing health consciousness among the young generation (particulary the demand for safe vegetables). Though the broiler industry and production of safe and organic vegetables are now governed by the modern value chains, most FVCs are dualistic in nature. Our previous study shows that operating in the modern FVCs allows the participants to improve their value-adding activities and reduce loss in the value chains.

Factors affecting the outcome of value-adding activities include (i) shifting consumer preferences, (ii) reliable source of quality raw materials, (iii) chain upgrading, (iv) business cooperation and integration, (v) better flow of information and collaboration between stakeholders, and (vi) fluctuating demand. Yet the traditional FVCs are highly efficient, resulting in high farm-gate prices of products and low input prices bought by the farmers. Smallholders' benefits from the access to the high-value markets are the return to specific non-land assets, particularly knowledge and capital investment.

The paper also identifies key challenges, namely, the feed cost, haze problems, and external shocks in the broiler value chains, and food safety as well as labour shortage in the vegetable chains and provides some policy recommendations.

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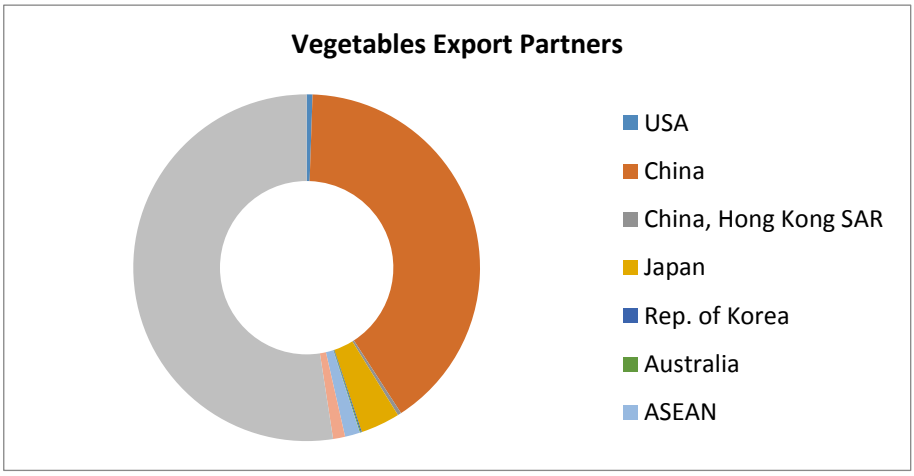
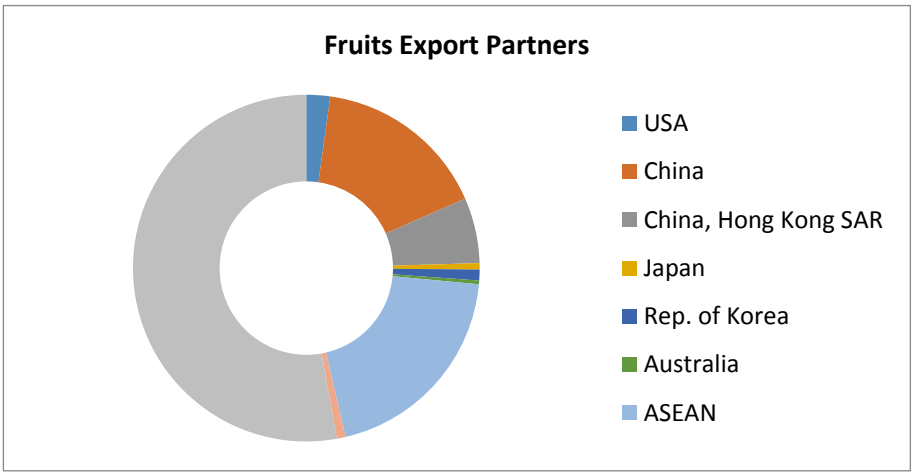
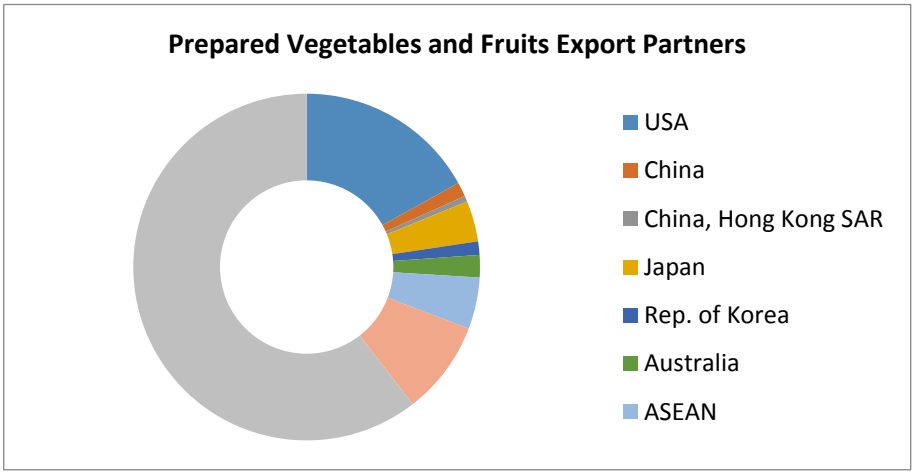
Annex: Major Export Destinations of Thai Vegetables and Fruits, 2016







Source: Compiled by the authors. Data from United Nations Comtrade (https://comtrade.un.org/).

Chapter 3

Realisation of Higher Value Added of Seng Cu Rice Value Chain in Viet Nam

Lam Thi Bui[*]*,Cuong Huu Tran, Hop Thi Minh Ho,*
Eiichi Kusano, and Philippe Lebailly

1. Introduction

Lao Cai is a border province located in the Northern Midlands and Mountains (NMMs) of Viet Nam, containing the typical features of mountains such as high poverty rate (27.4% in 2017), the scarcity of arable land[1], diversity of 25 ethnic minority groups and the widening gap among the different income group (Lao Cai SO, 2016; MOLISA, 2016; Nguyen Tran, 2017; WorldBank, 2017). Despite its being an agriculture-based province with nearly 80% of total rural population engaging in farming activities, the share of agricultural output in gross regional domestic product was only 14.24% in 2017 (Lao Cai SO, 2017). This indicates that agricultural activities in the province provide low value addition, leading to currently high poverty rate and other serious socio-economic issues. Several recent studies carried out in the NMMs indicated that although increasing the value added of farming activity always gets the attention of the local authorities, top–down policies and their implementation have created ineffective results in agricultural development and livelihood-improving roles for the local people (Bui et al., 2018; Castella et al., 2002; Yen et al., 2013). Moreover, farmers and other actors in the agricultural chain are faced with various challenges in production and marketing. In this study, the authors chose a potential agricultural product of Lao Cai, namely, Seng Cu rice, to identify the bottlenecks and, thus, suggest feasible solutions to generate more value addition and allocate more suitable benefit among actors in the chain.

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Seng Cu is a special rice of the NMMs, with superior aroma, nutrition, and flavour compared to other rice varieties. Seng Cu cultivated in Lao Cai has the highest price in the domestic market[2], therefore, providing high economic value to producers and other actors. It is also listed among the primary agricultural products of the province in terms of improving the economic state of poor farmers and ensuring food security, especially in upland areas. However, the share of production area devoted for Seng Cu rice still remains low; it slightly increased from 3.5% in 2012 to 6.1% in 2017 in total rice cultivated land of Lao Cai (Lao Cai DARD, 2012; 2017). Based on the value chain approach, the study aims to determine challenges in production, processing, and marketing and, therefore, suggests reasonable solutions to get higher value added of this special agricultural product and to distribute better benefits among those in the chain.

The chapter comprises six sections. After the introduction and methodology, the next section describes the main characteristics and cost–benefit analysis of primary actors in the chain as well as the role of secondary actors who provide support services affecting value addition of the chain. The fourth part presents an overview of product channels and calculates the contribution of value addition of each actor in four main channels. Based on this, the main advantages and disadvantages occurring in the chain, which are important evidence, are identified. Recommendations on production and marketing for sustainable development are presented in the last section.

2. Methodology

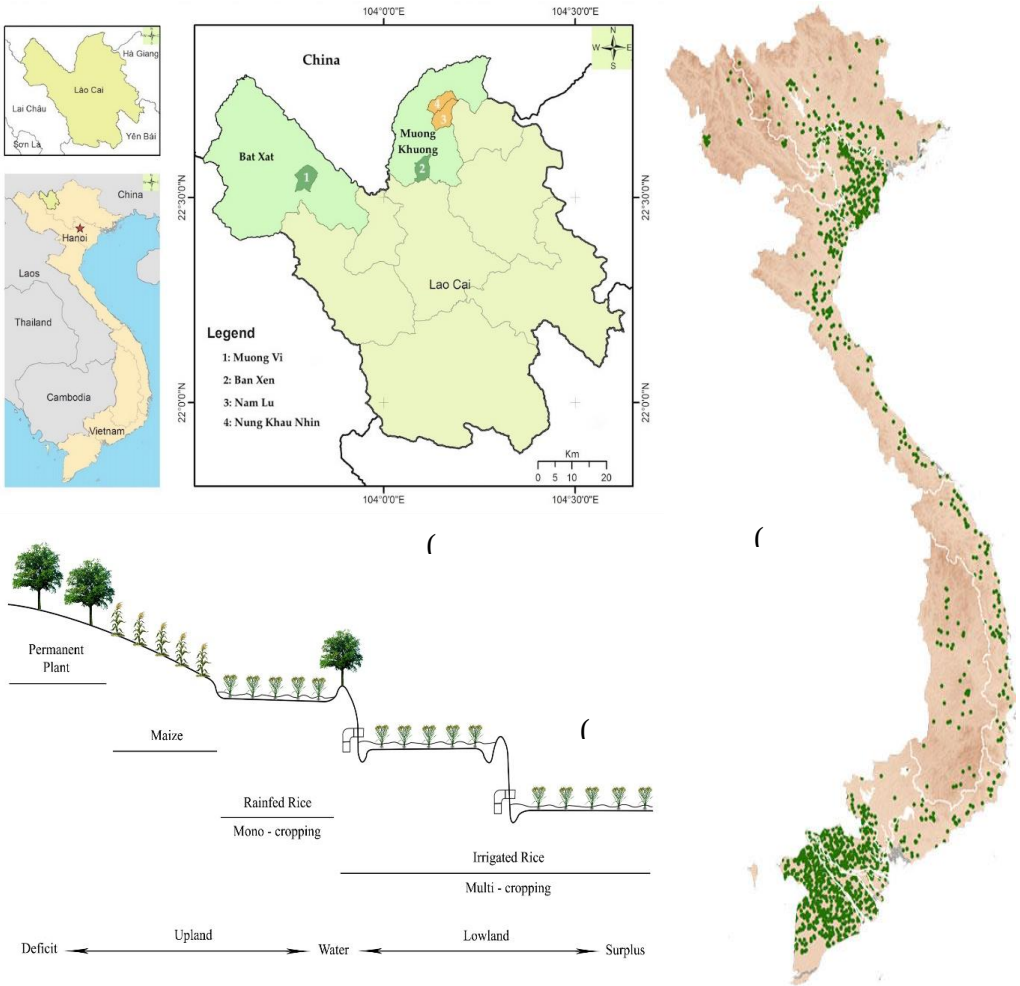
2.1. Research Site

According to Bui et al. (2018), Lao Cai is the ideal site for researching on the montane rice sector because of the following reasons. Firstly, Lao Cai has typical socioeconomic and political characteristics representing the mountainous areas of Viet Nam. Secondly, the province produces about 5 tons/ha of rice, almost about the same as what farmers of the NMMs region produce. Moreover, Lao Cai has more potential in developing some special agricultural products that can provide high economic value for farmers and other relevant actors in the locality. Specifically, the province is endowed with various natural advantages for Seng Cu rice cultivation, such as a high difference between daytime and night-time temperatures with an average temperature at 20.45°C; low latitude at 21°30’ N and 22°51’ N; moderate sunshine duration at around 1,500 hours per year; high annual rainfall of more than 2,050 mm; and alluvial fertile soil and watershed (Lao Cai SO, 2016). According to GRiSP (Partnership), 2013), rice planted in low-latitude areas, with high solar radiation, and cool temperature tends to get higher productivity. Rice cultivators, therefore, should exploit these geographic features to obtain high quality and high yield to improve their economic situation.

Regarding Sengcu rice production analysis, the study chose four largest production-area communes from two districts, existing in two different ecological zones (i.e. upland versus lowland and rain-fed versus irrigated). In 2017, rice growers in Muong Khuong spent 22.54%

of total cultivated rice land for Seng Cu rice (about 550 out of 2,218 hectares). In the same year, 16.74% of total rice land in Bat Xat district was devoted for Seng Cu rice growing (840 ha out of 5,016 ha). Figure 3.1(a) shows the selected research site, comprising (i) two lowland communes, namely, Muong Vi located in Bat Xat district (green 1) and Ban Xen located in Muong Khuong district (green 2); and (ii) Nam Lu and Lung Khau Nhin (orange 3 and 4) and two upland communes belonging to Muong Khuong district. The results of in-depth interviews of the agricultural officials indicated that majority of rice growers in those communes are planting Seng Cu rice, more or less, but the proportion of their cultivated land spent for Seng Cu rice fluctuated significantly, especially in the uplands. Arguably, the purpose of Seng Cu cultivation strongly influences this difference. While lowlanders aim to maximise profit, uplanders prioritise food security. This is why upland rice farmers tend to plant high-yielding hybrid varieties, not Seng Cu rice.

Figure 3.1: Map of Research Site



Note: In Figure 1 (c), one green dot represents 5,000 ha dedicated to rice growing.
Source: Figure 3.1 (a) and (b) are author's own elaboration; Figure 3.1 (c) is cited from GRiRS (2013).

2.2. Sampling and Data Collection

The study collected both secondary and primary data to conduct the qualitative and quantitative analyses. Qualitative analysis was applied to explore the typical characteristics of each kind of chain actor under different prism observations, and interaction and relationships existing among participants in different product channels. Moreover, their attitude and feedback on the corresponding policy system were precisely recorded. The authors also applied purposive sampling, open data collection through individual in-depth interviews, case studies, and observations.

For the quantitative analysis, this study used the data collected from the household survey and in-depth interviews to identify the cost and return of each activity in the chain. Based on this, value-added analysis for each process and the whole value chain was calculated.

The household survey with the stratified random sampling method was carried out in 2016. The structured questionnaire was used to collect primary data on (i) the specific characteristics of the household; (ii) Seng Cu rice-farming practices and input management; (iii) costs and income generated from Seng Cu rice production; and (iv) the households' feedback on two important services, agricultural credit and extension. The sample size was calculated by the following formula used in the work of Cochran (1977):

$$\mathbf{n} = \frac{\mathbf{Z}^2 \times \boldsymbol{p} \times (\mathbf{1} - \boldsymbol{p})}{\mathbf{e}^2}$$

Where, **n** is the sample size; **Z** is the statistical value containing the area under the normal curve (e.g. Z = 1.96 for 95% level of confidence); **p** is the estimated proportion of a feature that is present in the population (in general, the p value is equal to 0.5); and **e** is the desired level of precision (7.5%). Based on the above equation, the sample size of 170 households is identified. However, the authors removed 10 non-representative outliers and divided the 160 remaining observations into two ecological production zones, containing 80 rice-growing households (Table 3.1).

Table 3.1: Number of Farmers in the Household Survey in the Research Site

Name of Communes	Upland (Rain-fed)	Lowland (Irrigated)	Total
(1) Muong Vi	0	41	41
(2) Ban Xen	0	39	39
(3) Nung Khau Nhin	35	0	35
(4) Nam Lu	45	0	45
Total	80	80	160

Source: Authors.

To analyse the costs and benefits of other actors in the Seng Cu rice chain, the authors conducted 31 individual interviews, including 9 small collectors in upland communes, 10 large collectors in Lao Cai city and districts, and 12 retailers in Lao Cai city. The interviewees were selected through convenience and judgment sampling methods (Table 3.2). The authors also interviewed the heads of the province, two districts, and four communes from 2015 to 2017 to have an overview of the agriculture sector in the locality. Furthermore, the subsidised programmes for Seng Cu rice development were also examined on how farmers and relevant business units benefited from such support.

Table 3.2: Number of Other Actors Selected for the In-depth Interviews

Interviewees	Quantity	Year Conducted	Information Collected
(1) The heads of people's committee and agricultural officials at three administrative levels	14	2015 – 2017	- Annual agricultural development/events, etc. - Annual agriculture supporting programmes and their results/drawbacks
(2) Small collectors	9	2017	- Input and output markets - Cost and incomes of their business
(3) Large collectors	10	2017	- Input and output markets - Costs and incomes of their business
(4) Cooperatives	2	2017	- Input and output markets - Costs and incomes of their business - Contract farming with producers
(5) Retailers	12	2017	- Input and output markets - Costs and incomes of their business
Total	**45**		

Source: Authors.

Data Analysis

Value chain analysis (VCA) was first introduced by Michael Porter (1985). Over the past 30 years, VCA has been developed in terms of theoretical, methodological, and practical fields, especially in agricultural studies (see Fitter et al. (2001); Kaplinsky (2004); Riisgaard et al. (2010); Macfadyen et al. (2012); Khai et al. (2013); and Ho et al. (2016)). A crucial element of the VCA is the content of distribution of benefits among actors in the whole chain to understand the financial performance of main stakeholders to upgrade the chain towards sustainability (Macfadyen et al., 2012; Riisgaard et al., 2010).The work of Springer-Heinze (2018) indicated that the distribution of value addition along the chain is mainly to show the sources of economic growth and determine the competitiveness of products as well as the role of each actor in the specific chain.

To pursue the precious analysis of the Seng Cu rice chain and suggest effective implementation to achieve higher value for participants, especially poor growers, the study applies the value added analysis in the model of value chain development named ValueLinks 2.0, which was proposed by GIZ (Springer-Heinze, 2018). This method comprises four elements – structural, economic, environmental, and social analyses. This study primarily focuses on the first two:

(1) *Structural analysis* is a visual representation identifying the product flow; chain participants, their functions, and their linkages; as well as the supporting factors. Value chain mapping plays a crucial role in value added analysis.

(2) *Economic analysis* is the core element of value-added analysis. It determines prices and volume of products sold at a particular stage in the chain. Consequently, the value added along the stages and its distribution among each actor is identified. As a result of the assessment of the production and marketing costs, the subsequent target of this method of analysis is to evaluate the chain competitiveness of products compared with the best practices of competing chains in other regions. Moreover, analysis of the distribution of benefits among actors can estimate whether the chain development is sustainable or not.

According to Lebailly et al. (2000), (Baptist et al., 2013), and Springer-Heinze (2018), the sharing benefit analysis requires the main indicators presenting their operations and role in the chain, such as value generated (i.e. turnovers) of main products and by-products, total cost issued at each different stage (Figure 3.2).

Figure 3.2: Main Indicators Applied in the Value-added Analysis

VALUE GENERATED by the whole chain or by each different actor in the chain. Value generated = **Q**uantity × Unit **p**rice of product sold $TR_i = P_i \times Q_i$ $TR = \sum_{i}^{k} TRi$	**VALUE ADDED** is created in one stage of the value chain by a specific actor. • Wage • Interests and rents • Depreciation • Taxes • Profit/Income	Used to pay claims of the owners of factors of production (capital, labour, land, taxes)
	INTERMEDIATE COSTS • Raw materials • Semi-finished or traded products	Transferred to operators of the previous stage
	Other Inputs and Services Input, equipment Energy, water Operational services	Transferred to external suppliers

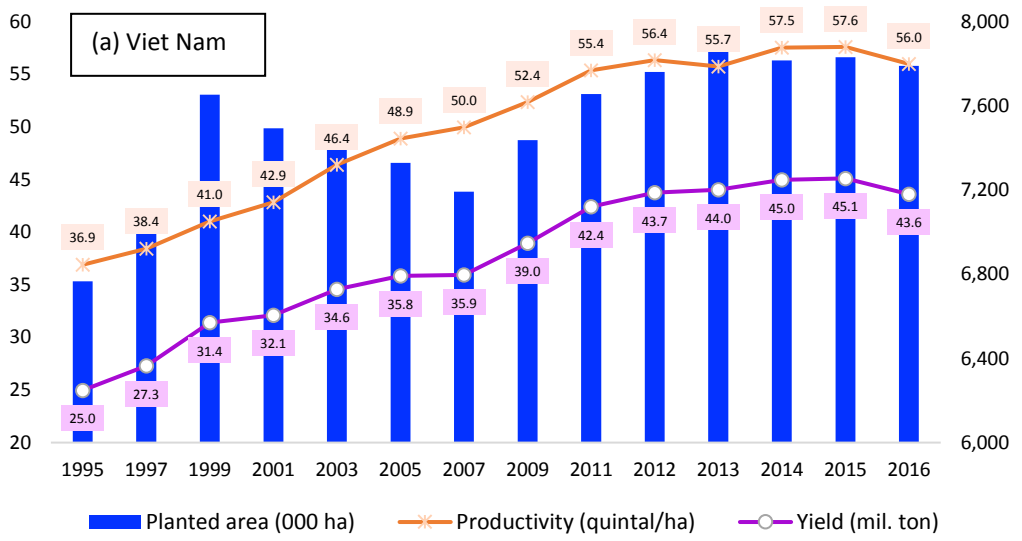
Source: Adapted from Springer-Heinze (2018).

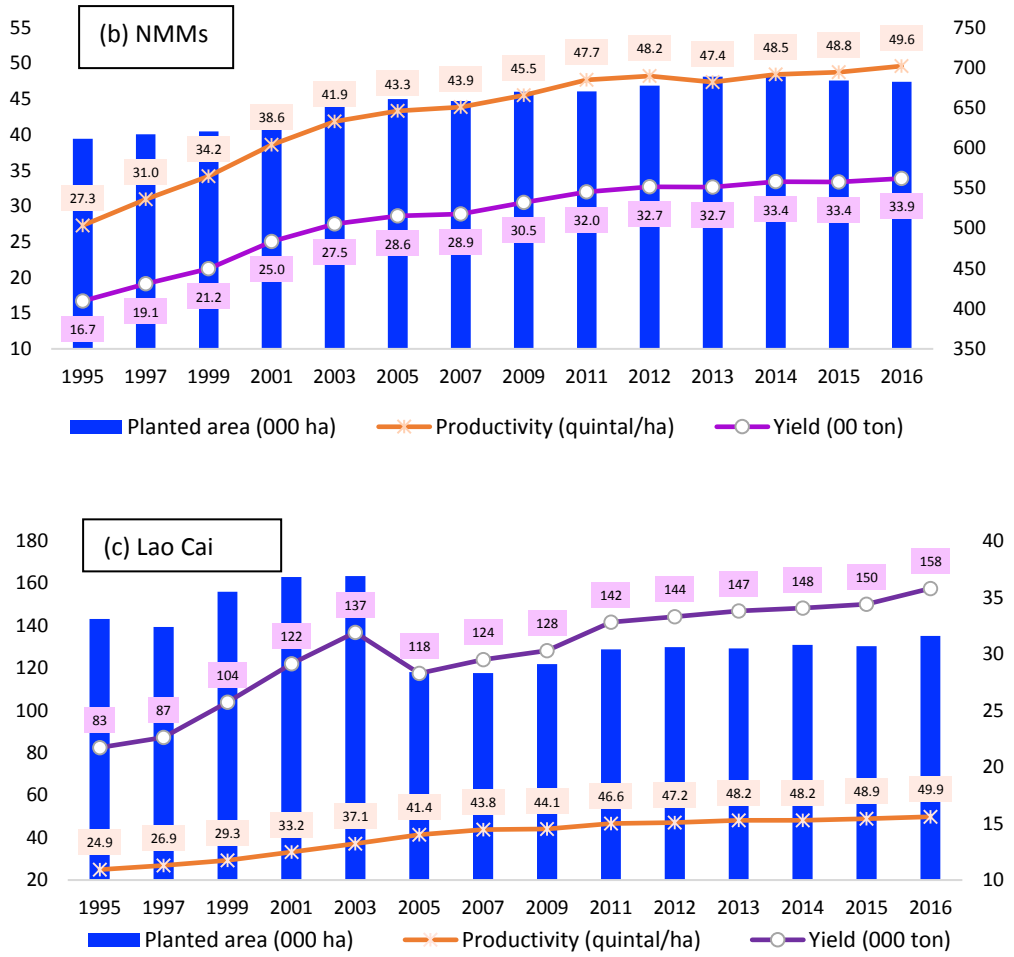
3. An Overview of Rice Production in Viet Nam and Lao Cai Province

Rice Area, Yield, and Output in Viet Nam and Lao Cai

Viet Nam has a remarkable achievement in rice production in the past 40 years. From an importing crop country in 1988, Viet Nam has become one of the five biggest rice exporters in the world from 2002 to the present. In 2017 alone, Viet Nam provided the international market more than 5.8 million tons of rice, with an estimated value of US$2.6 billion (VietnamMARD, 2017). Figure 3.3 shows that (i) rice production continuously increased from 25 million tons in 1995 to almost 43.6 million tons in 2016 (GSO, 2016), of which the expansion of rice-harvested area and higher yield contributed 15.1% and 51.7%, respectively. In addition, rice also remains the staple food of most of the population, providing the highest source of calories (52% in 2011) and of protein (37% in 2010) per person per day (GRiSP, 2013). Therefore, rice has always played a vital role in socio-economic development and in food supply for the domestic and international markets.

Figure 3.3: Planted Area, Productivity, and Paddy Output





Source: Vietnam General Statistic Office, 1995–2016 (GSO, 2016).

As mentioned, a typical characteristic of mountainous areas, including Lao Cai province, is the scarcity of agricultural land in general and land for cultivating rice. Figures 3.3(b) and (c) indicate rice production in NMMs and Lao Cai, respectively. While NMMs is the largest ecological region of the country (29%), its share of rice cropping land accounts for only 8.76% of the total national amount in 2016. The ecological area of Lao Cai accounts for 1.92% and the share of rice cropping land accounts for only 0.41% of the total national amounts in 2016 (GSO, 2016). The province devotes most arable land to rice – from the uplands with steep hillsides to create attractively terraced plots to the lowlands with flat fields. Rice is harvested twice a year. The remarkable difference between these two ~~kinds of~~ ecological rice-producing zones is water availability. While upland growers must store water as paddy output depends totally on rainfall (i.e. rain-fed rice), lowland farmers can take advantage of the well-constructed public irrigation system (Figure 1[b]). As a result, lowlanders often achieve much higher rice productivity and yield. In 2016, there were 1,735 mono-cropping rice hectares, accounting for 23.98% of total harvested rice area (Lao Cai DARD, 2016).

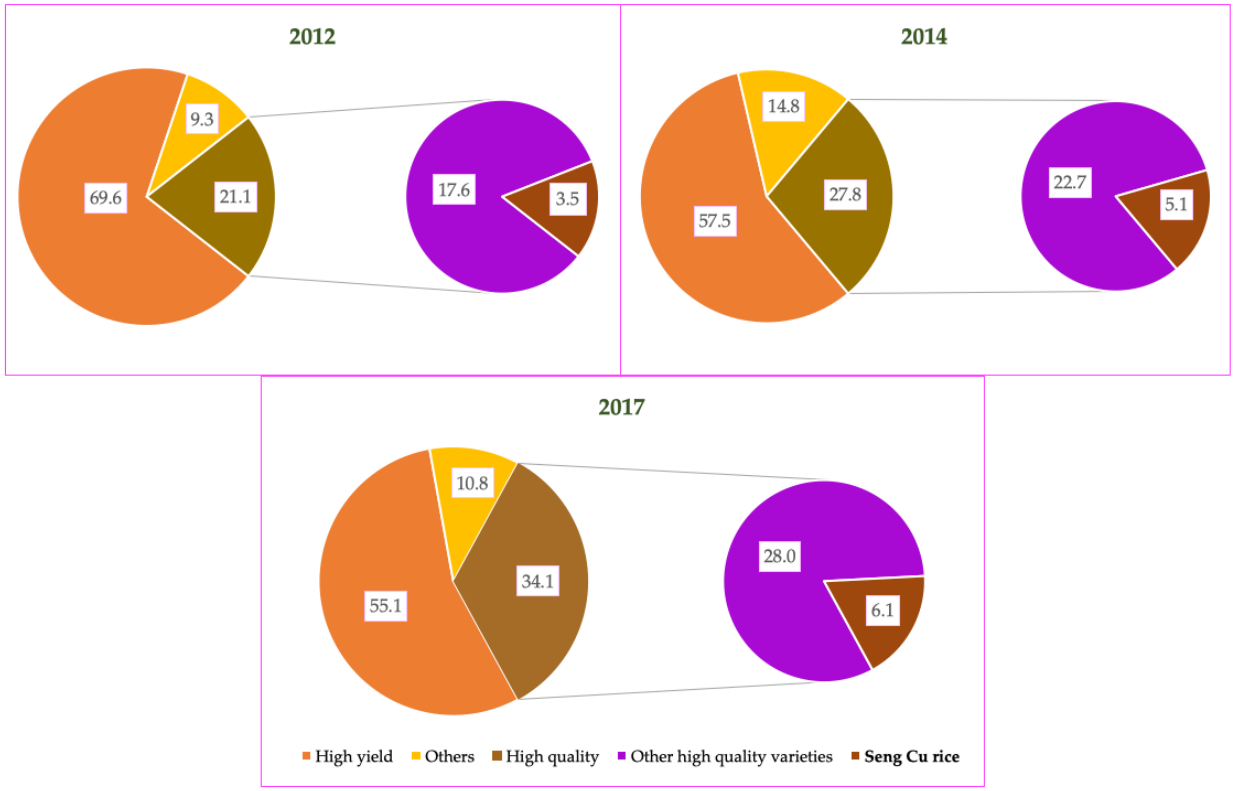
Seng Cu Rice Production in Lao Cai and the Main Markets

As mentioned, Seng Cu rice is cultivated once to twice a year, depending on water availability. Figure 3.4 represents the structure of rice production areas from 2012 to 2017, including those for Seng Cu rice. Remarkably, the share of cultivated land spent for high-yielding rice variety reduced rapidly from 69.6% in 2012 to 55.1% in 2017, while that for the high-quality rice variety increased significantly from 21.1% to 34.1% during the same period. According to local officials, this rise contributed significantly to the improvement of income and livelihoods of rice farmers.

Seng Cu rice grew slightly from 3.5% in 2012 to 6.1% in 2017, although this kind of rice is listed as a primary agricultural product of the province and Lao Cai authorities have issued many supporting regulations. The household survey revealed the reasons explaining why many ethnic minority respondents prefer to grow the high-yielding rice than the high cash crop due to their priority of food security. Besides this, it is easier for them to calculate the physical output (i.e. how many paddy packages they gained) than the financial value such as cost, revenue, and profit generated. In fact, many people living in the uplands have very low education. And last but not the least, their economic benefits are undermined in asymmetric transactions with buyers because of their weak marketing skills (low bargaining power; no information of price; selling paddy when they often lack of money and, so on). All these result in the impression that Seng Cu is not attractive enough for the ethnic minorities in the uplands to grow. Based on these findings, recommendations on the improvement of marketing skills and financial management of local producers as well as appropriate policies to boost the chain's sustainable development are necessary.

Nearly 2,000 hectares was devoted to produce Seng Cu rice in 2017, generating about 10,000 tons of paddy output. The household survey and interviews of key persons carried out in 2016–2017 estimated the consumption structure of Seng Cu rice as follows: 1.8% of total paddy output was stored by Seng Cu rice growers to become seeds for the next season (i.e. self-production seed); 16.6% was used by households to create some traditional dishes for special events; 49.7% was consumed in the provincial market; and the remaining volume (31.9%) was delivered to high-end markets of the northern region, where Ha Noi is the dominant market.

Figure 3.4: Structure of Rice Production Areas, by Rice Variety in Lao Cai



Source: Lao Cai DARD (2012, 2014, 2017).

In the provincial market, white rice is processed simply without special packaging, trademark, certification, and traceability of original products. The end users buy Seng Cu rice very easily and conveniently through the retailers, followed by the processors/millers downtown. The consumer survey revealed that the quality of Seng Cu rice has been significantly reducing over the last decade. The main reason for this is that majority of collectors, pursuing to maximise profit, often mix ordinary rice varieties with Seng Cu rice. From the processing phase, the in-depth interviews showed that low technology and/or lack of processing machines for harvesting, threshing, drying, milling, and polishing causes the quality of milled rice to decrease remarkably.

In the national market, Seng Cu rice is mainly sold at big supermarkets or fresh and safe food stores in big cities like Ha Noi, Quang Ninh, Hai Phong, etc. To meet the high demand of customers, the packaging of this type of rice is well designed and associated with the geographical indication of terraced fields in Lao Cai. Currently, Seng Cu rice has two business units with registered trademarks 'Séng Cù Lào Cai' in 2008 by Tien Phong Cooperative (TPC) and 'Gạo Séng Cù Mường Khương' in 2012 by Muong Khuong Cooperative (MKC). The first unit is located in Muong Vi commune, Bat Xat district and belongs to the lowland zone, so it conveniently accesses the market. Meanwhile, the second unit in the upland is faced with various difficulties regarding poor infrastructure (i.e. the electricity and road system). It is nearly isolated, especially in the rainy season, when landslides and storms occur frequently.

In general, the marketing system remains chaotic and the price between buyer and sellers is inappropriate, especially in the uplands. This is a result of the isolation, high transaction costs, and poor marketing infrastructure, such as rural road system and scattered population. Therefore, improved infrastructure is a vital factor in enhancing a dynamic market and value addition for local farmers.

4. Seng Cu Rice Value Chain Map and Actors in Lao Cai Province

Overall, five main actors participate in the chain: (i) input suppliers, (ii) producers (upland and lowland), (iii) small collectors, (iv) large collectors, and (v) retailers. Figure 3.5 shows five key value-addition phases in the Seng Cu rice chain in Lao Cai, including input supply, production, collection, processing, and trading. Some actors are responsible for multiple functions: producer cum collector, processor cum wholesaler and retailer, etc. The study points out that the two most important actors in the chain are (i) producers, who directly determine the quality obtained and quantity generated of paddy in the production phase; and (ii) marketing actors, including the MKC, the TPC, and large collectors, that perform multiple functions in the post-harvesting phase (collecting, processing, trading, delivering). All the experienced millers reported that it is not easy to manage the quality of milled rice as it strongly depends on various factors – such as good humidity, temperature, wind, sunshine, and others – during storage. ~~Moreover,~~ understandably, ~~there is rational equivalence between the high price of this special rice and high requirements of end users to enjoy it~~. The satisfaction, behaviour, and willingness to pay of final customers, like elsewhere, decide the benefits of all participants in the chain. This section analyses the activities of each actor to identify the value added generated by each stage.

Figure 3.5. Seng Cu Rice Value Chain

Source: Adapted from J. Nico et al. (2012).

Seng Cu Rice Producers

- Main characteristics of Seng Cu rice producers

Rice is a semi-aquatic plant; water, therefore, is the most important factor influencing grain yield. Since the uplands are characterised by unpredictable rainfall, rice cultivators there are frequently vulnerable to drought in the first season (from February to later May) and flood in the second one (from June to October). Moreover, the household survey in 2016 revealed that only 16.1% of rice-cultivated land was irrigated in the uplands through public investment. The remaining area is rain-fed and can grow one crop during the summer season (from May to October). Although upland producers invested in the expensive pipe system to flow water from the mountains to the field, rice cultivation still depends heavily on natural conditions (i.e. rainfall). By contrast, the public irrigation system in the lowland areas meets most water requirements for agricultural production, and rice is planted twice a year.

Table 3.3: Main Characteristics of Rice Producers in Upland and Lowland of Lao Cai

Terms	Upland Producers	Lowland Producers
Age of household head (years)	39.00	46.60
Number of members (persons)	4.54	3.97
Number of labours (persons)	2.64	2.70
Number of dependents (persons)	1.90	1.27
Years of attendance	5.10	7.01
Total agricultural land (ha)	0.37	0.65
Land for SC rice growing (%)	48.19	92.56
SC rice-growing experience (years)	5.42	9.15
Share of SC rice in household's income (%)	42.33	51.38
Number of cropping	Almost monocropping	Twice per year
Irrigation system	Rain-fed and self-made pipe system	Irrigated through public investment
Mechanisation state	Totally depend on manpower and animal traction because of difficulties from the terraced plots	Most works are done by machine, including land preparation, harvesting, threshing, etc.
Pattern cropping	High-yielding varieties are a priority because the concern about food security is higher than the goal of generating income.	SC rice has a high economic value for selling and profitability, so farmers grow it as much as possible.
Seed quality and resources	Most seeds saved from the last crop are stored. A few ones were brought to the town market with high price.	Most seeds were purchased in the local markets with lower price.
Labour use	Almost the entire family	Both family and hired labour
Marketing skill	Poor	Much better

SC = Seng Cu.
Source: Author's findings.

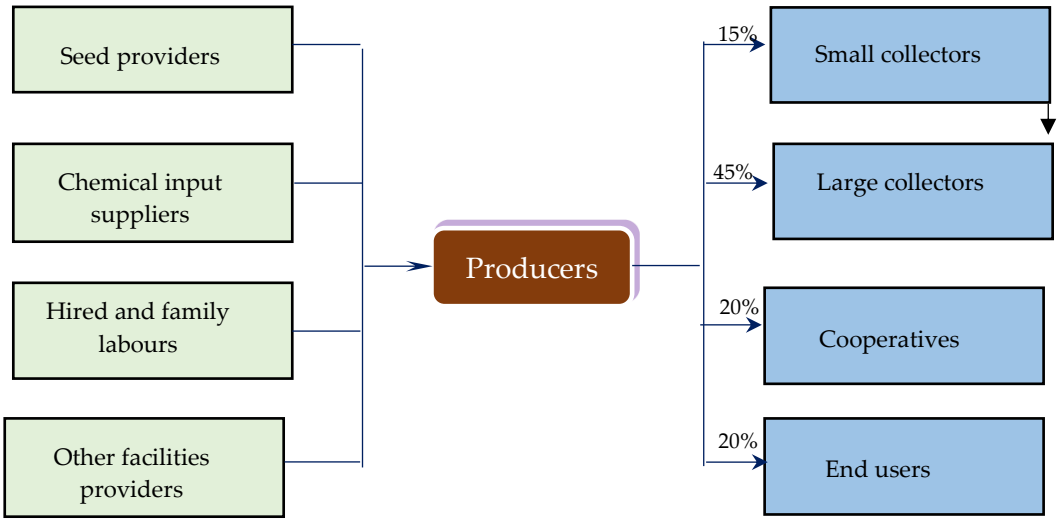
Besides the advantage of irrigation, lowland Seng Cu rice producers have various socio-economic advantages compared to the remaining group of growers. Such advantages include more experience in Seng Cu rice planting, higher educational level, more labourers and less dependants, more favourable topography for cultivation (i.e. flatter and larger), easier access to input and output markets, better marketing skill, etc. (Table 3.3). It is important to note that all these differences are statistically significant in the independent samples' t-test. Clearly, upland farmers not only have poor endogenous resources but also suffer from various exogenous difficulties in accessing external support. For these reasons, a huge income gap among different regions and ethnicities tend to remarkably widen over the last decades in the NMMs and Lao Cai (CEMA, 2015; Lao Cai SO, 2017; Nguyen Tran, 2017), leading to various latent consequences of social-economic-political instability.

- Input and output of Seng Cu rice producers

The input and output markets of the two rice-ecological areas are remarkably different. In general, lowland producers can easily access the markets, while upland households face various difficulties regarding accessibility. This is due to the mountainous topography, extremely poor road system, dispersed population, and low financial capacity of customers, causing high operating costs in upland areas. Consequently, the price of inputs (seed, pesticide, fertiliser) in the uplands is always higher than that of the lowlands.

The most prominent feature in the input market is the seed used by producers. Most of the surveyed upland growers use 'self-produced' seeds (56.4%) and those exchanged with other local producers (21.6%). It means that only 22.0% of them purchase certified seeds compared to 84.6% of lowland producers. The key person interviewees, including experienced farmers and local extension staff, argued that seed is the most important rice-producing input and directly influences the quality, especially its aroma, and the productivity of paddy output. In reality, many upland growers are well aware of the role of seed; however, they do not buy it as expected because of their limited finance. The price of certified seed is very high at D80,000–D130,000/kg at the local markets. The Agricultural Seedling Centre of Lao Cai can meet only 20% of the demand of local customers, and their main market is lowland areas. Thus, Vietnamese and Lao Cai authorities must concentrate on the research on varieties, including on Seng Cu, to be independent in agricultural production. The reliance on farm-saved seed is partly due to lack of availability of high-quality seeds and provincial seed agencies.

Figure 3.6: Input and Output Markets of Seng Cu Rice Producers in Lao Cai



Source: Author's findings.

Figure 3.6 shows that the output marketing consists of four main buyers: (i) small collectors in the uplands, (ii) large collectors, (iii) two cooperatives, and (iv) final customers. Small collectors are often large-scale farmers. They have more available financing and better storing conditions, so they buy dried paddy from surrounding households and resell to large collectors when its price increases. They are considered the primary collectors of district and provincial collectors (i.e. wholesalers) to save on transaction costs.

Large collectors carry out most processing activities, including collecting dried paddy from upland collectors and lowland farmers, milling, sorting, and distributing. The actor has the largest paddy collected in the provincial Seng Cu rice market. Besides this, two cooperatives participate in the chain: TPC in the lowlands and MKC in the uplands. Both establish and develop their relationship with Seng Cu rice growers through several financing mechanisms. Farmers can receive advance rice-production inputs (seed, fertiliser, pesticide) and guidelines on how to use these correctly to obtain the highest quality and productivity. Obviously, those business units buy the whole product output after reducing the value of inputs that farmers received. Because of financing limitations, the proportion of the total Seng Cu rice output collected is still small at 20%, although they desire to increase the quantity.

- Cost–benefit analysis of Seng Cu rice producers

Besides differences in main characteristics presented in Table 3.3, the study also points out the huge difference in terms of farming practices between the two rice-producing regions. Lowlanders tend to abuse chemical fertilisers and pesticides to maximise paddy yield. By contrast, upland producers apply toxic inputs lower than the recommended dosage due to several following reasons:

(1) The advantage of a lower temperature in uplands leads to fewer insects and pathogens.

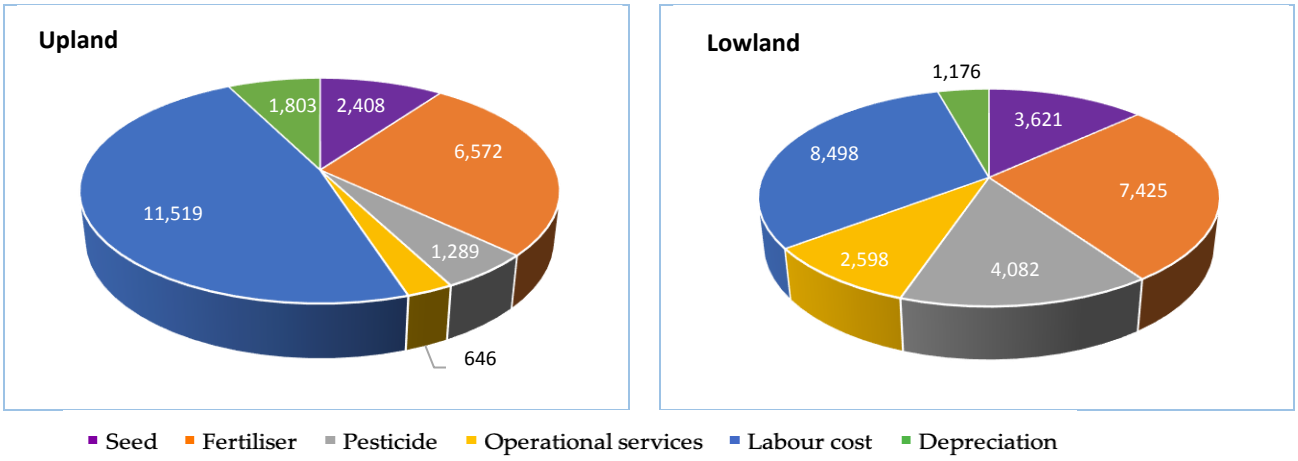
(2) Highlanders are also experienced in exploiting beneficial insects and natural agronomic

practices. For example, they apply some species of natural enemies to fight harmful insects (e.g. spiders attack brown plant-hoppers, dangerous pathogens for rice). Thus, local farmers control the field ecosystem to protect their crops.

(3) The unavailability of the agricultural input market strongly affects the quantity of commercial inputs applied that is much lower than the dosage recommended by local extension. Upland rice growers use a large amount of organic fertiliser, manure from animal waste (Bui et al., 2018).

Under the input usage mentioned above, Seng Cu rice planted in upland areas by ethnic minorities seems the eco-friendly farming method like Sustainable Intensification (Elliott et al., 2013); Low Input Sustainable Agriculture (Tan, 2009); Good Agricultural Practice (FAO, 2007); and other similar concepts (Mishra et al., 2016; Murray, 2012). In essence, all farming practices have the same goal: optimal exploitation of natural and human resources, to maximise technical efficiency and improve the economic state of households without negative impacts on the ecosystem, (Bui et al., 2018). For this reason, the price of upland rice deserves to fetch a very high price because of its high quality without chemical residues, which are usually present in other commercial agricultural products, including Seng Cu rice grew in lowlands. Unfortunately, lack of marketing skills and socio-economic disadvantages do not enable them to obtain a reasonable price as expected. Notably, the total production cost for 1 hectare of Seng Cu rice–cultivated land in the lowland was higher at D27.4 million/ha than that of the highlands at D24.2 million/ha. However, the cost to produce 1 ton of Seng Cu rice in the uplands was higher at D5.5 million/ton than that in the lowlands at D5.1 million/ton. The main reason is that lowlanders are more productive (5.3 ton/ha) than highlanders (4.4 ton/ha).

Figure 3.7: Seng Cu Rice Production Cost and Its Components in Two Ecological Zones (D1,000/ha)



Source: Author's calculation.

Furthermore, the analysis of the structure of production costs presents a huge difference between the two ecological sites. In the uplands, farmers use little commercial inputs (seed, fertiliser, pesticide) because of financial shortage ~~and apply a fairly basic input management~~. Moreover, they must complete all operational activities in the field using manual labour and animal power instead of agricultural machines. Labour cost[12] therefore occupies the highest proportion in the total cost at 47.5%. This is followed by fertiliser which accounts for 27.2%, with manure being a major fertiliser.

In the lowlands, on the other hand, purchased inputs are captured significantly, representing improved access to the inputs market mentioned above and the plentiful financial capacity of the surveyed households. Labour cost continues to be the largest contributor in total cost at 31.0% and less than 26.2% compared to the time highlanders spend on farming. In all kinds of commercial inputs, fertilisers always captured the maximum investment of lowlanders at nearly 50%. Pesticide also accounts for a much higher amount of D4.1 million/ha than uplanders (D1.3 million/ha). The reason for this difference is that upland areas are cooler, so pests and insects are much lesser.

On pricing, 72% of surveyed households in the lowlands mentioned that pricing is the result of negotiation among farmer(s) and collector(s). Eighteen percent of the remaining respondents believe that farmers are price takers, and 10% think farmers are price makers. It seems that during high competition like in the Seng Cu rice sector, farmers economically benefit more than buyers. Their position in the market is improved and they have more power in price negotiation. This is a good sign, compared to previous cases when individual farmers were always losers in negotiations with collectors. This beneficial condition, however, does not exist in upland areas, where most ethnic minorities live. Due to weak marketing skill and language barrier, upland producers cannot achieve a high price that is proportional to the quality of rice (i.e. organic product) and their miserable plight in the terraced fields. On average, upland farm-gate prices are at D14,050/kg while lowlanders' prices are slightly lower at D13,625/kg. It is understandable that lowlanders gain more produce and income than uplanders (Table 3.4).

[2] In fact, upland producers totally relied on family workers, while lowlanders used much hired labour to apply timely input management at key phases of crop growth.

Table 3.4: Cost–Benefit Analysis of Seng Cu Rice Producers in Lao Cai

Terms	Unit	Upland (n = 80)	Lowland (n = 80)
Calculated for 1 average household			
1. Harvested area	ha	0.252	0.615
2. Yield	ton/ha	4,378	5,318
3. Production (3) = (1)*(2)	kg	1,102	3,270
4. Home consumption	kg	125	599
5. Sold (5) = (3) – (4)	kg	978	2,671
6. Rate of rice sold (%) (6) = (5)/(3)	%	88.70	81.68
7. Unit price	D1,000 /kg	14.05	13.63
8. Revenue (8) = (7)*(5)	D1,000	13,745	36,388
9. Gross output (9) = (3)*(7)	D1,000	15,497	44,549
Calculated for 1 average hectare cultivated			
10. Gross output	D1,000	61,511	72,458
11. Total cost	D1,000	24,237	27,401
12. Gross income	D1,000	37,274	45,057

Source: Author's calculation.

Small Collectors

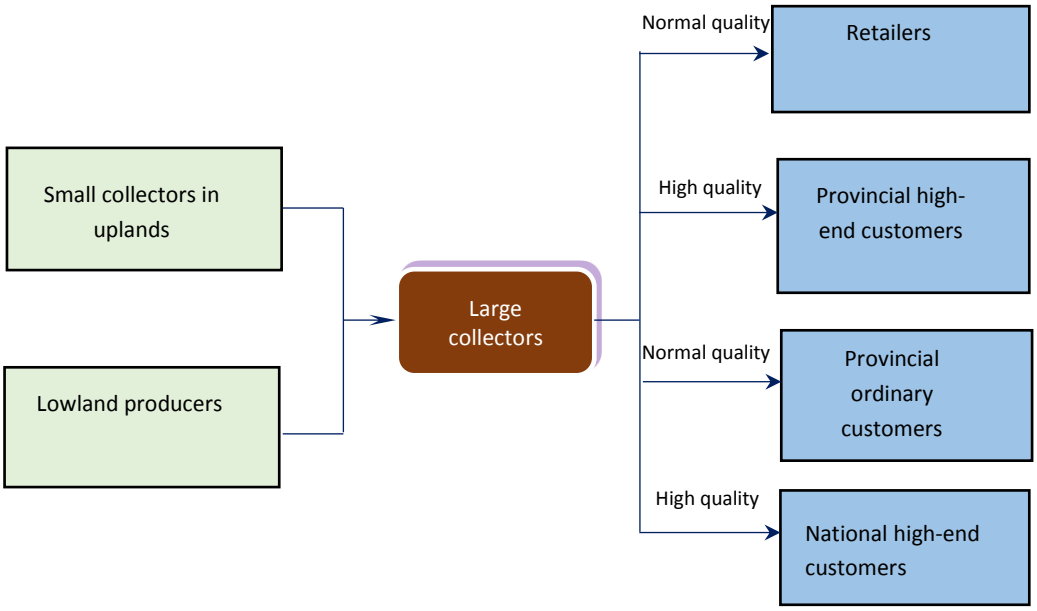
In the research site, small collectors exist mainly in upland communes. They have two kinds of purposes corresponding to their activities and their linkages with buyers and sellers. The first type of collectors are independent business units; they maintain fairly weak internal linkages in the chain. Normally, they buy Seng Cu dried paddy from poor producers at the lowest price at the beginning of harvest time. At that time, those farmers must pay their financial obligations to other input suppliers. After 1 to 2 months, they resell for a higher price to large collectors in districts and provinces to get profit. Sometimes, they also sell directly to end users. This task requires them to have (i) plenty financing capacity because they must risk pricing fluctuations, and (ii) well-designed storing conditions and warehouses enough to maintain the quality of Seng Cu rice, especially its aroma.

The second type of small collectors are the agents of large collectors and processors in the locality. They gather dried paddy based on the order of larger actors regarding quantity, quality, and fixed price. The small collectors' profit is likely commission for agents, fluctuating from D1,000/kg to D1,500 /kg.

Large Collectors

In the research area, the study team interviewed eight large collectors in Bat Xat town, Muong Khuong town, and Lao Cai city. Figure 3.8 illustrates the input and output markets of large collectors in the Seng Cu rice chain. In the uplands, they collect dried paddy from small collectors to reduce transaction costs, as a result of poor infrastructure; meanwhile they buy directly from lowland producers. They can classify two kinds of customers corresponding to the two kinds of rice – ordinary and high quality – in the provincial and national markets.

Figure 3.8: Input and Output Marketing of Large Collectors in the Seng Cu Rice Chain



Source: In-depth interviews, 2017.

It is difficult to clearly distinguish millers, processors, collectors, transporters, traders, and retailers as other agricultural products such as dairy, fruit, fish, meat, and others. In this chain, large collectors operate most activities including collecting, processing, and trading. Their role in the chain is tailored because of their dominant power, large share, and diverse activities. The survey carried out in 2017 shows that these actors own old and outdated machinery (on average, milling machines used for more than 10 years). For this reason, losses in processing increase and the quality of rice sold in the market is lower, hence, affecting customers' satisfaction. In some cases, large collectors must cope with risks from storing duration which requires strict conditions, such as good humidity, temperature, wind, sunshine, etc. They, therefore, need modern equipment like dryers, milling machines, large housing stores, and trucks to maintain the quality and quantity of Seng Cu rice. Moreover, some actors deliberately mix ordinary types of rice to maximise profit.

Table 3.5: Average Cost and Revenue of a Large Collector in Lao Cai, 2017

	Quantity	Unit Price (D1,000/kg)*	Value (million D)
I. Cost of intermediate goods and services			
1. Paddy purchase (ton)	800	13.68	10,944
2. Energy	—	—	271.2
3. Sacks and nylon bags	800	200	160.0
4. Others	800	253	200.0
Total	—	—	***11,575***
II. Total Revenue			
5. White rice (ton)	520	25.6	13,312
6. By-product (6) = (1) – (5)	—	—	928
Total	—	—	***14,240***
III. Value added			
7. Wage (working days)	1,440	200	288
8. Interest	—	—	53
9. Depreciation	—	—	70
10. Tax	—	—	80
11. Gross profit	—	—	2,174
Total	—	—	***2,665***
IV. Relevant indicators (converted per 1 kg of dried paddy			
12. Unit selling price	—	17.80	—
13. Intermediate costs	—	14.47	—
14. Value added	—	3.33	—
15. Gross profit	—	2.72	—

* D1,000/number for '3. Sacks and nylon bags' and '4. Others.' D1,000/day for '7. Wage.'
Source: In-depth interviews, 2017.

Table 3.5 shows the costs and benefits of large collectors generated in the chain. On average, the amount of paddy they collected in 2017 was 800 tons per year at the farm-gate price of D13,680/kg, resulting in a gross profit of D2,174 million (i.e. D2,717/kg). Because their target market was provincial citizens, Seng Cu rice was simply packed with unregistered trademark. Consequently, total intermediate goods added at this stage were small, at D632.1 million (i.e. D789/kg). Both input and output prices of this product were lowest in the chain. It means that farmers, marketing actors, and customers gained lesser benefits than the potential. Clearly, they should improve the quality of white rice and by-product values, reduce some kind of cost related to losses, and replace workers with machines. Obviously, outdated technology results in paddy losses, increases operational costs, and exploits the potential of the product.

Tien Phong and Muong Khuong Cooperatives

Two cooperatives in the study site participated in the chain: the TPC and the MKC. The MKC is located in Muong Khuong district (upland zone) and the TPC belongs to Bat Xat district, a lowland area. These units are organised as economic units with profit as a purpose and have an independent financing report system. They registered two trademarks of Seng Cu rice. They have huge differences in terms of exploitation of the main product and by-products as well as controlling the quality of milled rice (Table 3.6).

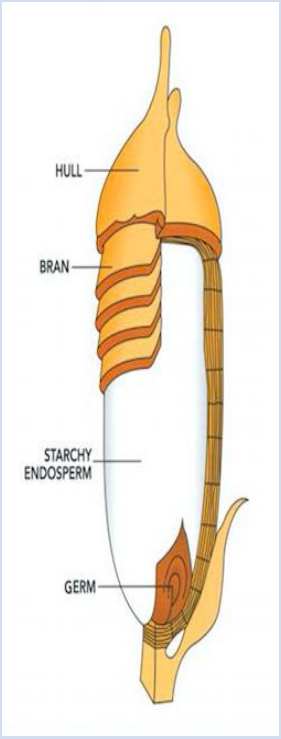
The TPC has diverse commercial products, including white rice, brown rice, germ rice, and Seng Cu alcohol, while the MKC and other large collectors exploit only the unique core goods (i.e. white rice). Beside this, the TPC has been fully exploiting most potential by-products to become valuable goods, while other large collectors mainly throw away or sell these by-products for a lower price. For example, the TPC developed the Seng Cu bran into a skincare product because it contains vitamins B1, B3, B6, and E four times more than other rice varieties[3]. Another good example is hull exploited as fuel for cooking alcohol. However, other marketing actors consider it likely worthless. Briefly, these innovations provide not only benefits for the unit but also higher values for producers (upstream in production) as well as customers (downstream in marketing).

Nevertheless, the significant difference in managing rice quality is also clear. While the MKC concentrates only on collecting output, the TPC also focuses on the whole process of controlling rice quality through contract farming with Seng Cu rice producers. Regarding the production phase, the TPC, without profit as a purpose, provides to these farmers main important inputs, like certified seeds, organic pesticide, rice fertilisers. In addition, the TPC also hires one technical staff who is responsible for managing diseases and helping farmers deal with technical problems. On harvesting and collecting, the unit helps farmers to reap paddy, concurrently, to collect fresh paddy in the fields. This activity enhances their linkage, especially as hired labour is always expensive because of high demand. More importantly, the TPC is able to remarkably prevent some farmers mixing ordinary rice with Seng Cu, resulting in lower rice quality and dissatisfaction of high-end customers. Last but not least, at the processing stage, the TPC has been investing in the following modern machinery: dryer, miller, polisher, classifier (for removing black rice and others), wrapper, and vacuum-packed machine to obtain the best quality of this special rice. Furthermore, mechanisation also helps the TPC recover a higher rate (65.7%) of milled rice after processing, compared to 60.0% of the MKC and 65.0% of large collectors. Also, this cooperative continuously innovates to optimally exploit new features of Seng Cu rice, such as white rice, brown rice, germ rice, and alcohol, and invest in researching new products from by-products (broken rice and bran) to enhance the value addition (Table 3.6). TPC's slogan is 'Quality is the most important thing to sustainable development'.

[3] http://khoahocphattrien.vn/Dia-phuong/gao-seng-cugiong-ngoai-thanh-dac-san-lao-cai/20170317112152239p1c937.htm

Table 3.6: Comparison of the Level of Exploitation of Rice Products among Key Marketing Actors in the Chain

Products	Tien Phong Cooperative (TPC)	Large Collectors and the MKC	Paddy Structure
I. Selling price of main products			
1. White rice	D32,000/kg	D26,000–33,000/kg	
2. Brown rice	D33,000/kg	Not produced	
3. Germ rice	D80,000/kg	Not produced	
4. Seng Cu alcohol	D50,000/litre	Not produced	
II. Other products			
5. Lower class of Seng Cu rice paddy	Material of Seng Cu alcohol	Not much pay attention about the quality	
6. Broken rice	Grounded to become baby food, with its price at D25,000 /kg	Selling with much lower price at D6,000/kg for local people	
7. Hull	Energy (like fuel) for cooking Seng Cu alcohol.	Selling with much lower price or thrown away	
8. Bran	Become a skincare product	Selling with much lower price like animal feeding	
III. Rate of milled rice recovery	65.7%	65.0% at large collectors 60.0% at the MKC	



Source of information: In-depth interviews, 2017.
Source of the image: https://www.thinkrice.com/on-the-farm/how-is-rice-grown/

The in-depth interview with the head of the TPC in 2017 sketched his challenging journey in conquering the Seng Cu rice. The business unit experienced bankrupt in 2006 after various unsuccessful experiments regarding unsuitable storing conditions and/or challenges in the output market. In 2008, he created a much better business plan and registered the trademark of Seng Cu rice nationwide. His valiant attempts have been rewarded by several promising results from the comprehensive investment and his special passion. Understandably, financial problems are the most difficult drawback hindering its development. As mentioned, the TPC prefers to buy fresh paddy; this often requires cash payment. This is the reason it can collect only 700 tons (Table 3.7). This paddy amount uses only one-third of the capacity of the modern machines, on which the TPC invested; yet those machines are highly depreciating. Despite its well-managed performance, the cooperative obtained a much lower loan from the

Viet Nam Bank for Agriculture and Rural Development in Lao Cai compared to the value of its collateral, a land use certificate. As per the World Bank (2014), the collateral-to-loan ratio in Viet Nam at 218%, that is higher than most neighbouring ASEAN countries. From this view of point, it is necessary for policy-makers and local banks to suitably facilitate the start-up enterprises as the sustainable development of the provincial and national economy.

Table 3.7: Cost and Benefit of the Tien Phong Cooperative in 2017 (Lowland)

	Quantity	Unit Price (D1,000/kg)*	Value (D million)
I. Cost of intermediate goods and services			
1. Paddy purchase (ton)	700	13.75	9,625
2. Energy	—	—	169.61
3. Sacks and nylon bags	—	656	459.2
4. Others	700	253	377.1
Total	—	—	***10,631***
II. Total Revenue			
5. White rice (ton)	400	32	12,800
6. Brown rice (ton)	45	33	1,485
7. Germ rice (ton)	15	80	1,200
8. By-product (ton)	—	—	600
Total	—	—	***16,085***
III. Value added			
9. Wage (working days)	3,810	200	762
10. Interest	—	—	357
11. Depreciation	700	200	140
12. Tax	—	—	358
13. Gross profit	—	—	3,837
Total	—	—	***5,454***
IV. Relevant indicators (converted per 1 kg of dried paddy)			
14. Unit price	—	22.98	—
15. Intermediate costs	—	15.19	—
16. Value added	—	7.79	—
17. Gross profit	—	5.48	—

* D1,000/number for '3. Sacks and nylon bags' and '4. Others.' D1,000 /day for '9. Wage'.
Source: In-depth interview, 2017.

Based on the activities mentioned, the cost and revenue of two cooperatives had a huge difference (Tables 3.7 and 3.8). It can be seen that, on average, the TPC collected 700 tons with the farm-gate price of D13,750/kg while the MKC bought 200 tons for D14,420/kg in 2017. As a result of innovation, the TPC has many better indicators compared to the MKC, such as more diverse portfolio of agricultural products to meet the increasing demand of customers, much lower paddy losses during processing, and increased value added for all participants in this channel and final customers. On the other hand, the TPC also creates many permanent and seasonal jobs for the local people.

Table 3.8: Cost and Benefit of Muong Khuong Cooperative in 2017 (Upland)

	Quantity	Unit Price (D1,000/kg)*	Value (D million)
I. Cost of intermediate goods and services			
1. Paddy purchase (ton)	200	14.42	2,884
2. Energy	—	—	51.98
3. Sacks and nylon bags	200	656	131.2
4. Others	200	253	50.6
Total	—	—	***3,118***
II. Total Revenue			
5. White rice (ton)	120	33	3,960
6. By-product (6) = (1) – (5)	—	—	312
Total	—	—	***4,272***
III. Value added			
7. Wage (working days)	1,080	120	130
8. Interest	—	—	88
9. Depreciation	—	—	55
10. Tax	—	—	50
11. Gross profit	—	—	832
Total	—	—	***1,154***
IV. Relevant indicators (converted per 1 kg of dried paddy)			
12. Unit price	—	21.36	—
13. Intermediate costs	—	15.59	—
14. Value added	—	5.77	—
15. Gross profit	—	4.16	—

* D1,000/number for '3. Sacks and nylon bags' and '4. Others.' D1,000 /day for '7. Wage.'
Source: In-depth interview, 2017.

Concerning the performance of MKC, this business unit is one of the biggest enterprises in this upland district. It has been investing in various goods and services. Since Seng Cu rice is not the MKC's key product, it does not pay attention to control the quality of Seng Cu rice. Luckily, most producers are ethnic minorities using traditional farming practices as described in the section on the cost–benefit analysis of producers.

To sum up, the TPC plays an important role in value chain development towards sustainability and enhancing the competitiveness of the product. To provide high value added and net profit to actors in the chain, the product must have high quality to satisfy the demand of high-end customers. Development of this special rice not only contributes to the economic benefits of all actors in the chain but also creates more skilled jobs in rural regions. Furthermore, the TPC is the pioneer in approaching and applying new processing technology for high value-added products and fully exploit the by-products of rice and maximum value added for farmers participating in this marketing channel. The authors suggest that this channel is the best model to develop sustainably and must receive full support from local public authorities on agricultural preferential credit to expand operating scale and increase profitable indicators.

Secondary Actors and their Role in the Seng Cu Rice Value Chain

The Seng Cu rice value chain plays an important role in reducing poverty, improving the livelihoods of local people, and contributing to multifaceted rural development. It is one of the three kinds of rice belonging to the primary agricultural products of the province.[4] That is why this sector has received much support from the provincial government and non-government organisations (NGOs).

- Department of Agriculture and Rural Development and Agricultural Service Extension

This department has both governance and facilitating functions as follows:

1) **Governance function.** The department builds the development plan for the agriculture sector in general and Seng Cu rice in particular. More specifically, the department ~~unit~~ in performing this function, is responsible for the harvested area and the production zone (i.e. the suitable natural condition of Seng Cu rice) to maintain its high quality. Besides, it also manages the chemical inputs (fertilisers, pesticides, etc.) regulated by the Viet Nam Ministry of Agriculture and Rural Development that are allowed to circulate in the provincial market. This important mission protects customers' right to use legitimate products (not fake and low-quality ones).
2) **Facilitation function.** To encourage local producers to increase their cultivated area for Seng Cu rice, the department manages supporting programmes, including two main

[4] Regulated at Resolution No. 85/2016/NQ-HĐND dated 15 September 2016, encouraging policy on the development of agriculture, forestry, and aquaculture production in Lao Cai province during 2017–2020.

activities: provided certified seeds for ethnic minority groups in the uplands in 2015–2016 and subsidised 50% of total cost of certified seeds and 8 kg of NPK fertiliser per sao (1 sao = 360 m^2) in 2017. Such support was always based on the harvested area of beneficiaries, the Seng Cu rice growers. In addition, the department regularly transfers technical guides twice a year at new Seng Cu rice–production points and every 2 years, in experienced ones. However, the feedback of surveyed interviewees indicates that knowledge on pests, diseases, and techniques has not been updated. Sometimes the new transferred techniques are not suitable to the local climate, such as transplanting 18–25 days' old seedlings when the temperature in February at Lao Cai and terraced fields (planting in rows) is 10°C–12°C. Finally, the differences in language are also a significant barrier for ethnic minority farmers to fully understand new techniques.

- Department of Trade and Industry of Lao Cai Province

The Department of Trade and Industry (DTI) belongs to the Lao Cai People's Committee. The DTI is responsible for trading and promoting agricultural goods, including Seng Cu rice. In 2016–2017, the Lao Cai People's Committee and DTI approved many activities to support Seng Cu rice processing and trading. It (i) provided a non-refundable aid of 20% of the total value of modern agricultural machines to reduce paddy losses in quality and quantity[5]; (ii) organised regional festivals to introduce special agricultural products, obviously including Seng Cu rice; (iii) provided free land rights and built a showroom to display the primary agricultural products of Lao Cai city, including Seng Cu rice delivered by the TPC; and (iv) created several short trainings on business skills for local agricultural enterprises, including the TPC.

- Viet Nam Bank for Agriculture and Rural Development (VBRAD) and Viet Nam Bank for Social Policy (VBSP) in Lao Cai

The results of the household survey revealed that 38.8% and 33.1% of total respondents have agricultural credits at the VBARD and VBSP, respectively. So, the suppliers of formal financing in Lao Cai play an important role in providing money for agricultural investment and other living expenditures. Regarding the demand side, most upland households are faced with financing shortage, leading to lower investment in Seng Cu rice production. However, they could not access banking credits due to complicated documents and collaterals required by banks. Without access to the formal sector, poor farmers go to the informal financing resources or moneylenders to fund their agricultural inputs and other consumption at higher interest rates. The imperfect credit market then seems to seriously contribute to poverty. The in-depth interviews revealed that business units in the Seng Cu value chain are also challenged in accessing banking credits. Consequently, they, especially the TPC, mainly depend on own capital and struggle to expand on an operational scale and focus on~~pay attention to~~ innovation. Banks then must reduce the complexity of their procedures and

[5] Decision 68/2013/QD-TTg issued on 14 November 2013 on agricultural loss reduction support policy.

improve the quality of credit assessment to select and fund potential customers while ensuring minimum payment risk.

Briefly, Table 3.9 summarises some constraints in the Seng Cu rice value chain. This analysis is the important basis to issue the relevant recommendations to enhance the capacity of each actor in the chain, and to deal with challenging mandates of the government, like poverty alleviation, equality, and socioeconomic development.

Table 3.9: Constraints in the Seng Cu Rice Value Chain in Lao Cai

Value Chain Step	Constraints
Paddy production	**Upland zone:** ● Low usage of commercial inputs (certified seed, fertiliser, pesticide) because of limited financing availability ● Sloped topography creating challenges in mechanisation and dispersed production area, taking time for growers to control the ecosystem ● Weak marketing skill ● Lack of access to extension and application for advanced technical training ● Difficulties in accessing formal credit and irrigation facilities **Lowland zone:** ● Abusing chemical inputs, especially pesticide and nitrogen fertiliser, causing imbalanced nutrition for rice's requirement, high cost of production, and low productivity ● Weak application for extension
Collection	● Deliberate mixing of different types of rice ● Difficulties in paddy collection because of poor infrastructure, especially during the rainy season in uplands ● Poor storage conditions, causing paddy losses ● Lack of marketing information (e.g. price fluctuation) ● Poor processing technology ● Lack of capital
Retailing	● Limited capital and storage conditions ● Being sole operators, they cannot afford the time off to develop new sources of supply ● Value addition at this stage is trivial
Marketing system	The marketing system, in general, remains chaotic and the price between buyers and sellers is inappropriate, especially among ethnic groups in the uplands. Marketing this agricultural product tends to be regionally captured, resulting in isolation, high transport costs, poor marketing infrastructure such as rural road system, and scattered population.

Source: Author's findings.

5. Sharing Benefits among Actors in the Value Chain

There are six underlying channels in Lao Cai to transform raw materials to produce Seng Cu rice for final customers.

Channel 1: Upland producers –> MKC –> Final customers

Channel 2: Upland producers –> Final customers

Channel 3: Upland producers –> Small collectors –> Large collectors –> Final customers

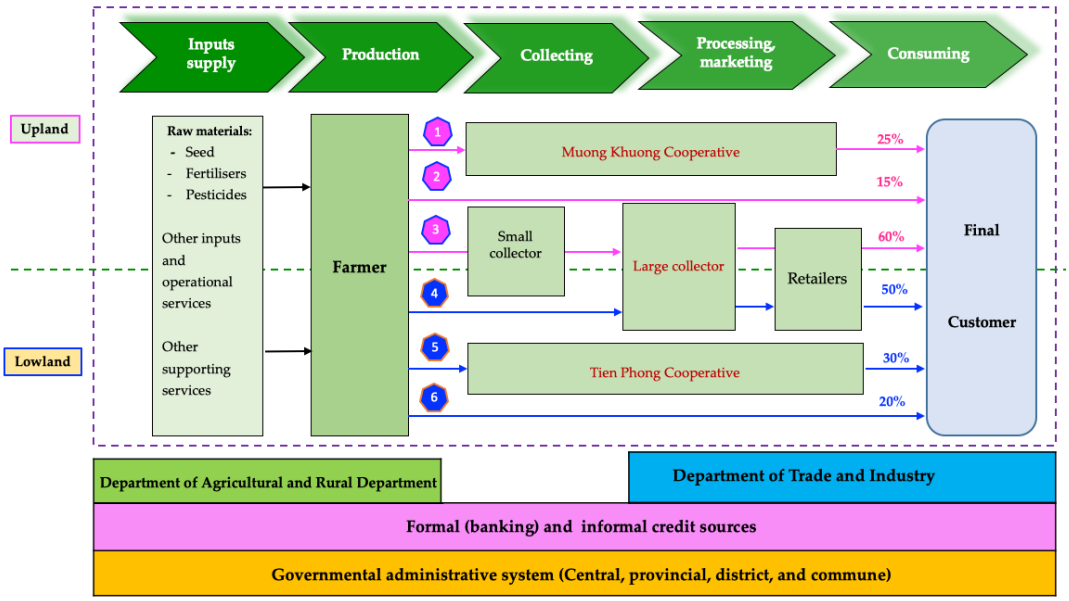
Channel 4: Lowland producers –> Large collectors –> Retailer –> Final customers

Channel 5: Lowland producers –> TPC –> Final customers

Channel 6: Lowland producers –> Final customers

As mentioned in section 3.4, there are six channels in the Seng Cu rice chain. This section analyses the value-added assessment in four main flows, including channel numbers 1, 3, 4, and 5 in Figure 3.9.

Figure 3.9: Marketing Channels of Seng Cu Rice in Lao Cai



Source: In-depth interviews, 2017.

As described, provincial collectors account for the biggest share of purchased paddy output and sale of milled rice to the final consumers. In 2017, they purchased about 60% and 50% of total amount dried paddy in the uplands and the lowlands, respectively. The study found that these actors often deliberately mix ordinary rice with Seng Cu to maximise profit, resulting in dissatisfaction of many high-end customers with the quality of the milled rice. On the other hand, two enterprises are striving to develop the trademark and quality of Seng Cu rice, but their volume is very small because of financial challenges. Interventions from local

authorities must be created to resolve their difficulties and enhance the awareness of large collectors in protecting the trademark and quality of this special product.

Value Added and Distribution of Benefits among Actors in Different Channels

Overall, the main participants in the chain are producers and marketing actors, including large collectors and the cooperatives, especially the TPC. This section identifies and evaluates the advantages and disadvantages as well as compares the sharing benefits of each actor among the four different channels at the two zones of rice production, lowland versus upland areas. Two short chains consist of producers and the MKC in the uplands and the TPC in the lowlands, which are responsible for multiple functions in the chain, such as collecting, sorting, milling, packing, advertising, and delivering. Both cooperatives take advantage of the high quality of rice that allows them to reach high-end markets nationwide and achieve higher profits than large collectors. By contrast, the long chains include more middle actors, all of whom pursue maximum profit without sustainable development through rice quality management.

To start, the authors summarise the bargaining power of sellers and buyers that somehow influences the negotiated price and sharing benefits among them (please look at the section 3.4 regarding the cost-benefit analysis of SC rice producers). Upland producers are relatively homogeneous in terms of socio-economic characteristics. Firstly, nearly 90% of highlanders are ethnic minorities of different language than the ethnic majority (Vietnamese). Thus, they suffer from the language barrier when bargaining with marketing actors, especially collectors. Secondly, they are very poor. Among limited income sources, Seng Cu paddy from monocropping generates the most important income. The voice of farmer-sellers is also much lower than buyers. Thirdly, poor infrastructure results in their isolation in terms of market accessibility, market information, and others. For these reasons, many upland growers reported that they are price takers. In addition, geographic and natural conditions favour rice cultivation as an organic product. It is proper if the price of upland rice is much higher compared to that of the lowlands (Table 3.10). However, the increase is small due to the drawbacks mentioned above.

On the other hand, lowland growers not only take advantage of external public services (irrigation, extension, and production and marketing infrastructure); they are also more knowledgeable and skilled than their upland counterparts. Cultivation of Seng Cu rice in lowland households is one of the economic activities among widely diverse income sources, such as perennial plant, livestock, non-farm income, etc. Consequently, the household survey revealed that some lowland farmers are not interested much in joining the contract because they must spend too much time controlling pests and the ecosystem field rather than earning more money as hired workers in big cities. Thus, to enlarge the area cultivated to Seng Cu rice, this special rice should become attractive enough to farmers in terms of the income gained in the chain.

Tables 3.10, 3.11, and 3.12 analyse the distribution of cost and value addition among actors of the four main selected channels. All chain participants seem to have reasonable ratios

between cost contribution and acquisition of economic benefit. Producers gain high value added in all channels, around 70% of total value addition in the chain. It is then important to suggest to producers and provincial authorities to effectively support enlarging the cultivated areas devoted for Seng Cu rice, especially where favourable natural conditions exist.

At the farm level, to produce 1 kg of dried paddy, lowlanders must invest more than the uplanders by 14.1% though they have lower value added (8.6%) than upland growers. This is because upland rice has outstanding quality and is considered organic because of the absence of pesticide and has lesser chemical fertilisers. Thus, both upland farmers and enterprises can increase the price because of its better quality compared Seng Cu rice cultivated in other ecological zones. In addition, farmers who sell their paddy to enterprises always receive a higher price than those paid by collectors. In fact, enterprises just collect paddy from producers through contract farming or through compliance to the integrated pests management farming method because they can control the quality of paddy.

Table 3.10: Value-added Analysis of Short Channels in Uplands and Lowlands

	Producer	Cooperative	Total
Channel 1: Upland producer – MKC			
Cost of intermediate product (IC, D/kg)	2,494	1,470	3,964
Value added (VA, D/kg)	11,926	5,470	17,396
Price (D/kg)	14,420	21,360	21,360
% IC in the channel	62.92	37.08	100.00
% VA in the channel	68.56	31.44	100.00
Channel 2: Lowland producer – TPC			
Cost of intermediate product (IC, D/kg)	2,845	2,053	4,898
Value added (VA, D/kg)	10,905	7,176	18,081
Price (D/kg)	13,750	22,979	22,979
% IC in the channel	58.08	41.92	100.00
% VA in the channel	60.31	39.69	100.00

D = Vietnamese dong, IC = intermediate cost, MKC = Muong Khuong Cooperative, TPC = Tien Phong Cooperative, VA = value added.

Source: In-depth interview, 2017.

Regarding marketing actors, the TPC invested heavily in research and development to optimally exploit the potential value of the product, thus, enhancing the value of core products. Consequently, the cost of intermediate products generated by the TPC is higher by 39.7% than that of the MKC (D2,053/ kg compared to D1,470/kg, respectively) and nearly three times than that of large collectors (about over D700/kg). Concerning cost contributed, the MKC accounted for 37.1% of the total cost in channel 1 that is smaller than the contributed rate of the TPC (41.92%) in channel 2. However, the MKC received the share of the total value added of its channel (31.4%) which is higher than that of the TPC (31.4% and 39.7%, respectively).

In two long channels presented in Tables 3.11 and 3.12, the total value addition created by these participants and the price paid by the final customers are lower than both of the ~~above~~ short channels. As any agricultural product, quality is the most important factor affecting the willingness to pay of final customers who, in turn, decide how much welfare each actor receives in the chain. In these channels, Seng Cu rice maintains its core value; thus, it is sold for a lesser price in the provincial market. Producers play the most important role because they account for the biggest share of intermediate cost but the modest acquisition of economic benefits.

Table 3.11: Value Added Analysis of the Long Channel in Upland Areas

Channel 3: Upland – Long	**Upland Growers**	**Small Collectors**	**Large Collectors**	**Total**
Cost of intermediate product (IC, D/kg)	2,494	127	789	3,410
Value added (VA, D/kg)	11,186	943	3,961	16,090
Price (D/kg)	13,680	14,750	19,500	19,500
% IC in the channel	73.14	3.72	23.14	100.00
% VA in the channel	69.52	5.86	24.62	100.00

D = Vietnamese dong, IC = intermediate cost, VA = value added.
Source: In-depth interview, 2017.

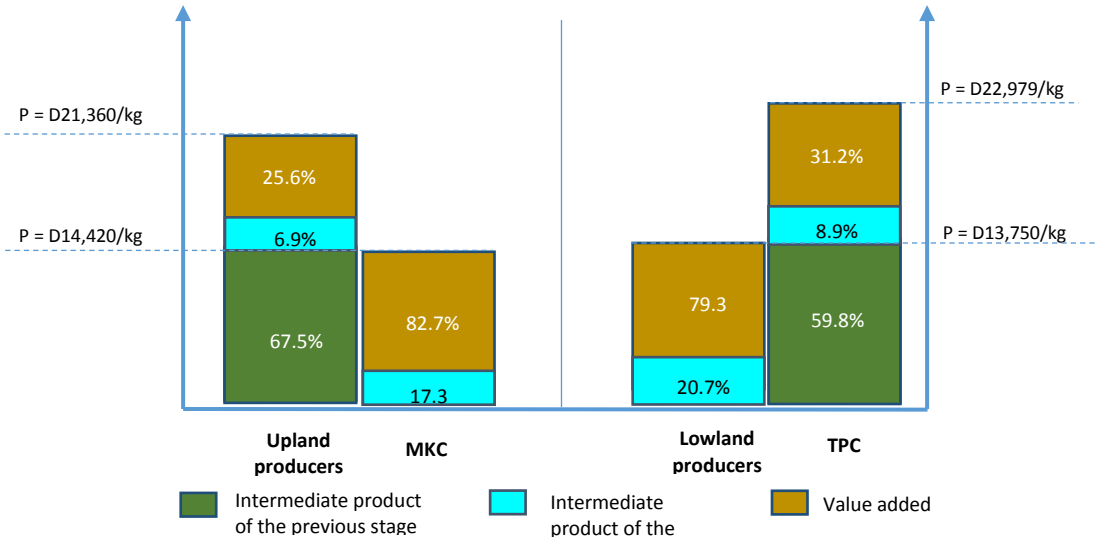
Table 3.12: Value Added Analysis of the Long Channel in Lowland Areas

Channel 4: Lowland – Long	**Lowland Producers**	**Large Collectors**	**Retailers**	**Total**
Cost of intermediate product (IC, D/kg)	2,845	631	186	3,662
Value added (VA, D/kg)	10,655	2,769	1,114	14,538
Price (D/kg)	13,500	16,900	18,200	18,200
% IC in the channel	77.69	17.24	5.08	100.00
% VA in the channel	73.29	19.05	7.66	100.00

D = Vietnamese dong, IC = intermediate cost, VA = value added.
Source: In-depth interview, 2017.

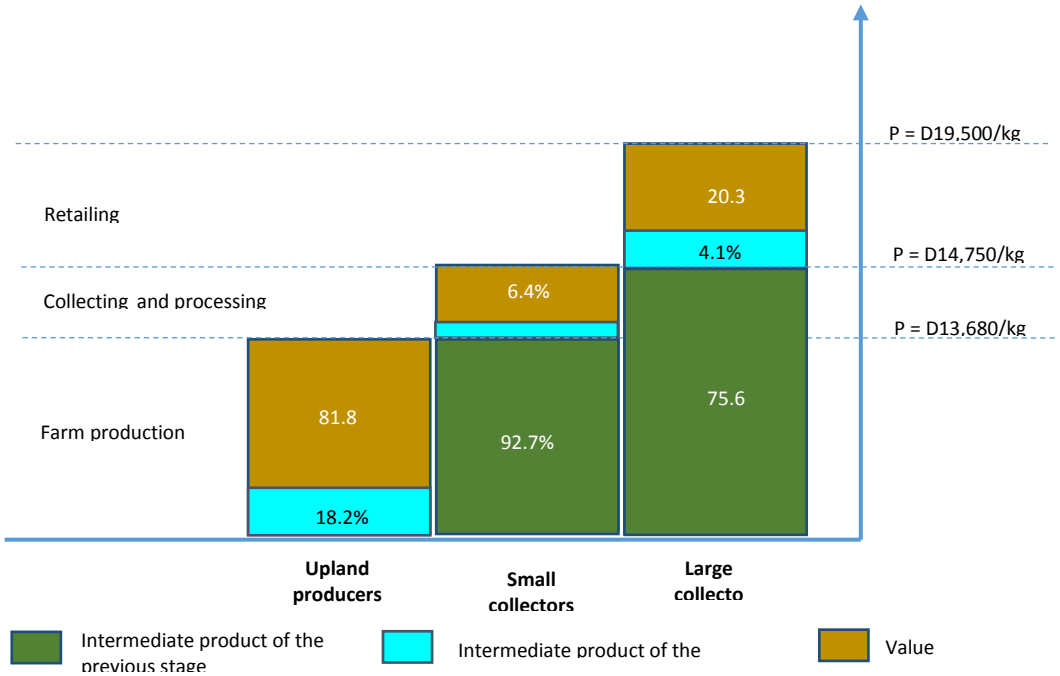
Figures 3.10, 3.11, and 3.12 visualise the structure of value added and the contribution of members in each channel as the product is transported from the producer to the end consumer. They also indicate paradoxes in terms of sharing benefits existing in the chain between lowland and upland producers as well as the TPC and other marketing actors. A large percentage of participants are pursuing the goal of optimal profit, even the greediness, causing a reduction in the value of the remaining actors. Furthermore, it also hinders the chain to develop towards sustainability and negatively affects the brand name of Seng Cu rice.

Figure 3.10: The Composition of the Product Generated for Each Actor in the Short Channel in the Uplands (on the left) and Lowlands (on the right) (Channels 1 and 2)



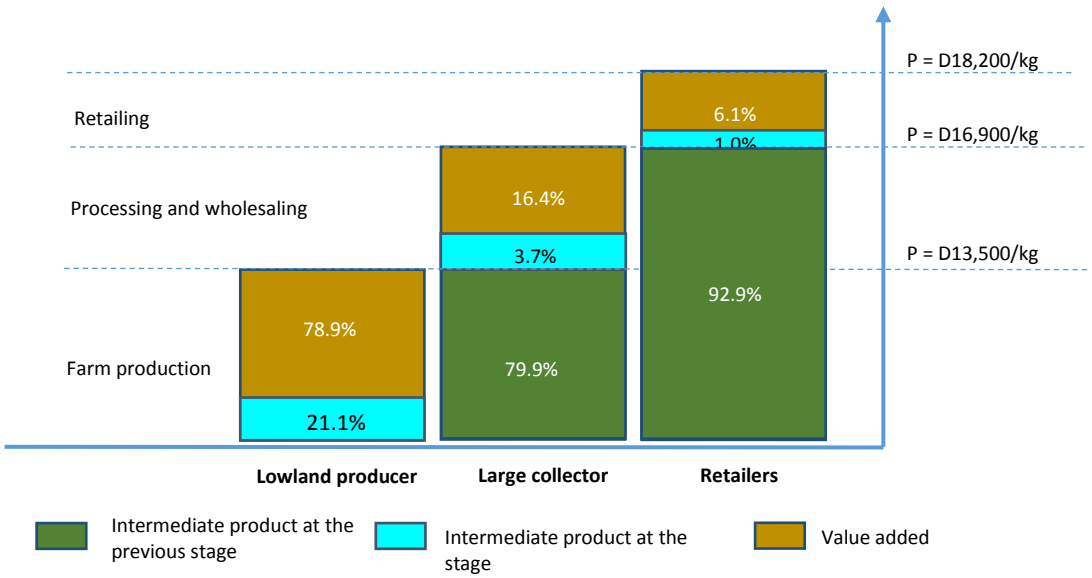
D = Vietnamese dong, MKC = Muong Khuong Cooperative, P = price, TPC = Tien Phong Cooperative.
Source: Author's calculation.

Figure 3.11: Composition of Product Generated for Each Actor in the Long Channel in the Uplands (Channel 3)



D = Vietnamese dong, P = price.
Source: Author's calculation.

Figure 3.12: The Composition of Product Generated for Each Actor in the Long Channel in the Lowlands (Channel 4)



D = Vietnamese dong, P = price.
Source: Author's calculation.

6. Conclusions and Recommendations

This study provides valuable insights into the operations of main participants in the Seng Cu rice chain made up of four main channels existing in lowland and upland areas of Lao Cai province. Besides this, it also deeply examines the advantages and the challenges of each chain actor as well as the effects on their cost contributed and economical benefit gained. The study focuses on two key chain actors, including (i) producers, who directly determine the quality obtained and quantity generated of paddy in the production phase; and (ii) marketing actors, comprising large collectors and two cooperatives, the TPC and the MKC. These business units perform multiple functions in the post-harvesting phase (collecting, processing, trading, delivering) that directly affect the quality of milled rice and the value added generated by each stage.

From the producers' side, upland growers are faced with numerous exogenous challenges, such as scarcity of agricultural land, lack of machines in terraced fields , and little irrigation. Most highlanders also suffer from endogenous drawbacks like low educational level and low bargaining power. For these reasons, upland rice cannot obtain optimal price, as deserved because of its outstanding quality without chemical residuals. This phenomenon also explains why upload producers do not consider Seng Cu rice attractive and just allocated a modest percentage of cultivated land for Seng Cu.

In order to obtain higher value added for Seng Cu rice and improve the livelihood of local growers, the study suggests the following comprehensive strategy. Firstly, well-served public services, such as extension, irrigation, credit, education, and marketing information, should

be provided. These services play a pivotal role in improving the position of the small farmers in the chain, thus, sustainably boosting the value chain. Secondly, an increase in paddy quality and quantity requires (i) proper input management that helps Seng Cu rice growers increase productivity by 15% in the uplands and 12% in the lowlands through better farming practices and financial management (Bui et al., 2018); (ii) expanding new areas for rice production whose condition is favourable for growing Seng Cu; (iii) encouraging the internal links, including farmers and marketing actors (i.e. contract farming as vertical linkage) to cope with risks and common interest groups as a horizontal linkage to enhance production capability as well as their voices during negotiations with buyers. This suggestion is consistent with the finding of Ho et al. (2016), who highlighted the role of contract farming in improving farmers' position and income through new governance of the shrimp chain in the Mekong River Delta of Viet Nam.

From the marketing actors' side, the most remarkable point in this study is the recognition of their role and impact in the value chain. To clarify further, large collectors accounted for the highest amount of paddy produced, estimated at 50% and 60% of total volume in the uplands and lowlands, respectively. Their activities, therefore, significantly govern the development of the whole chain. Sadly, many large collectors deliberately mix ordinary types of rice with Seng Cu rice to maximise profit. Obviously, this action negatively impacts the trademark of Lao Cai Seng Cu rice and the satisfaction of final customers. Their other problems are under-exploitation of both main products and by-products due to outdated processing technology and lack of innovation. Based on those realities, the recommendations given are that they should (i) upgrade the current technology in processing and pay more attention to innovation of higher value product, and (ii) increase their awareness of the long-term benefits of quality and customer service that are the best ways to protect the brand name Seng Cu rice.

On the bright side, two cooperatives exploiting the registered trademarks of Seng Cu rice Lao Cai participate in the chain. They always attempt to improve the quality of Seng Cu rice during the ex-ante and ex post production phases and to add more value for them and producers who have contract farming with these cooperatives. The TPC in the lowland commune is the most advanced example in the chain. More specifically, this business unit has invested strongly not only in modern machinery systems to reduce losses in the processing stage (in quality and quantity) but also in innovation to discover new functions, new higher-quality products in the portfolio to meet the increasing consumer demand. It is necessary to facilitate access to bank credit to address their biggest challenge (i.e. financial shortage), especially when they buy fresh paddy during harvest time. All of these are strategies for developing the Seng Cu rice value chain towards sustainability.

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Chapter 4

Analysis of Fresh Milk Value Chain in North Viet Nam

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1. Introduction

Background

Viet Nam has no tradition in breeding dairy cattle. For centuries, cattle were used just for plowing, manure, and meat production. The Vietnamese started to raise dairy cows at the end of the 18th century when colonisers brought the first dairy cows to the country. Since then, it has been an important economic activity of Vietnamese farmers. In October 2001, the Viet Nam government strongly promoted dairy development to replace dairy product imports, generate rural employment, and increase rural incomes.

Viet Nam's fresh milk market is a potential market with a significantly increased demand. From 2010 to 2015, the demand for raw milk rose by 61% (Dairy Vietnam [c]). In 2010, each Vietnamese consumed about 15 litres of milk per year. By 2020, this figure is forecast to almost double, up to 28 litres per year. However, Viet Nam's dairy industry now faces some difficulties in terms of milk quantity and quality. The total milk supply of the whole industry satisfied only 20%–30% (data from 2009) of domestic demand and Viet Nam had to import most of its dairy products (Dairy Vietnam [c]). Moreover, consumers, now aware about health and food safety, are more concerned about their consumed milk products. Thus, milk containing melamine, which makes it unsafe, remains a big problem and negatively affects the industry (Bui, T.N., H.C., Tran, and P. Lebailly, 2011).

Another problem is a loose linkage amongst actors and stakeholders in the milk chain so that the quantity and quality of fresh milk have not been ensured. In 2016, dairy farmers in Cu Chi could not sell their milk because dairy plants refused to buy their output (Pham, 2016). In 2018, thousands of farmers sold their cows and changed into other economic activities (NLDO, 2018). In 2017, farmers in Ha Nam found it difficult to find feeds resources because the flood severely destroyed their grass fields and there were rarely other input suppliers (Phung, 2017).

Therefore, this study and analysis of the fresh milk chain in the north of Viet Nam is necessary.

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Objectives of the Study

This research aims to analyse and evaluate the fresh milk chain in the north of Viet Nam through a case study of Son La and Ha Nam provinces. It then suggests some recommendations to upgrade the chain, improve the benefits for dairy farmers in particular and the fresh milk chain actors as a whole.

2. Methodology

The Selection of the Study Sites

Dairy farming is not a conventional economic activity in Viet Nam because of its unfavourable natural conditions. Viet Nam is famous for its tropical monsoon climate with a high relative humidity (84%–100%). It also encounters severe natural disasters all-year round, such as flood, drought, storm, etc. There are only two highland areas in Viet Nam where natural conditions are suitable for dairy farming: Moc Chau District, Son La Province (in the north) and Da Lat, Lam Dong Province (in the south). They have a relatively cool climate, the dairy farmers are more experienced in dairy farming and are, therefore, more productive. For these reasons, Son La Province was selected for the study.

According to the Government Decision for Dairy Production in Viet Nam No. 167/2001/TTg, dated 26 October 2001, Ha Nam, together with Son La Province, is also encouraged to engage in dairy farming (making it a total of 30 provinces across the country). In contrast with Son La Province, Ha Ham has less favourable conditions for dairy farming. It is a lowland area, has relatively hot climate, and its farmers are less experienced in milk production. Two districts in Ha Nam chosen to be studied are Ly Nhan and neighbouring Duy Tien.

Table 4.1: Natural Conditions of the Study Sites

	Moc Chau District, Son La Province	Ly Nhan and Duy Tien Districts, Ha Nam Province
Geographical location	• Located in a mountainous area northwest of Viet Nam, southeast of Son La Province • An important spot to connect Son La and other northwestern provinces with Ha Noi and the Red River Delta	• Located in the Red River Delta of Viet Nam • Easy to connect to other regions and markets
Topographic characteristics	• Many rugged mountains and wide valleys • Moc Chau Plateau is flat and large, the widest area reaches 25 km with the average height above the sea level of 1,050 km	• A delta area so the terrain has plain topography and terrain • A plain of sediment deposited from large rivers with fertile land
Climate conditions	• Sub-temperate climate, cold and dry winter, cool summer with heavy rain • Average temperature: 15°C–20°C • Average rainfall: 1,560 mm • Humidity: 60%–85%	• Tropical monsoon climate, hot and humid • Four seasons: spring, summer, fall, and winter

		• Average annual temperature: 23°C–24°C, in some days, the temperature rises to 38°C–39°C. • Average rainfall: 1,900 mm • Average humidity: 85%
Water supply conditions	• Da River is the largest river and borders Moc Chau District in the northeast and has an important role for Moc Chau. • Water resources are unevenly distributed, due to high mountainous terrain.	• The average rainfall for water resources falling about 1.602 billion m^3 • Surface water supply from the Red River, Day River, Nhue River brings about 14.05 trillion m^3 of water annually • Underground water in Ha Nam exists in many layers and is of good quality, meeting the needs of socio-economic development.

Source: Collected from websites of the People's Committee of Moc Chau District (Son La) and Ly Nhan, Duy Tien District (Ha Nam).

Data Collection

- Secondary data

Secondary data in this research was collected from websites of the People's Committee of the study sites, articles in the Internet, and various studies about dairy production of national and international projects

- Primary data

Structured interviews

This research is both a qualitative and quantitative research. The primary data came from a project supported by the Australian Centre for International Agricultural Research (ACIAR) (ACIAR AH/2016/020), which was collected in 2017 through two-round surveys.

The first round of the project involved semi-structured interviews to collect qualitative data and information in order to define and describe the milk chain in its actual stages: fresh milk production, collection, processing, and distribution. Besides, it would help describe the characteristics of the chain actors, flow of information, flow of products, and supporting system. This step would also help analyse the overall value chain. Generally, it started with the dairymen and finished at the retailers.

The second round of the project involved structured interviews with standard questionnaires. Questionnaires were distributed to 40 dairy farmers in each study site in Son La and Ha Nam provinces. The questionnaires were broken down into nine sections which covered information about (i) the socio-economic status and characteristics of the dairy farmer; (ii)milk production, including herd size, characteristics of cow's milk production, inputs and outputs from cow milk production, expenses, feed resources; and (iii) market and linkages for the milk produced, and socio-economic issues related to improved milk production.

About two-thirds of the questionnaires included close-ended questions, which means responses were classified into predetermined codes. Other questions were open ended, allowing interviewees to respond.

Informal interviews

Two field trips were carried out in Moc Chau Farm Commune, Moc Chau District, Son La Province and Trac Van Commune, Duy Tien District, Ha Nam Province. These field trips aimed to collect qualitative data and cross-check information obtained from other sources by observation and in-depth interviews with dairy farmers.

After researching the real situation of two sites, Ly Nhan and Moc Chau districts, the research group studied all dairy smallholders which had less than 40 dairy cows. However, in Ly Nhan, the number of smallholder farms was not enough; thus, some dairy farms in Duy Tien, a neighbouring district of Ly Nhan, were studied. In total, 80 dairy farmers participated in the research in two provinces.

Data Analysis

The analytical method in this chapter is twofold: The first is a description of the dynamics of long-term policy and economic background surrounding the dairy sector in Viet Nam and selected sites. The second is a structural analysis of activities of firms along the value chain, especially input suppliers, milk collectors, milk producers, dairy plants, and stakeholders.

The value-added analysis applied to the Seng Cu rice value chain of Viet Nam in Chapter 3 focused mainly on value chain mapping and economic or cost–benefit analysis. This chapter, on the other hand, puts more emphasis on the description of the linkages among actors, including sales/purchase contracts and financial, technical, and other support, as well as the functions of each actor inside and surrounding the chain. This chapter also briefly explains the cost–benefit structure of milk producers and the distribution of profit in the value chain.

3. Milk Production in Viet Nam and Study Sites

Milk Production in Viet Nam

Dairy farming is not conventional in Viet Nam. It started in the early years of the 20th century. Here are some significant periods in Viet Nam's dairy sector (Dairy Vietnam [b]):

- 1920–1923: The French brought some cow breeds which could bear the tropical climate, such as Red Sinhi and Ongle, into Tan Son Nhat, Sai Gon, and Ha Noi to produce for French people in Viet Nam. Dairy cows at that time numbered about 300 heads, and the milk yield was only about 2–3 kg/cow/day.
- 1937–1942: In the south of Viet Nam, some dairy farms were established, producing about 360 tons of milk per year. More breeds such as Jersey, Tharpara, Sahiwal, and Haryana were brought into the country besides Red Sindhi and Ongle. With support

from the Australian government, a purebred Jersey Center was established in Ben Cat with 80 heifers; it was later dissolved because of the Viet Nam War. Private farms in Tan Binh, Go Vap, and Thu Duc started to raise dairy cows with a herd size of 10 to 20 heads.

- 1954–1960: In the north of Viet Nam, the government encouraged dairy farming. State-owned farms and dairy cow raising and research centres were established in Ba Vi (Ha Tay), Than Uyen (Nghia Lo), Moc Chau (Son La), Tam Duong (Lao Cai), Huu Nghi (Quang Ninh), Ha Trung (Thanh Hoa), etc. In 1960, Beijing's black-and-white breed was brought into Ba Vi, Sa Pa, and Moc Chau. The Cuban government helped Viet Nam export 1,000 Holstein Friesian to Moc Chau and establish a research centre for male Moncada cows in Ba Vi.
- 1970s: Viet Nam imported dairy buffalo Murrah from India to be raised in Phung Thuong, Song Be, and other regions. As Viet Nam's climatic conditions seemed unfavourable for this breed, not so many Murrah buffalos were raised. Since 1976, Holstein Friesian cows have been distributed to Duc Trong (Lam Dong). Besides, cross-breeding and dairy farming were developing more and more in the southeast and in Ho Chi Minh City. However, in the early 1980s, dairy cows were raised only in some state-owned farms with a herd size of about a hundred heads. The largest state-owned farm was Moc Chau Farm Commune with about 1,000 heads. Because of the farmers' limited experience, inadequate management mechanisms, poor processing conditions and milk consumption, many farms were dissolved due to inefficient dairy farming. The number of dairy cows decreased significantly.
- 1985–1987: Cross-breeding programmes were conducted (Holstein Friesian x Lai Sind (Laisind = Indian Red Sindhi Bulls x Domestic Yellow cow). During this period, Viet Nam imported male and female Sind and Sahiwal breeds from Pakistan to improve the domestic breeds.
- 1986–1999: Since *Doi Moi* (Reform) 1986, Viet Nam transformed from a poor country suffering from food shortage into a country exporting goods. This period witnessed a significant increase in total herd size of 11% per year. Privately owned farms were established.
- 2001: The government strongly encouraged dairy farming and milk production via Decree No. 167/2001/QD/TTg on development policy for dairy farming in 2001–2010.

Through the years, the number of dairy cows in Viet Nam has been increasing. In 2017, the figure reached over 300,000 heads, which was more than 6% compared to 2016. The milk yield has also increased through the years along with the increase in the herd size. Compared to the previous year, milk yield has been increasing 10% on average per year. However, the industry has not met domestic demand and has to import about 70% of inputs, ranked 20th of top countries importing raw milk (Ky Anh, 2014).

Table 4.2: Total Yield of Dairy Cows and Milk

	2015	2016	2017
No. of dairy cows	275,328	282,990	301,649
Increase/decrease compared to previous year (%)	—	2.8	6.6
Milk yield	723,153	795,144	881,261
Increase/decrease compared to previous year (%)	—	10.0	10.1

Note: Data on 1 October in 2015, 2016, and 2017.
Source: General Statistic Office of Vietnam (GSO) (2018).

A typical trait of Viet Nam's dairy sector is that it is dependent mostly on smallholders. Their dairy farms are usually small in herd size, disperse, lacking herd management skills which significantly affect the quantity and quality of raw milk (Dairy Vietnam [c]). For example, in 2012, the total dairy cows across the country were more than 166,000 heads, of which about 120,000 were being raised in smallholder farms and 47,000 cows were being raised in enterprises' dairy farms. Vinamilk is the biggest enterprise in the industry in terms of market share for milk and milk products.[1] The second biggest, FrieslandCampina, has bought 100% of raw milk from smallholders. At this time, TH True Milk ranks third, and can ensure the quantity of input itself with 45,000 dairy cows producing 400 tons of milk per day (Dairy Vietnam [a]).

Moc Chau District, Son La Province

There are three phases in the development of dairy farming in Moc Chau: introduction period (1956–1985), reform period (1986–2000), and development period (2001–present) (Moriyama, 2017).

- Introduction period (1956–1985)

As ordered by the communist party, the armed forces established a collective farm following orders 'from the top'. Many engineers were dispatched from different provinces to Moc Chau to work there. The main purpose of the collective farm was to increase food production in the undeveloped highland areas. The armed forces farm, built in 1958, became a state farm in 1960. In the same year, 24 heads of Beijing black-and-white dairy cows were first introduced for trial and raised in Moc Chau. Ten years later, the Cuban government exported 1,000 pure Holstein-Friesian cows for experiment in Viet Nam. In 1972, 400 heads of Holstein Friesians produced about 400 tons of milk, or roughly 1,200 kg fresh milk per cycle per cow on average. This low level of milk production was attributed to the lower quality of milk cow and feed shortage during winter. During the Viet Nam–American War (1960–1975), the state farm produced canned sweetened condensed milk for the North Vietnamese army. After the reunification of North and South Viet Nam in 1975, the government created the Moc Chau

[1] https://vietnambiz.vn/kho-khan-trong-gianh-thi-phan-dong-luc-tang-truong-2018-cua-vinamilk-se-den-tu-dau-53816.html

state dairy farm and the Moc Chau Milk company. During this period, there was a severe nationwide shortage of food, so the number of milk cows were reduced.

Table 4.3: Dairy Cows in Moc Chau, 1976–1980

Year	Number of Dairy Cows (head)	Average Milk Production (kg/head/day)
1976	134	15.7
1977	387	13.8
1978	684	12.5
1979	701	11.5
1980	761	11.4

Source: Nguyen T. A, Tran C. C, Pham V. N (2009).

- Reform period of dairy farming (1986–2000)

To take advantage of market economisation under the *Doi Moi* (Reform) Policy, dairy farming was converted into a 'bottom-up' process based on the situation of individual farms. Under the Land Law of 1988, individual farmers were provided with cultivated land and milk cows. The dairy cows were fed in a large brick cow house with mortar walls to protect them from the cold. However, feed fell short during winter and about 800 milk cows were slaughtered, thus reducing the number of cattle to 1,300 heads. Milk consumption slowly increased based on the demand from the urban areas. Along with economic and population growth in Viet Nam, the consumption of milk and dairy products increased from 0.47 kg per capita in 1990 to 8.09 kg per capita in 2000 (FAOSTAT, 2011). In 2000, 354 farmers in Moc Chau owned 1,453 milk cows (an average of 4.1 heads per farm).

- Development of dairy farming (2001–present)

In phase III, the 'top-down' government policy and 'bottom-up' requests of dairy farmers were merged. To reduce the import of dairy products, the government introduced in 2001 the Dairy Development Programme. It also aimed at increasing the income of dairy farmers and encouraging them to switch from rice production to dairy production. In 2005, a new dairy farming public corporation was established called Moc Chau Milk. Farmers in Moc Chau were entirely attached to the company by a milk sale contract because it was the only milk purchaser in the region. Under the terms of the contract, farmers must sell the totality of their milk to the company at a fixed price set by the company according to quality standards. Moc Chau Milk Company was directly involved at all levels of the dairy sector: training of technicians and farmers; collecting and analysing the quality of milk; hiring land and farm buildings; manufacturing concentrated feed; providing technical and veterinary services, guarantees, and credits to cattle purchase, etc. In 2018, the Moc Chau company, along with all its contracting dairy farms, was reported to have about 23,000 heads of dairy cows. The average milk production is 25.22 kg/head/day (Moc Chau Milk Company, 2018).

Ha Nam Province

In Ha Nam Province, animal husbandry accounts for 50%, cultivation accounts for 45%, and service accounts for 5% agricultural value. In animal husbandry, Ha Nam farmers raised 750,000 pig heads, 6.5 million poultry heads, and more than 30,000 ruminant heads, mostly yellow, beef cows, and buffalo (Table 4.4).

Ha Nam started its dairy industry in 2001 with 150 dairy cows at the same time as the national dairy project of Viet Nam. However, they faced many difficulties and most dairy farms disappeared. In 2013, Ha Nam authorities committed to improve dairy production again. In 2014, they launched the dairy project (second period) with the support of two dairy-processing companies that committed to consume all dairy milk for farmers. Thus, during this year, 500 dairy cows imported from Australia and bought from Moc Chau were raised in Ha Nam. In 2016, Ha Nam approved a dairy project for 2016–2020 with many supported dairy farmers to promote dairy production.

By 22 February 2017, 196 farmers, raising 2,562 dairy cows in Ha Nam Province, produced an average of 20.6 tons of milk per day. Duy Tien district had 109 farms raising 1,457 dairy cows, which produced 12.8 tons of milk per day. Ly Nhan district had 23 farms raising 605 dairy cows and produced 3 tons of milk per day. Kim Bang district had 57 farms raising 249 dairy cows and produced 2.6 tons milk per day. Thanh Liem district had three farms raising 24 dairy cows. In addition, a company was raising 75 dairy cows, and two nuclear farms of FrieslandCampina was raising 152 dairy cows and producing 2.2 tons of milk per day.

Table 4.4: Milk Production in Ha Nam Province, February 2017

District	Commune	Number of Farms	Numbers of Newly Bought Cows	Number of Newly Born Calves	Number of Lactating Cows	Milk Collection
		Farms	Heads	Heads	Heads	Tons/Day
1. Duy Tien	Total	109	16	21	1,457	12.8
	Moc Bac	78	5	21	950	In Moc Bac commune: 9 In Chuyên Ngoại: 3.8
	Chuyen Ngoai	21	0	0	245	
	Trac Van	13	11	0	203	
	Yen Nam	4	0	0	59	
2. Ly Nhan	Total	24	8	30	605	In Nhan Binh: 3
	Nguyen Ly	8	0	1	149	
	Chinh Ly	4	8	2	101	
	Xuan Khe	2	0	0	42	
	Nhan Dao	2	0	0	35	
	Nhan Binh	5	0	4	112	
	Hoa Hau	1	0	19	129	
	Nhan My	1	0	4	35	
	Vinh Tru	1	0	0	2	

3. Kim Bang	Total	57	4	5	249	In Ba Sao: 2.6
	Ba Sao	33	0	4	148	
	Kha Phong	21	4	1	81	
	Tan Son	2	0	0	16	
	Lien Son	1	0	0	4	
4.Thanh Liem	Total	3	0	0	24	
	Liem Tuc	3	0	0	24	
5. Ha Nam Dairy Milk Joint stock company		1	0	0	75	
6. Friesland-Campina		2	0	3	152	2.2
Total: 17 Communes + 2 companies		**196**	**23**	**59**	**2,562**	**20.6**

Source: HPCR (2017).

In 2015, FrieslandCampina established a sustainable dairy zone in Moc Bac Commune, Duy Tien district (Duc, 2015). FrieslandCampina's dairy farming area is a joint project between the Ha Nam provincial government and the Dutch government within the framework of the Sustainable Food Security and Food Security Programme for 2014–2018. The project aimed to establish and develop a professional and sustainable dairy farm on a family-farm scale, thereby contributing to food security, job creation, and minimisation of import of dairy products.

As the main partner of the project, FrieslandCampina directly managed, operated, and invested to build a professional dairy farm in Ha Nam with two sample farms. The company developed and implemented training programmes from basic to advanced levels for dairy farmers; constructed forage production systems; provided training and introduction of technicians about artificial insemination services, veterinary practice, etc.

Farmers who operate dairy farms in the sustainable zone were provided with land to raise cow and grow forage.

On 19 May 2017, Ha Nam Province approved the proposal of Vietnam Dairy Products Joint Stock Company (Vinamilk) to invest in a dairy farm in Thanh Nguyen Commune, Thanh Liem District (Nguyen, 2017). The farm was given 150 hectares (ha) for raising 4,000 heads and 500 ha for growing forage.

Among 197 households, 85 sold to Vinamilk Dairy Company, 13 sold to Dutch Dairy Company, 8 new households – five households in Moc Bac Commune, three households in Trac Van Commune – had not signed milk contracts because there were no dairy cows. Two households opened milk-processing factories and sold in the chain of clean farm products.

Dairy farmers in Ha Nam gained experience in dairy farming such as caring for, feeding, and milking dairy cows. However, dairy farming in Ha Nam still have the following constraints:

- Livestock development is unplanned, not concentrated into specialised production zones, because of the lack of linkages among actors and stakeholders.

- Herd management is still weak, forage areas are limited so that the animal feeds sources are dependent from outside.
- Ha Nam has not had technical staff specialised in cattle, so the effectiveness of consultancy and technology transfer is limited.
- The majority of raw milk producers are small households with small production scale, resulting in high production cost.
- Environmental pollution in dairy farming is one of the big issues.
- The development of dairy herds is relatively low, householders are not investing in dairy farming and some are facing difficulties in acquiring capital.

Interviewees' Profiles in Survey Farms

Surveys were distributed to 40 dairy farmers in each study site. In Moc Chau – Son La, eight (20%) are farm owners, three (7.5%) are managers, and the majority are both owners and managers. In Ha Nam, there is only one farm manager (2.5%) and the rest – 39 farmers, comprising 97.5% – are both owners and farmers. Thus, clearly, majority of interviewees in this research are both owners and managers in both study sites, who thoroughly understand farms and give the most accurate results to the research.

Out of 40 interviewees, males and females equally comprise 50%. However, in Ha Nam, 39 interviewees are male farmers (97.5%) while only one (2.5%) is female.

The average age of dairy farmers in Moc Chau is about 41 years, while that for Ha Nam is higher, at 44 years.

Table 4.5: Interviewees' Personal Information

n = 40		Moc Chau District, Son La Province		Ly Nhan and Duy Tien Districts, Ha Nam Province	
		No.	%	No.	%
Interviewee's Role	Owner	8	20.0	0	0.0
	Manager	3	7.5	1	2.5
	Both	29	72.5	39	97.5
Sex	Male	20	50.0	39	97.5
	Female	20	50.0	1	2.5
Age	Mean	41.2		44.4	
	Median (Min; Max)	39.5 (22; 68)		45.5 (27; 58)	

Source: Survey results, 2017.

Dairy Farming and Milk Production of Surveyed Farms

The dairy farms in Moc Chau, with their longer farming experience and Moc Chau's favourable climate, have larger scale and productivity than those in Ha Nam. The scale of one dairy farm includes the total number of dairy cows, the total area for raising cows and forage, and the number of workers. Productivity involves the average milk production and the total revenue from milk production during a period.

The average cattle in Moc Chau is 40 heads while that in Ha Nam is only 15 heads (Table 4.6). There are about 22 milking and dry cows in Moc Chau and 8 milking and dry cows in Ha Nam. However, there is no big difference in the average number of workers in one farm from both study sites.

Table 4.6: Production Scale of Surveyed Farms

	Moc Chau District, Son La Province	Ly Nhan and Duy Tien Districts, Ha Nam Province
Total cattle (head)	**n = 40**	**n = 40**
Mean	40	16
Median (Min; Max)	42 (15; 59)	12 (3; 40)
Milking and dry cows (head)	**n = 40**	**n = 40**
Mean	22	8
Median (Min; Max)	22 (13; 30)	7 (2; 20)
Labour (People)		
● **Hired workers**	**n = 37**	**n = 39**
Mean	1	0.8
Median (Min; Max)	1 (0; 2)	0 (0; 5)
● **Family workers**	**n = 39**	**n = 38**
Mean	2	3
Median (Min; Max)	2 (1; 5)	2 (2; 4)

Source: Survey results, 2017.

The average milk productivity of studied farms in Moc Chau is 23 kg/cow/day, which is higher than that in Ha Nam, at 20 kg/cow/day. The average revenue from milk per cow per day of the dairy farms in Moc Chau is also higher, given that the average price for raw milk is D12,100 in Moc Chau and D13,100 in Ha Nam. Therefore, even with lower payment per kilogram of raw milk, dairy farms in Moc Chau are seemingly more productive in terms of revenue than those in Ha Nam.

Table 4.7: Productivity of Surveyed Farms

	Moc Chau District, Son La Province	Ly Nhan and Duy Tien Districts, Ha Nam Province
Average milk production (kg/cow/day)	**n = 40**	**n = 40**
Mean	23	20
Median (Min; Max)	23 (13; 30)	20 (16; 26)
Average price (D1,000/kg of milk)	12.1	13.1
Revenue from milk per cow per day (D1,000)	**n = 38**	**n = 38**
Mean	278.3	262.0

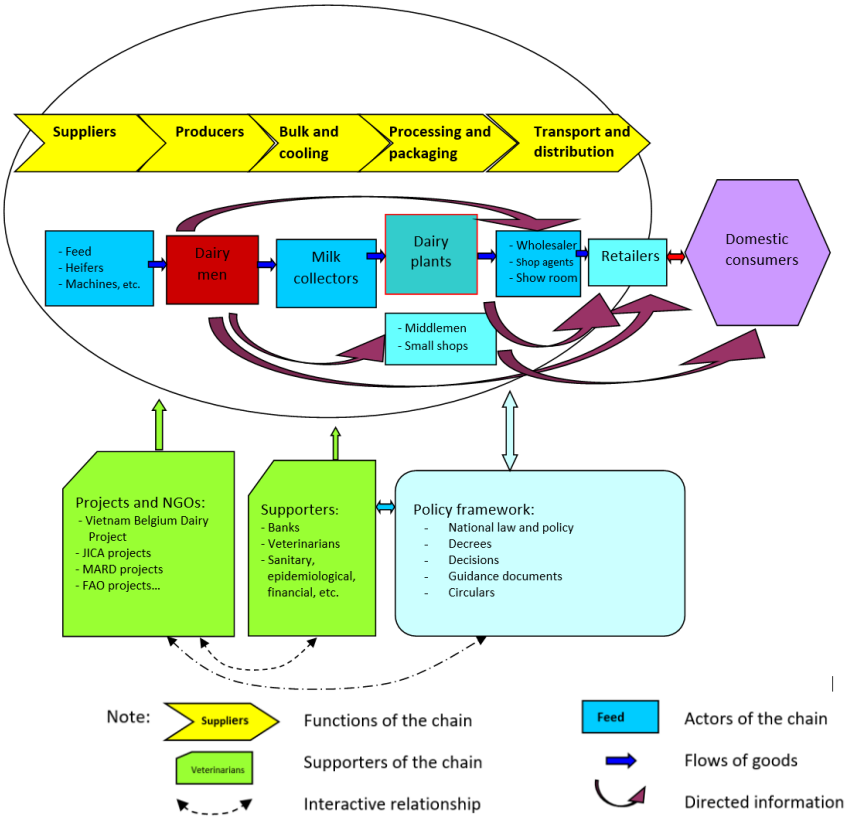
Source: Survey results, 2017.

4. Overview of the Fresh Milk Value Chain

The fresh milk chain in Viet Nam includes milk production, collecting and bulking, processing, and distribution. These functions are performed by major actors: dairy farmers, milk collectors, dairy plants, and milk distributors. Each actor has a specific role in the chain and link together quite well to be a chain. Besides, stakeholders will facilitate the chain's development from outside.

Figure 4.1 presents the main actors and stakeholders in the fresh milk chain in Viet Nam.

Figure 4.1: Basic Actors and Stakeholders in the Milk Chain



FAO = Food and Agriculture Organization, JICA = Japan International Cooperation Agency, MARD = Ministry of Agriculture and Rural Development, NGO = non-governmental organisation.
Source: Bui et al. (2014); survey results, 2017.

The fresh milk chain in Viet Nam starts from the input suppliers who provide breeds, feeds, and machinery for dairy farmers. After production, milk is delivered to milk collectors. Milk collectors do the bulking and cooling processes; after that, milk is transferred to the dairy plants. From there, fresh milk is sterilised, pasteurised, and packaged. Then, it is transferred to distributors, including wholesalers and retailers, and then to the final customers.

In each region, there are normally some major suppliers of heifers, grasses, feed, proteins, etc. for dairy farmers, one of which comes from a dairy plant or is very closely related to one.

Although some local blacksmiths and retailers supply some items of machinery, most of the equipment for milk production is supplied by big companies such as the DeLaval Company.[2]

Besides some big farms from companies or corporations, many farmers keep dairy cows that produce fresh milk. They are the main actors and play the most important role in the milk chain. All other actors almost depend on their operation. Some milk collectors (called collection centres) in each region usually work independently.

The most powerful actor in the milk value chain is the dairy processing company or dairy plant. Theoretically, the dairy processing company depends on the dairy farmers. In reality, it becomes the decision-maker for the chain. It links dairy farmers with input suppliers, milk collectors, and distributors.

In the distribution stage are many participants referred to as small milk shops, milk candy shops, some showrooms and supermarkets, and many agents and retailers.

There are some relevant stakeholders within the chain. Some organisations and projects from the Japan International Cooperation Agency (JICA), Association Sud-ouest pour le Development International Agricole (ASODIA), Ministry of Agriculture and Rural Development, Department of Agriculture and Rural Development (MARD), and National Institute of Animal Husbandry support the dairy farmers.[3] The major fields of support from JICA involve the technique of breeding cows and include a training course for feed preparation. ASODIA provides them with financial support.

The veterinarian and outreach [4] initiatives helped farmers deal with their specialised problems such as controlling diseases, protecting dairy cows from harsh conditions, preventing them from suffering the effects of natural disasters, etc. Financial institutions such as the Bank for Agriculture and Rural Development (AgriBank), along with the Policy and Social Bank, provided them with small loans for keeping cattle.[5] The government and local authorities created the environment to produce milk through decisions, resolutions, directives, decrees, etc.

5. Functions of the Main Actors in the Value Chain

The Input Suppliers

Some difficulties have been reported in the supply of feed for dairy cattle in Viet Nam. In big cities and towns, the price of land is the biggest problem for dairy farmers. But in land-abundant areas, land quality is not suited enough to grow grass that is nutritious for cattle.

[2] This is an international company (http://www.delaval.com/en/About-DeLaval/The-Company/) that collaborates with the dairy plant to provide necessary equipment for dairy farmers.
[3] In fact, only the Japan International Cooperation Agency supported them in technical areas and the Association Sud-ouest pour le Development International Agricole supported in the financial aspect.
[4] Mostly from the dairy plant.
[5] It was difficult for farmers to access these financial institutions. Most of them did not borrow from the banks but saved for themselves.

Another problem is the overuse of herbicides, insecticides, or other chemicals that gradually affects grass growth. Therefore, the quantity of natural and grown grass meets forage demand by only about 30% (Khoi, 2013). Viet Nam's dairy industry now depends too much on the world grass market because about 70% of dairy feed is imported from foreign countries. Due to the shortage of suitable forage, dairy farmers must increase the proportion of processed feed, which lowers milk quality.

Moc Chau Milk, the dairy cattle-breeding company, is the major input supplier for dairy farms in Moc Chau, Son La Province. The percentage of dairy farms supplied with heifers, feeds, fertiliser, and machinery by the milk company is remarkably high. The figure for heifers is 82.5%. In terms of feeds, 100% of surveyed farms have chosen Moc Chau Milk as their supplier of concentrates and by-products. The figures for fertiliser and machinery are 66.7% and 85.7%, respectively. Also, dairy farms can buy machinery for dairy production from local blacksmiths and mechanists.

Table 4.8: Number of Dairy Farms in Moc Chau District, Son La Province, Buying Inputs from Moc Chau Milk

Heifers (n = 40)		Feeds			Fertiliser (n = 36)	Machinery (n = 35)
		Forage (n = 35)	Concentrates (n = 35)	By-products (n = 40)		
No.	33	17	35	40	24	30
%	82.5	48.6	100	100	66.7	85.7

Source: Survey results, 2017.

Meanwhile, in Ha Nam, there are no dominant suppliers. Dairy farmers in Ha Nam usually purchase heifers from Moc Chau. Otherwise, they can buy imported breeds from Australia. Other sources of heifers are Phu Ly, Phu Tho (in the north) and Lam Dong, Cu Chi (in the south).

Most dairy farms in Ha Nam do not purchase feeds from milk companies (Vinamilk or Dutch Lady). They seem to prefer to buy feeds from agents or stores in the local market. Only 12.5% of surveyed farms are supplied forage by their milk company, while the figure for agents is 60% (Table 4.9). For concentrates and by-products, the percentage of dairy farms that are supplied feeds by the milk company is much lower than that by local agents. The percentage of dairy farms buying concentrates from local agents approximately doubles the percentage of farms buying from the milk company. The figure for by-products from agents is seven times higher than that from the milk company. In terms of fertiliser for home-grown grass, the majority of dairy farms (80%) choose to buy from local agents and stores. The same trend happens for machinery.

Table 4.9: Input Suppliers in Ly Nhan and Duy Tien Districts, Ha Nam Province

n = 40		No.	%
Heifers	Various suppliers (Moc Chau, Phu Ly, Phu Tho, Lam Dong, Cu Chi, etc.)		
Feeds			
● Forage	Milk company	5	12.5
	Agents	24	60.0
	Others	11	27.5
● Concentrates	Milk company	13	32.5
	Agents	27	67.5
● By-products	Milk company	4	10.0
	Agents	28	70.0
	Others	8	20.0
Fertiliser	Agents	32	80.0
	Others	8	20.0
Machinery	Milk company	4	10.0
	Agents	17	42.5
	Others	19	47.5

Source: Survey results, 2017.

The majority (97.5%) of dairy farmers from the two study sites find it easy to buy inputs. Despite abundant input supply in Moc Chau, about 74% of dairy farmers said that the input price, in general, is normal; this means that the input supply in Moc Chau is not only stable but also affordable. In Ha Nam, the percentage of dairy farmers who find the input price expensive is higher than the figure for normal. Despite the diversity of input suppliers, the input price in Ha Nam is less affordable than that in Moc Chau.

Table 4.10: Availability and Input Prices

			No.	%
Moc Chau District, Son La Province	**Easy to buy input (n = 40)**		39	97.5
	Price (n = 38)	Normal	28	73.7
		High	10	26.3
Ly Nhan and Duy Tien Districts, Ha Nam Province	**Easy to buy input (n = 40)**		39	97.5
	Price (n = 40)	Normal	13	32.5
		High	25	62.5
		Normal for feed, high for machinery	1	2.5
		High for feed	1	2.5

Source: Survey results, 2017.

Therefore, to ensure quality, stable, and affordable input sources, a contract between farmers and input suppliers would be beneficial. In Moc Chau, out of 40 surveyed farms, 14 farms (35%) have signed a contract with input suppliers. The number of farms receiving support from input suppliers are 11 (27.5%). Some dairy farms received loans, concentrates, or technical support from input suppliers. However, in Ha Nam, no dairy farms have contracts with input suppliers.

Table 4.11: Dairy Farms Signing Contracts With and Receiving Support from Input Suppliers

	Farms Signing Contracts with Input Suppliers		Farms Receiving Support from Input Suppliers	
	No. (n = 40)	%	No. (n = 40)	%
Moc Chau District, Son La Province	14	35.0	11	27.5
Ly Nhan and Duy Tien Districts, Ha Nam Province	0	0	0	0

Source: Survey results, 2017.

Collectors of Fresh Milk

Previously, when the number of dairy cattle was still too small and the consumption of milk buyers was simple, selling–buying was all about self-supply and self-demand. Dairy farmers usually sold their collected fresh milk to nearby refreshments or milk/cake shops for regular consumption needs. Dairy farmers also grouped together and took turns to deliver the milk to milk shops.

Currently, due to the dairy development of each subregion/region, the milk collection network is expanding more and more. Most dairy farms in Viet Nam are far from milk-processing companies; thus, forming a system of milk collection, transshipment, and preservation is essential. Three types of members participate in the milk collection networks across the country: cooperatives (19%), companies (23%), and private collectors (58%) (Chu, 2007). Twice a day (in the morning and in the afternoon), dairy farmers, using their motorbikes, deliver their milk to collection centres. Milk collectors are responsible for collecting and checking the quantity and quality of fresh milk and delivering the milk to the processing plants.

Moc Chau Milk has 16 collection centres so that dairy farmers do not have to travel more than 1 kilometre to sell their milk. After its purchase, (usually at temperatures of 35°C–37°C), it is stored (at 2°C–4°C) and quickly tested to be classified. Then milk collectors take samples of all milk bottles to be checked. The criteria are temperature, dry matter content, fat proportion, microbiological ratio, etc. All milk purchased from the farmers is transported to the dairy plant by specialised vehicles (Thao, 2018).

In Ha Nam, two companies, Vinamilk and FrieslandCampina, buy milk from dairy farms. Vinamilk has three collection centres in Moc Bac and Chuyen Ngoai Commune (Duy Tien District) and Ba Sao Town (Kim Bang District). FrieslandCampina Ha Nam only has two collection centres in Moc Bac (Duy Tien) and Nhan Binh Commune (Ly Nhan district).

Milk collectors in both study sites work independently and receive their income. However, the milk collectors in Moc Chau unofficially work under the control of the dairy plant, Moc Chau Milk Company, while milk collectors in Ha Nam do not work under the power of dairy plants or other actors in the chain.

Table 4.12: Number of Dairy Farms Signing Contracts with Milk Collectors

	Signing Contracts with Milk Collectors	
	No.	%
Moc Chau District, Son La Province	17	42.5
Ly Nhan and Duy Tien districts, Ha Nam Province	3	7.5

Source: Survey results, 2017.

In the case of Moc Chau, it is less risky when milk collectors belong to the dairy plant because they are the representatives of the dairy plants. The dairy plants have already promised to consume the output of dairy farmers so the milk collectors will surely buy the raw milk. Dairy farmers may not have to sign contracts with milk collectors as they already have the contracts with the dairy plant. But in Ha Nam, milk collectors may not buy milk from dairy farmers because they are not controlled by the dairy plant. Therefore, a contract between dairy farmers and milk collectors is necessary.

The number of dairy farms signing contracts with milk collectors in Moc Chau is higher than that in Ha Nam. In Moc Chau, the number is 17 out of 40 farms (42.5%) while that for Ha Nam is only 3 out of 40 farms (7.5%).

Producers of Fresh Milk

- Types of milk producers

In Viet Nam, there are two types of milk producers. The first is the dairy farmer. Majority (about 95%) of fresh milk is produced by small and medium households (Khoi, 2013). According to Khoi (2013), the dairy farmers can be divided into three main groups:

The independent farmers: who buy and raise cows without any support from milk processors. They also do not work under the control of the dairy plant.

The contract farmers: who are the most popular type and appear to be mostly in Ho Chi Minh city. Farmers sign contracts with milk processors. Following the contracts, they receive cow breeds, feeds, medical treatment, and other support from the milk processors. They raise cows in their own land and sell milk to the same milk processors. This type is the symbol of cooperation between farmers and processors.

The dairy farmers working in large agriculture farms: They are in Moc Chau and Ba Vi Dairy farms. They do not possess their own land, so they have to hire land from these farms. Like contract farmers, they also receive cows, feeds, and medical treatment from the farm and sell milk to milk processing companies.

The second type of milk producer is a corporate or company, such as Vinamilk or TH True Milk. It raises thousands of cows in a huge farm using modern technology. Feeding, medical care, and milking are specially supervised to ensure the quality and quantity of the milk.

- Dairy farmers' experience and educational level

In the surveyed farms, Moc Chau farmers have an average experience of 14 years and Ha Nam farmers, 5 years. Moc Chau also has more than 60 years of dairy farming, longer than that of Ha Nam.

In terms of educational level, most of the interviewees in both study sites graduated from high school. The number of dairy farmers chasing higher education is particularly small.

Table 4.13: Interviewees' Educational Level and Dairy Farming Experience

		Moc Chau District, Son La Province		Ly Nhan and Duy Tien Districts, Ha Nam Province	
		No.	%	No.	%
Highest educational level	Elementary	1	2.5	5	12.5
	High School	36	90.0	34	85.0
	College	2	5.0	1	2.5
	Others	1	2.5	0	0
Experience with dairy cattle (years)	Mean	14.4		4.7	
	Median (Min; Max)	13 (1;37)		3 (1;14)	

Source: Survey results, 2017.

- Land resource of dairy farms

Adequate land resource is crucial in dairy farming because it ensures the physical health of dairy cows, such as preventing them from heat or diseases and bacteria. With a large area of land, the dairy farmers can also grow corn and grass on their own so that they will be less dependent on other sources. Also, one benefit of linkages is reduced production costs through economies of scale. The larger the land area is, the larger the production scale of dairy farmers can expand; eventually, the production costs decrease.

With bigger dairy herds, agricultural land used for dairy production in Moc Chau is also larger than that in Ha Nam. The average agricultural land in Moc Chau is about 12,000 m^2 while that in Ha Nam is about 10,000 m^2. Dairy farms in both study sites grow their own forage. The forage area in Moc Chau and Ha Nam is about 8,000 m^2 and 7,000 m^2, respectively. About 1,900 m^2 is being used to raise heifers on average in one farm in Moc Chau and about 250 m^2 in Ha Nam.

Table 4.14: Agricultural Land of Surveyed Farms (m^2)

	Moc Chau District, Son La Province	Ly Nhan and Duy Tien Districts, Ha Nam Province
● **Total area**	**n = 35**	**n = 22**
Mean	11,967	10,150
Median (Min; Max)	10,000 (2,500; 28,800)	9,000 (1,100; 39,600)
● **Forage area**	**n = 40**	**n = 40**
Mean	8,150	7,155
Median (Min; Max)	6,000 (2,000; 22,000)	5,580 (3,600; 36,000)
● **Heifers' stall**	**n = 39**	**n = 40**
Mean	1,944	251
Median (Min; Max)	1,500 (300; 14,820)	200 (50; 1,000)

Source: Survey results, 2017.

Dairy Plants

Dairy plants, so-called milk processors, are in charge of processing, packaging, and transferring raw milk into final products. They are also the actor setting the quality standard of the milk, thus, the ruler of the chain. Viet Nam's market is manipulated by four giants: Vinamilk; FrieslandCampina, known as Dutch Lady brand in Viet Nam (Khoi, 2013); TH True Milk; and Moc Chau Milk.

In the study sites, the milk companies are the most powerful actors in the chain, and they operate the whole chain (Tran and Bui, 2011). Even the purchase price of milk is subject to policy decisions applied to producers (reward, penalty, information requirements, quality requirements). Farmers cannot impose or negotiate prices; they are price acceptors. So, the rights of dairy farmers in this chain have not been demonstrated and their voices have little value. For milk collection, the dairy plant also decides on location, policy, rights, benefits, and responsibilities of each side.

Most dairy farms are smallholders with limited sources of labour, capital, and technology, sometimes even education. This may lead to inappropriate cattle breeding, disease, low adoption of technology, limited market access, etc. Meanwhile, dairy plants can give them those kinds of support.

About 98%–100% of dairy farms sell milk to the milk companies; therefore, all of them have signed the contracts with the dairy plants. There are three types of contracts between dairy farmers and milk processors. In the first contract, the milk processor promises to only provide inputs to dairy farms. In the second, the milk processor purchases raw milk from dairy farms. The third contract is on supplying inputs and consuming outputs. The third type is obviously the most advantageous for both sides; it is a win-win situation. Dairy farmers do not have to worry about input sources and output markets; dairy plants can ensure the quality and quantity of raw milk. In Moc Chau, 100% of them signed contracts with Moc Chau Milk because these contracts not only supply inputs but also purchase output for farmers. Contracts last for 1 year and can be extended in the next year. The proportion of dairy farms receiving support from Moc Chau Milk is also remarkably high, with 70% receiving loans from

the milk company. The amount of loan ranges from D40 million to D200 million with an interest rate of 1.0%–1.1%, in 7 to 24 months. Technique and training support includes dairy cattle raising such as insemination, caring, disease management, etc. This kind of support is usually held in workshops or conferences lasting from 1 to 7 days.

Table 4.15: Linkages between Dairy Farmers and Dairy Plants

	Signing Contracts		Receiving Loan Support		Receiving Technical Support		Trained by Dairy Plants	
	No.	%	No.	%	No.	%	No.	%
Moc Chau District, Son La Province	40	100	28	70	32	80.0	27	67.5
Ly Nhan and Duy Tien districts, Ha Nam Province	40	100	2	5	17	42.5	30	75.0

Source: Survey results, 2017.

In Ha Nam, all surveyed farms have contracts with dairy plants – 18 farms with Vinamilk and 22 farms with Dutch Lady (FrieslandCampina) – to prevent switching of dairy farmers to the two milk companies. Whenever the price of raw milk for one company is higher than the other, dairy farmers can sell milk for the higher price. However, only two dairy farms are provided inputs (one by Dutch Lady and one by Vinamilk). Dutch Lady promised to buy the output of 17 farms. The figure for Vinamilk is seven dairy farms. Three farms have contracts on both supplying inputs and consuming outputs by Dutch Lady and 10 farms by Vinamilk. There is a big difference in the terms of the contracts between the two milk companies in Ha Nam. Dutch Lady mainly offers principal 5-year contracts which will be renewed after 6 months. This kind of contract guarantees that dairy farmers do not easily sell milk to the other company. By contrast, Vinamilk prefers to have contracts with farmers for only a year. To a certain extent, this kind of contract can be risky for the company in securing the stability of input.

The milk companies in Ha Nam hardly provide loan support to dairy farmers. However, they back up dairy farmers in technique and training through workshops or conferences five to seven times a year.

Table 4.16: Number of Dairy Farms Contracting with Milk Companies

		Types of Contracts			Terms of Contracts (years)				
		Supplying Inputs	Purchasing Output	Both	0.5	1	1.5	3	5*
Moc Chau District, Son La Province		0	40	0	40	0	0	0	0
Ly Nhan and Duy Tien districts, Ha Nam Province	Dutch Lady	1	17	3	1	4	0	0	16
	Vinamilk	1	7	10	0	13	0	0	0

*Dutch Lady will sign a principal 5-year contract with farmers. Every 6 months, it will consider continuing the contract or not. If they find that the farmers follow their regulations, they will renew the contract with them.

Source: Survey results, 2017.

In Moc Chau, the only milk company in the region is Moc Chau Milk Company. It involves in the whole process from input supplying, milk collecting, purchasing and even veterinary extension service via 'Milk sale contract'. They also support farmers in the capital and technical training. The link between farmers and Moc Chau Milk is very close. Besides, Moc Chau Milk promises to maintain the linkages among dairy farmers, milk company and the local authority.

Table 4.17: Relationship among Farmers, Moc Chau Milk, and Local Authorities

Relationship	Responsibilities
Farmers to Moc Chau Milk	● Ensure the quality and quantity of milk and raw materials for animal feeds. ● Guarantee long-term attachment to milk production and the company, contributing experienced and dedicated human resources for the whole chain. ● Actively participate in cultural activities, bringing the Moc Chau Milk programmes to raise the level of cultural activities. ● Actively participate in the insurance fund, helping households in difficulty. ● Fully trust the support policies of Moc Chau Milk.
Moc Chau Milk to Farmers	● Provide more jobs for local people. ● Purchase raw milk at a competitively high price; provide veterinarians, animal husbandry experts, herds' stalls, etc. ● Organise and contribute to cultural and artistic festivals, ensuring the spiritual life of the people, for example, Dairy Cow Queen Contest, Moc Chau Tea Festival, etc. ● Formulate policies to support people to borrow loans and insurance so that people can feel secure in breeding and production.
Moc Chau Milk to Local Authorities	● Significantly contribute to social security by reducing unemployment. ● Being a leading company, contribute to the economy of the whole province. ● Hold cultural and artistic events to attract tourists to visit Moc Chau. ● Assist local authority in providing loans and insurance to locals.
Local Authorities	● Fully support the company in terms of policies to create a good business

to Moc Chau Milk	environment. ● Son La Provincial Government is formulating policies to help Moc Chau become a community tourism destination, calling on the government to invest in roads and infrastructure. ● Distribute information about Moc Chau Milk on social media.

Source: mocchaumilk.com.

In Ha Nam, dairy farmers are more independent from the milk companies Vinamilk and Dutch Lady. The dairy plants are not involved in supplying inputs, and their support for dairy farmers is limited. So, the link between the farmers and the dairy plants are 'looser' than that in Moc Chau. Farmers need to work with more actors and stakeholders.

Wholesalers and Retailers

Final dairy products are delivered to final consumers through distributors, namely, wholesalers and retailers. Viet Nam imports around one-fourth of total milk consumption; it is considered an importing country of dairy products. Thus, we can assume that the chain ends with domestic customers.

Otherwise, a limited quantity of fresh milk is distributed from dairymen to some local milk or cake shops or directly to wholesalers.

6. Functions of Relevant Stakeholders

Even though stakeholders are not included in the chain, they are in charge of creating a good environment for the chain. Governments can interact with the chain by providing priority loans/funds for the dairy industry, free tax for dairy products, support on price or subsidies to the dairy farms. Of the surveyed farms, 17.5% stated that they are prioritised in receiving loans/funds for dairy cattle production. In Moc Chau, the figure is only 5% because dairy farming and milk production are more developed than those in Ha Nam; dairy farmers in Moc Chau already receive more support from the Moc Chau Milk Company. But for other kinds of support, the percentage of dairy farms that could receive such support is extremely limited.

Table 4.18: Farms Having Linkages with Relevant Stakeholders

		Moc Chau District, Son La Province		Ly Nhan and Duy Tien Districts, Ha Nam Province	
		No.	%	No.	%
Support from the state and local governments	Priority loan/funds for dairy cattle rising	2	5.0	7	17.5
	Free tax for dairy products	0	0	0	0
	Price support	0	0	1	2.5
	Subsidy (feeds)	2	5.0	0	0
Linkages with financial organisations		4	10.0	18	45.0
Other linkages	Farmers' association	6	15.0	3	7.5
	War veterans	0	0	0	0
	Veterinary service	5	12.5	1	2.5
	Insurance agents	9	22.5	0	0

Source: Survey results, 2017.

Dairy farmers can receive loans from other financial organisations. In Ha Nam, 45% of dairy farmers stated they received financial support from the Vietnam Bank for Agriculture and Rural Development (Agribank) which they used to buy new dairy cows, animal feeds, and even new equipment and facilities. The loan amount ranges from D200 million to D1 billion, with an interest rate of 8%–11.2% in 3 or 5 years. However, in Moc Chau, dairy farmers could not access these funds as much as they expected. About 10% of surveyed farms also receive financial support from Agribank and other organisations amounting from D400 million to D1 billion.

Besides, some dairy farmers in the study sites have linkages with the associations of local farmers and war veterans. Those organisations can support farmers in terms of financial concerns or market power (such as helping farmers negotiate with dairy companies more easily or supporting them in receiving loans or funds from the banks).

Veterinary service can help farmers in vaccination and better management of diseases. A dairy cow costs a fortune when sick; without appropriate treatment, the sick cow may harm the herd's health. Being able to identify and monitor certain health conditions of dairy cattle properly can prevent unfortunate situations. In Moc Chau, the scheme of dairy cow and dairy price insurance has been implemented since 2004 by Moc Chau Milk in collaboration with BAOVIET (Thanh, 2016), one of the biggest insurance agencies in Viet Nam.[6] Each household pays from D200,000 to D600,000 for a calf, a heifer, or a cow. In October 2016, the insurance fund was raised to D20 billion. If there is risk to a cow, the examination board will check up and apply insurance calculation. The board includes representatives of veterinary services, labour unions, households, etc. If the cow dies, farmers will receive around D13 million to D15 million to buy a new calf. Since farmers manage the insurance fund, they will be paid immediately in case their cow dies. Sometimes, the Moc Chau Milk Company can also use the insurance fund to invest in production and pay the bank's interest rate. In addition, with

[6] http://www.baoviet.com.vn/Home

the milk price insurance policy, farmers only need to pay D50 per kg. If the milk price drops too low, 60% of the difference will be subsided.

The percentage of dairy farms in Moc Chau having linkages with veterinary service and insurance agents in Moc Chau is also higher than that in Ha Nam. The figures for Moc Chau are 12.5% and 22.5%, respectively, while those for Ha Nam are only 2.5% and 0%. It means that the linkage between dairy farmers and veterinary service is extremely weak in Ha Nam. Out of 40 surveyed farms, no farm has insurance for dairy cattle.

7. Cost–Benefit Structure of the Value Chain

Farm's Cost–Benefit Analysis

The income of dairy farmers mainly come from milk and accounts for a large proportion of their receipts. Milk receipts per kilogram of milk in Ha Nam were D13,080, accounting for 90.33% of total farm receipts. They were D1,340 higher than those of Moc Chau's D11,740.

In terms of stock sales dairy, the receipt in Moc Chau was a little higher than that of Ha Nam. But the sale of other stock in Ha Nam was higher than that of Moc Chau because besides dairy, Ha Nam often kept male calves for beef. In Moc Chau, the farmers could get some income from cow manure as they sold it to other agricultural farmers nearby.

Overall, the total farm receipts per kilogram of milk in Ha Nam was D1,950 or 15.56% higher than those of Moc Chau.

On production cost, the total variable cost in Ha Nam was much higher than Moc Chau. The total variable cost of Ha Nam per kilogram of milk was D9,920, while that of Moc Chau was only D5,760. In absolute terms, this cost in Ha Nam was D4,160 higher than in Moc Chau. In relative terms, it was 72.2% higher than Moc Chau. This could be explained by the much-higher feed cost in Ha Nam. Purchased feed cost in Ha Nam was D7,840/kg of milk, accounting for 79% total operating cost or 54.14% of total farm's receipts. In Moc Chau, purchased feed cost was D4,960/kg of milk, accounting for 39.5% of farm receipts, which was D2,880 lower than that in Ha Nam. Similarly, the fertiliser, herd, and shed costs in Ha Nam were also much higher than those in Moc Chau. Therefore, the feed-related costs and total variable costs of Ha Nam were quite high compared to those of Moc Chau.

Table 4.19: Farm's Costs and Benefits (D1,000/kg milk)

	Moc Chau District, Son La Province	Ly Nhan and Duy Tien Districts, Ha Nam Province
Cash receipts		
Milk receipts	11.74	13.08
Stock sales – dairy	0.14	0.06
Stock sales – other	0.38	1.34
Other receipts	0.27	0.00
Total Farm receipts	**12.53**	**14.48**
Production costs		
Purchased feed	4.96	7.84
Fertilisers	0.18	0.54
Feed-related costs	***5.14***	***8.38***
Margin over feed-related costs	***6.60***	***4.70***
Herd costs	0.16	0.81
Shed costs	0.35	0.69
Sundry variable costs (miscellaneous)	0.11	0.04
Other variable costs	***0.62***	***1.54***
Total variable costs	***5.76***	***9.92***
Gross margin – milk only	**5.98**	**3.16**
Gross margin – whole farm	**6.67**	**4.56**

Source: Survey results, 2017.

Although milk receipts per kilogram of milk in Ha Nam were higher than those in Moc Chau, the production cost of Moc Chau was lower than Ha Nam. This led to the margin on feed-related costs, gross margin on milk, and gross margin on the whole farm in Moc Chau being much higher than those of Ha Nam. This could imply that even if the farmers could not get high cash receipts, they could still get good economic results if they could manage their production costs well. Therefore, they should concentrate not only on the cash receipts but also pay more attention in reducing the production costs.

Distribution of Profits along the Value Chain

According to the results of the study, the added value seemed to be in favour of dairy farmers with the proportion of 40.6% of the added value along the chain in Ha Nam and 44.4% in Moc Chau. Following were the distributors who earned 32.1% in Ha Nam and 29.7% in Moc Chau; the processor obtained 22.2% in Ha Nam and 23.9% in Moc Chau; and the collector received only a small portion of 5.1% in Ha Nam and 1.9% in Moc Chau. However, to get the added value per kilogram of milk, the farmers had to invest a lot of fixed costs, calculated to around D2,500/kg of milk. In addition, they had to invest for a relatively long time; on average, it took about 3 months to build the breeding facilities and 2 years to raise cattle until the time of milking. Meanwhile, although the value-added ratio of collectors was quite low (5.1%), their initial investment cost was very low (only D55 in Ha Nam and D152 per kilogram of milk). In addition, they collected 2.0 to 2.5 tons of milk per day. Thus, even if the added value per kilogram of milk was relatively low, the actual benefit they receive was quite high.

Table 4.20: Value-added Distribution along the Fresh Milk Chain (per kg of milk)

		Dairy Farmer	Milk Collector	Dairy Plant	Distributor
Moc Chau District, Son La Province	Value added (D)	4,671	201	2,512	3,124
	Share of value added (%)	44.4	1.9	23.9	29.7
Ly Nhan & Duy Tien districts, Ha Nam Province	Value added (D)	4,550	572	2,484	3,600
	Share of value added (%)	40.6	5.1	22.2	32.1

Source: Survey results, 2017.

Distributors received a high proportion, reaching around 30% of added value of the chain, while they had to invest relatively lesser in a short period. In relative terms, they profited the most in the fresh milk chain.

8. Conclusion

Dairy farming has become an important economic activity of Vietnamese farmers even though Viet Nam has no tradition in it. However, its dairy sector is facing some difficulties in terms of milk quantity and quality due to the lack of professionalism and dispersal of dairy farms, and, more importantly, the weaknesses in the linkages among actors and stakeholders in the chain.

Dairy farming in Moc Chau has a longer tradition and a larger production scale and milk yield than in Ha Nam. Overall, the linkages between dairy smallholders and other actors, dairy smallholders, and relevant stakeholders in Moc Chau are stronger.

Moc Chau Milk Company, the only milk company in the region, is dominant in input supply. Conversely, there is no dominant input supplier in Ha Nam and dairy farmers prefer to buy inputs from local markets. In Moc Chau, 35% of surveyed farms have contracts with input suppliers and 27.5% receive support from them. However, there is no figure for Ha Nam.

Milk collectors in both study sites work independently from the dairy plants but, in Moc Chau, they unofficially work under the Moc Chau Milk Company. In Ha Nam, milk collectors do not work under the control of dairy plants (Vinamilk or FrieslandCampina). The percentage of dairy smallholders having contracts with milk collectors in Moc Chau is 42.5%, which is higher than that in Ha Nam (7.5%).

In both study sites, 100% of dairy smallholders had signed contracts with the milk companies. In terms of support, the percentage of those receiving loan and technical support in Moc Chau is also higher than in Ha Nam.

The linkages to relevant stakeholders in both Moc Chau and Ha Nam are quite 'loose'. The proportion of surveyed farms receiving priority loans or funds from the state and local authorities in Moc Chau is lower than in Ha Nam. Ha Nam dairy farms also commonly receive support from financial organisations. Moreover, dairy farms in Moc Chau seemingly receive more support from farmers' associations, and veterinarian service and insurance agents.

Especially in Ha Nam, no dairy farms have linkage with insurance agents, which is extremely risky in dairy cattle farming.

Although milk receipts per kilogram of milk in Ha Nam were higher than those in Moc Chau, the production cost of Moc Chau was lower than that of Ha Nam. This led to the margin on feed-related cost, gross margin of milk, and gross margin of the whole farm in Moc Chau being much higher than those of Ha Nam. Thus, even if the farmers could not get high cash receipts, they still get good economic results if they could manage their production costs well.

In numbers, the added value was higher for dairy farmers than other actors along the chain. However, in reality, the milk distributors profited the most in the fresh milk chain, followed by the collectors because milk distributors and collectors had to invest the smallest amount of capital.

Thus, considering the conclusions above, the following are highly recommended for each study site:

In Moc Chau District, Son La Province:

- Improve the involvement of relevant stakeholders. Because in Moc Chau, dairy farms are dependent mostly on the milk company so that their voice has little power. With the support of stakeholders, they can be more powerful.

In Ly Nhan and neighbouring Duy Tien districts, Ha Nam Province:

- Dairy farmers should more actively join in the chain. They need to sign longer-term contracts with milk collectors and interact more with dairy plants and actively ask for support from relevant stakeholders.
- Dairy plants need to consider providing more technical support and training courses for farmers. Those are the long-term assets to help boost milk quantity and quality and they are affordable by the firms' resources. Also, dairy plants in Ha Nam should try to sell inputs and consume outputs from dairy farmers.
- Stakeholders should improve the links by providing essential support for farmers; governments especially need to regulate and encourage all actors and other stakeholders to join the chain.

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Chapter 5
Marketing Mix of Milk and Dairy Products in Peninsular Malaysia

Chubashini Suntharalingam

1. Introduction

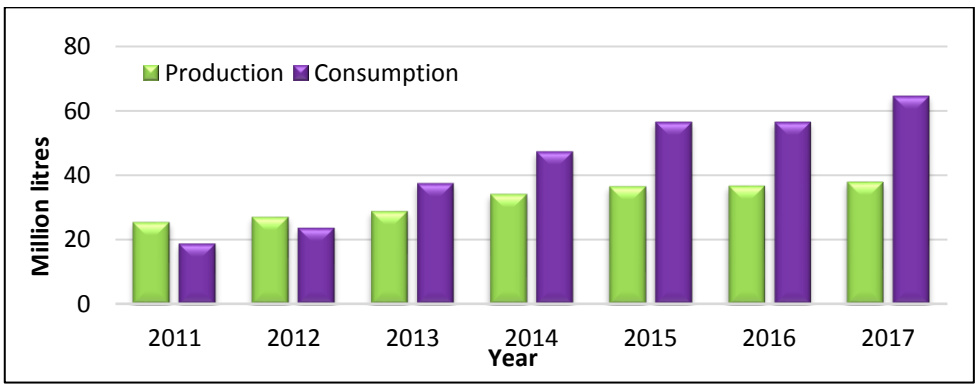
This case study on dairy marketing in Malaysia is commissioned by the Economic Research Institute for ASEAN and East Asia. This report was based on an extensive field work carried out among dairy farmers in the Southern Zone of Peninsular Malaysia. It encapsulates the marketing mix of milk and dairy products and elaborates on the marketing channels widely used by dairy farmers in distributing their products to consumers.

This is the first-ever study carried out in Malaysia focusing on the marketing and value-added aspects of milk and dairy products. Previous studies and publications on milk and dairy were mainly centred on the production aspect of dairy farming.

2. Production and Consumption of Milk in Malaysia

Globally, the outlook of milk and dairy consumption has decreased among developed countries while it is projected to increase in developing countries (FAO, 2013; Kearney, 2010). In Malaysia, domestic milk production is somewhat slow in its growth while consumption of milk has increased by about fourfold between 2011 and 2017 (Figure 5.1). In 2011, milk production was registered at 25.40 million litres and gradually increased to 36.60 million litres, demonstrating an increment of RM11.20 million litres in 7 years, reporting a growth rate of 5%. Meanwhile, milk consumption increased by 44.10 million litres in the same period; from 18.90 million litres in 2011, it sharply increased to 62.80 million litres in 2017. Milk consumption experienced an annual growth rate of 22% during the same period.

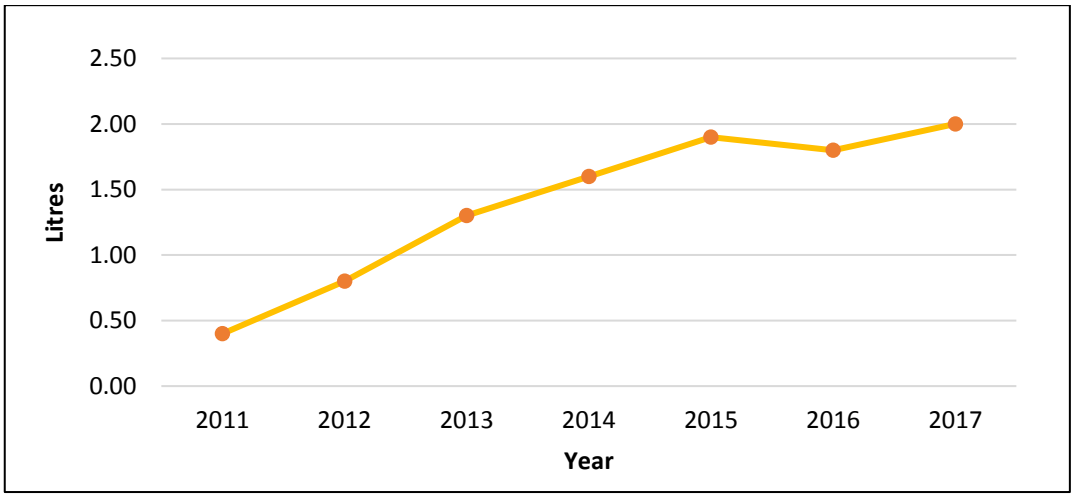
Figure 5.1: Milk Production and Consumption in Malaysia



Source: Department of Veterinary Services (2017 and 2018).

In 2011, an average Malaysian consumed 0.4 litres of milk in a year; at the end of the 6 years, the consumption per capita increased to 2litres/year (Figure 5.2). Rising incomes and increased awareness on the nutritional benefits of milk and dairy products, coupled with change of taste of preference among Malaysian consumers, have contributed to the growing demand for milk and dairy products (Sim and Suntharalingam, 2015).

Figure 5.2: Per Capita Consumption of Milk in Malaysia



Source: Department of Veterinary Services (2018).

3. Dairy Programmes and Policies in Malaysia

Programmes and policies related to the dairy sector in Malaysia are outlined in the country's various 5-Year developmental plans, beginning in 1966, and national agricultural policies, beginning 1984. The 5-year developmental plans outlined specific programmes for the dairy sector while the agricultural policies were broader in nature. A summary of these programmes and policies are discussed in this chapter. A comprehensive review of these programmes and policies can be drawn from the article by Sim and Suntharalingam (2015). Recent policy developments are included in this section to update on the latest programmes and policies concerning the dairy sector.

5-Year Developmental Plans

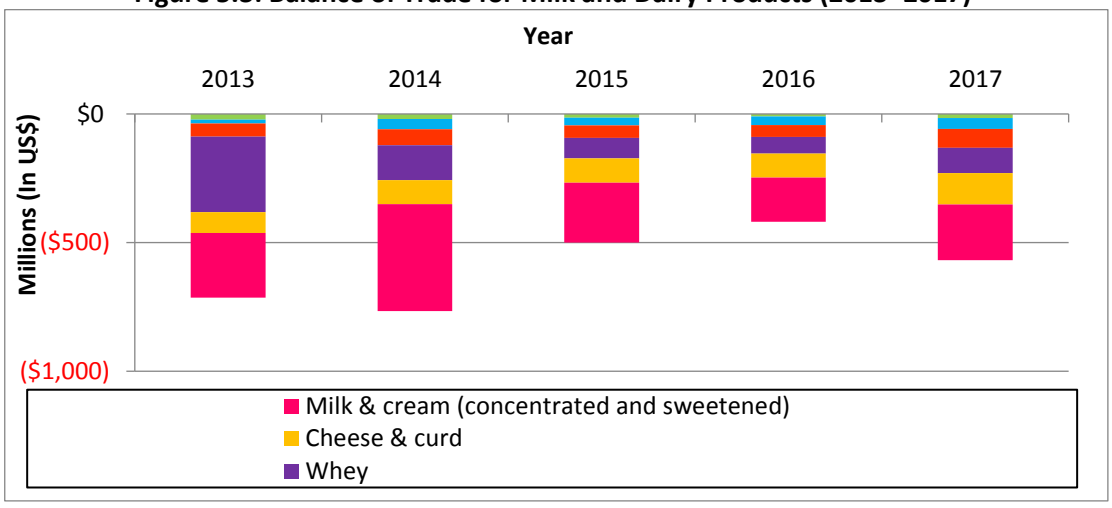
Between 1966 (the start of the First Malaysia Developmental Plan) and 1995 (the end of the Sixth Malaysia Plan), a period of 40 years, programmes and policies catered towards increasing the milk production capacity with the establishment of milk collection centres operated by the Department of Veterinary Services (Table 5.1). These programmes and policies were formulated to reduce the high reliance on imported dairy products. The department offered a range of services to dairy farmers, i.e. assistance in obtaining loans; testing of milk quality; and transporting, storing, and marketing of milk. However, from the Seventh Malaysia Plan (1996–2000) onwards, the country began to rely on imported dairy

products once again to compensate for the insufficient supply of local milk in the domestic market.

Over 4 decades, policies and programmes pertaining to the dairy sector were formulated and adopted to develop this sector into a sustainable one. However, as government shifted focus towards industrialisation beginning from the 1980s to the early 2000s, the agriculture industry took a back seat. The dairy sector specifically was hit hard as numerous dairy developmental projects which were planned since the First Malaysia Plan (1966–1970) were abandoned due to lack of proper implementation. The under-reporting pertaining to initiatives carried out during the First and Sixth Malaysia Plans failed to offer insights on the success or failure of these projects. Hence, the impact and outcomes of these initiatives were never ascertained to recommend strategies and corrective actions to be taken to strengthen the development of the dairy sector. Further, with the lack of governmental support to follow through with prior efforts, the supply of local milk continued to deteriorate, causing imported milk to flood the Malaysian market, and defeating the whole purpose of the dairy plans and programmes in the first place.

Imports of foreign milk and dairy products posed a disadvantage to local dairy farmers who were unable to market fresh milk at a competitive price. The balance of trade for milk and dairy products over the last 5 years (2013–2017) demonstrates that demand for value-added dairy products, such as cheese and curd, butter and other dairy spreads, is rising. To meet the demand for these products, Malaysia continues to import (Figure 5.3).

Figure 5.3: Balance of Trade for Milk and Dairy Products (2013–2017)



Source: United Nations (2019).

Realising the consequences of (mis)aligned policies pertaining to the dairy sector, the government stepped up its efforts to increase productivity and the quality of products by balancing production and importation of dairy products during the Tenth and Eleventh Malaysia Plans (2010–2020), pursuing the development of new high value-added products, encouraging good agricultural practices, and adopting modern agricultural technology. The government aspires an increase in productivity and development of high value-added products, a raise in farmers' income level, and a decrease in the dependence on imported dairy products, hence, resulting in a lower food import bill.

Table 5.1: Malaysia Developmental Policies on the Dairy Sector

	Malaysia Plan								
	First (1966–1970)	**Second (1971–1975)**	**Third (1976–1980)**	**Fourth (1981–1985)**	**Fifth (1986–1990)**	**Sixth (1991–1995)**	**Seventh (1996–2000)**	**Eighth (2001–2005)**	**Ninth (2006–2010)**
Status	—	Heavy reliance on imported dairy products in West Malaysia. Dairy Imports – valued at US$68.9 million (1970)	MAJUTERNAK (1972–1983) - Responsible for development and commercialisation of beef & dairy industry. Establishment of milk collection centres (MCCs) – stimulated production of fresh milk, supplementary income for smallholders	8 beef/dairy farms were established throughout the country – 12,000 heads of cattle	Milk production increased threefold (1980–1985), from 8.3 million litres to 28.9 million litres due to improved breeds, increase in the number of dairy farmers, improved dairy management	Production of milk was higher at 34 million litres (1990), increasing annually by 7.4%. Under the dairy programme, 39 new MCCs were established and others were consolidated to be more cost-effective	Milk production at 33.8 million litres (1995)	Milk production at 50 million litres (2000)	Milk production at 41.1 million litres (2005)
	—	—	During the Second Plan, 95% milk and milk product requirements were imported	Milk production increased with the implementation of dairy development programme for smallholders	During the Fourth Plan, 26 MCCs were established, bringing the total number of MCCs to 43	—	50% of total livestock imports is dairy produce	Import of dairy products – valued at RM1.4203 billion (2000)	Import of dairy products – valued at RM1.7451 billion (2005)
	—	—	—	—	Dairy Tech Centre established at Vet Institute at Kluang, Johor to train farmers and dairy technologists in	—	Import of dairy products – valued at RM727.6 million (1995)	—	—

					dairy techniques				
Focus area(s)	Development of two dairy colonies at Batu Arang, Selangor and Pantai, Negeri Sembilan	Establishment of three cattle multiplication units in West Malaysia and expansion of multiplication facilities at Kluang Station to develop large-scale cattle and dairy industry	Establishment of five beef/dairy farms in Johor, Kelantan, Terengganu, Sabah, and Sarawak	The Department of Veterinary Service will continue to implement the beef and dairy component – establish a 1,200-hectare farm at Sisek, Johor and nine MCCs.	Focus on beef and dairy programmes will be continued to increase self-sufficiency level. Improve facilities at MCCs; set up milk depots	Supply of milk estimated to grow annually by 14.8%, from 34 million litres (1990) to 68 million litres (1995). Improve efficiency and quality of fresh milk production. Further consolidation of MCCs	Government subsidies in livestock subsector will be gradually withdrawn.	—	—
	—	—	—	Expected milk production of 23.7 million litres by 1985. An ultra-heat-treated (UHT) milk processing plant will be set up at Air Hitam, Johor	—	—	—	—	—

Source: Economic Planning Unit, Malaysia.

National Agricultural Policies

The agricultural policies that were formulated followed closely Malaysia's development policies. The first phase of the agricultural policy (NAP 1) was to increase the income of farmers, and indirectly the country, by efficient utilisation of resources (Table 5.2). Subsidies for livestock were reduced, and privatisation was introduced to increase production and encourage mechanisation. This aspiration followed through to the second agricultural policy (NAP 2). Due to trade liberalisation, competition among similar agriculture-producing countries heightened, and farmers were requested to increase production while reducing cost. The third agricultural policy (NAP 3) was formulated as a result of the inclusion of agricultural products in the ASEAN Free Trade Area Agreement, coupled with the weakening of the ringgit, Malaysia's currency, during the Asian financial crisis. These scenarios attributed to the revision of NAP 2.

The recent National Agro-food Policy (NAFP) continues to re-emphasise the focus and plans of previous agricultural policies. Further, the importance of food safety and increasing income of 'agropreneurs' were also stressed. Nutritional security was also emphasised, in line with the Sustainable Development Goals. Understanding that personnel play an important role in the development of the agriculture sector, the government stressed the crucial need for increasing the competency level of workers in this sector. With skilled workers, the NAFP aims to reduce the dependence of unskilled labour by adopting modern technologies in the farms.

Table 5.2: National Agricultural Policies

NAP 1 (1984–1991)	NAP 2 (1992–2010)	NAP 3 (1998–2010)	National Agro-food Policy (2011–2020)
Objective: Maximise income from agriculture for farmers and the country through efficient use of resources	Objective: Increase production, competitiveness, and sustainable production	Objective: Enhance food security, increase productivity and competitiveness, deepen linkages with other sector, venture into new frontier areas, conserve and utilise natural resources sustainably	Objectives: Address food security and safety to ensure competitiveness and sustainability; increase income of 'agropreneurs'
Subsidies for crops, livestock, and fishery except paddy, pepper, and sago were reduced.	Policy on research and development emphasised, commercialisation encouraged	Policy for large-scale operation and commercialisation formulated	Incorporated strategies that are in line with nutritional aspects of food system
Privatisation, large-scale production encouraged, mechanisation encouraged	Self-sufficiency not encouraged, no comparative advantage	Private sector involvement increased	Efforts also taken to empower human capital and ensure sufficiently skilled labour force – modern technology and mechanisation encouraged
Increase in cost of production and some food crops were sidelined. Cash crops seemed to be prioritised.	Shift from agricultural economy to industrial economy, agriculture was considered non-productive –labour and capital intensive		

Source: Ministry of Agriculture and Agro-based Industry, Malaysia.

4. Case Study on Dairy Marketing in the Southern Zone of Peninsular Malaysia

Background

As mentioned, this case study aims of offer some insights into the marketing aspect of the milk and dairy products in the Southern Zone of Peninsular Malaysia. Hence, this report encapsulates the marketing mix of milk and dairy products and elaborates on the marketing channels widely used by dairy farmers in distributing their products to consumers.

Field interviews and data collection involved 74 dairy farmers in the Southern Zone of Peninsular Malaysia, comprising the states of Johor, Melaka, and Negeri Sembilan (Table 5.3). Semi-structured questionnaires were used in data collection. Farmers were encouraged to share their thoughts in an open discussion to gain a deeper understanding of the marketing process.

Table 5.3: Respondents of the Study

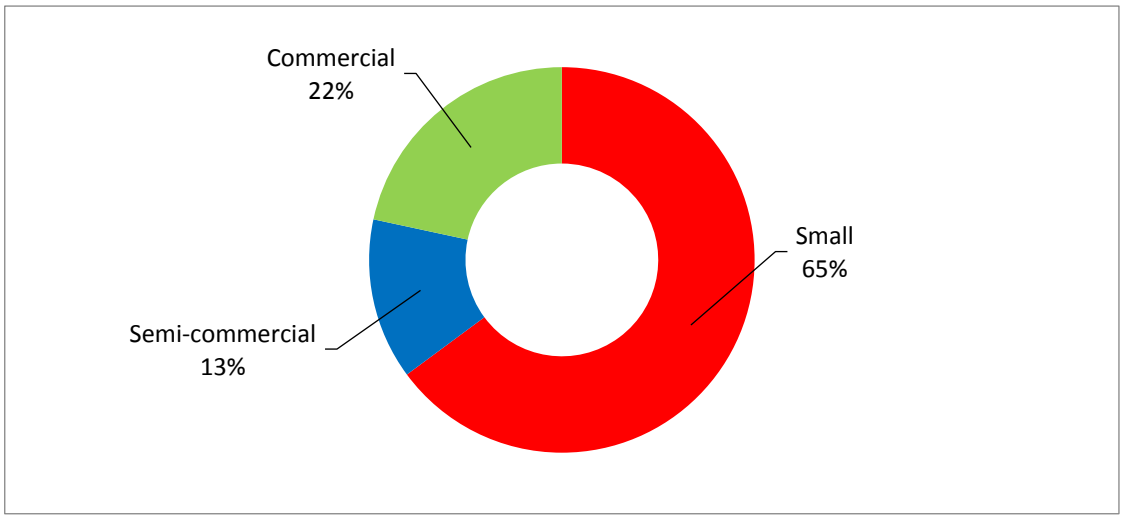
State	Number of Farmers
Negeri Sembilan	21
Johor	44
Melaka	9
Total	**76**

Source: Author's compilation.

Classification of Dairy Farms

In Malaysia, dairy farms are classified based on the number of adult -females on a farm. A farm with 30 or less adult-female cows is classified as small scale. Semi-commercial farms have between 31 and 49 adult-female cows while large-scale farmers, commonly known as commercial farmers, manage 50 and more adult-female cows. Majority (65%) of dairy farms in Malaysia are operated on small scale, followed by commercial scale (22%) (Figure 5.4).

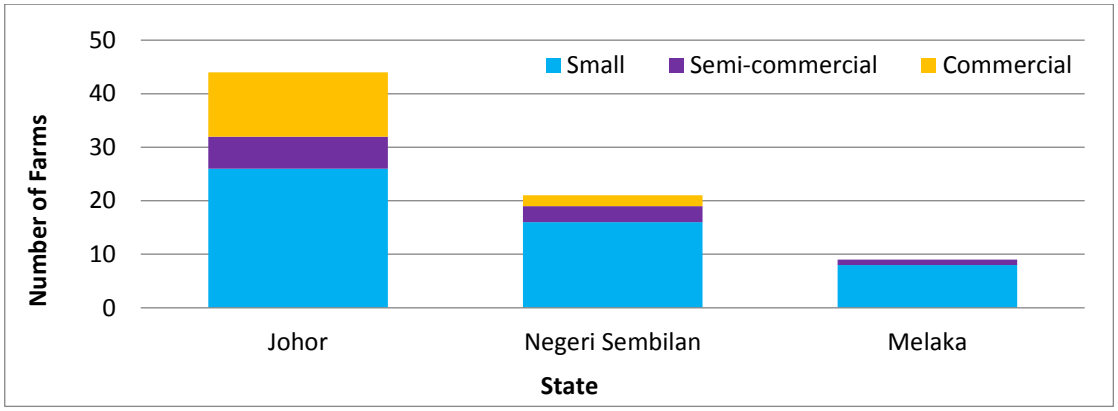
Figure 5.4: Classification of Dairy Farms in the Southern Zone of Peninsular Malaysia



Source: Author's compilation.

Only Johor and Negeri Sembilan have commercial farms while all three states have semi-commercial farms (Figure 5.5).

Figure 5.5: Distribution of Dairy Farms in the Southern Zone of Peninsular Malaysia



Source: Author's compilation.

Average Milk Production

Generally, the Southern Zone produces about 12,795 litres/day. Commercial farms, which are few, produce the most milk (6,295 litres). This accounts for 49% of Southern Zone milk production, followed by small-scale farmers at 35% (4,477 litres of milk), and the remaining 16% is produced by semi-commercial farms (2,023 litres of milk). Milk production in Johor is the highest among the three states, depicting a volume of 7,815 litres, followed by Negeri Sembilan (3,810 litres) and Melaka (1,170 litres). Large milk production in Johor is due to the establishment of commercial scale farms. They produce about 64% of total milk produced in

this state, amounting to 4,995 litres/day. Meanwhile, in Negeri Sembilan, milk production is closely distributed among the three scales of farm operation with an average of 1,270 litres/day/farm. In Melaka, small-scale farms dominate milk production with 970 litres/day

Types of Milk and Dairy Products

The largest volume sold is raw milk while yoghurt is the least volume sold (Table 5.4). The value-added dairy products commonly sold in the Southern Zone market are flavoured milk and yoghurt. Ninety-one percent (91%) of milk produced is sold raw or fresh, without any processing involved. Only 9% of total volume of fresh milk is added value to produce three types of dairy products: yoghurt, flavoured milk, and ghee.

Demand for yoghurt is in all three states. Flavoured milk has a higher demand in Negeri Sembilan. Generally, the processing involved in producing these dairy products vary between minimal to extensive. Processing milk into flavoured milk and yoghurt is relatively easy. Commercial farmers produce all the flavoured milk in Negeri Sembilan and a substantial amount of yoghurt in Johor. Nevertheless, small-scale farmers in all three states contribute to the production of yoghurt. Most often, it is the women at home who are responsible for yoghurt production. Production of ghee, which requires elaborate processing efforts, is also carried out by women; it is only produced by farmers in Negeri Sembilan as and when there is a demand for it.

Table 5.4: Types of Milk and Dairy Products Distributed in the Southern Zone of Peninsular Malaysia (RM/litre)

State	Total Fresh Milk	Raw Milk	Flavoured Milk	Yoghurt (in Milk Equivalent)
Johor	7,815	7,331	0	484
Negeri Sembilan	3,812	3,110	646	52
Melaka	1,170	1,145	0	25
Total	**12,797**	**11,586**	**646**	**561**

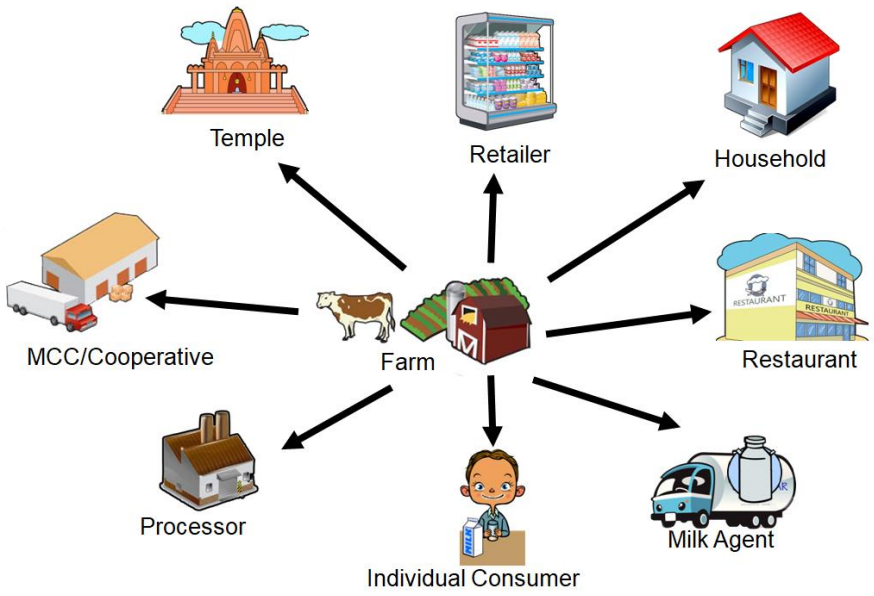
Source: Author's compilation.

Promotion and Marketing Channel of Milk and Dairy Products

Milk from small-scale farms is distributed via eight marketing channels (Figure 5.6), while milk from commercial farms is sold primarily to cooperative/milk collection centres (MCCs), processors, restaurants, agents, and retail outlets. Small-scale farmers have established close relationships and trust among individual consumers and households. Individual consumers are those who live close to the farm. They frequent the farm to obtain their supply of milk and dairy products. Meanwhile, for households, milk and dairy products are delivered at their doorsteps. The demand for milk and dairy products is much more stable for households compared to individual consumers. Yoghurt and milk are the two items frequently used for prayers; hence, there is a high demand for them in temples. While the demand for these

items are relatively stable throughout the year, occasionally during major festivals, demand increases and prices skyrocket. Since prices of milk and yoghurt during these periods are higher, farmers tend to divert their milk and yoghurt sale towards these requests which ultimately assist farmers in increasing their income.

Figure 5.6: Marketing Channel of Raw Milk in the Southern Zone



MCC = milk collection centre.
Source: Author's compilation.

In recent times, to sustain in the milk farming business, small-scale farmers are diversifying their markets by negotiating with restaurant and retail outlet owners to purchase from them. Generally, no formal promotional activities are carried out for the marketing of local fresh milk and dairy products. Majority of farmers market their milk and/or dairy products to close friends and relatives or to those who are in close contact with their friends and family members. The mode of promotional activities is often carried out via word-of-mouth.

Price of Milk and Dairy Products

This section offers some insights into the marketplace and ex-farm price for milk (fresh and flavoured) and dairy products (yoghurt, ice cream, and ghee).

- Market and ex-farm price for fresh milk

Individual consumers pay a higher ex-farm price for a litre of milk in Johor (RM4.30/litre) and Negeri Sembilan (RM4.67/litre), while in Melaka, processors pay the most with RM4.83/litre (Table 5.5). Temples in Johor pay the second-highest ex-farm price for milk with RM4.19/litre,

while in Negeri Sembilan, milk delivered to households fetch the second-highest price with RM4.25/litre. In Melaka, restaurants offer the second-highest price for a litre of milk, RM4.30.

The biggest difference in average ex-farm milk prices between the three states is milk sold to processors in Melaka (RM2.20/litre). The least difference is milk sold to retailers. Individual consumers in Johor and Negeri Sembilan and processors in Melaka have a high purchasing power for raw milk.

The formal market is where milk is delivered to cooperatives/MCCs operated by the Department of Veterinary Services; informal markets cover markets other than cooperatives/MCCs. The difference in ex-farm prices for formal and informal markets for a litre of milk sold is RM1.65 for Johor, RM2.17 for Negeri Sembilan, and RM1.93 for Melaka. Informal markets (individual consumers, processors, temples, and restaurants) offer the best ex-farm prices for fresh milk.

Cooperatives/MCCs are critical players in the formal distribution channel of fresh milk. However, their purchase prices are kept lower than the informal market. This is primarily attributable to the fact that a large quantity of milk from farms are delivered to the MCCs and cooperatives/DVS have negotiated with large processors to purchase the milk on a contractual basis. Thus, the price of milk is already predetermined. Although the price offered by the formal market is not as competitive as that of informal markets, farmers are assured of a stable income. They can minimise market risk and focus on managing their farms.

Commercial farmers prefer this mode of sale since they can profit with the large volume of milk produced in their farm. Additionally, due to the large volume of milk, it is also convenient for them to deliver milk to one location rather than to many other outlets. This approach does not only save them time but also help them reduce transactional costs.

Small-scale farmers, on the other hand, prefer to sell milk informally because their milk production is low. Hence, to capitalise on the quality of milk they produce, they can fetch a higher price in informal markets. However, to sell informally, they should seek markets on their own. This is the trade-off they must make, i.e. spend time and money in managing their farms (minimise cost) or in seeking alternative markets to increase income (thereby maximizing profit). Small-scale farmers will benefit if the government intervenes and assists them establish market connectivity to improve their income capacity.

Table 5.5: Marketplace and Average Ex-farm Price of Fresh Milk (RM/litre)

Marketplace	Johor	Negeri Sembilan	Melaka	Difference (Max–Min)
Temple	4.19	3.83	4.00	0.36
Household	—	4.25	3.60	0.65
Agent	2.97	3.44	—	0.47
Restaurant	3.69	3.83	4.30	0.61
Cooperative/milk collection centre	2.65	2.50	2.90	0.40
Retail outlet	3.30	3.40	—	0.10
Individual consumer	4.30	4.67	—	0.37
Processor	2.69	2.63	4.83	2.20

Source: Author's compilation.

- Market and ex-farm price for yoghurt

Generally, individual consumers from the three states offer a relatively high price to consume yoghurt (Table 5.6). The average ex-farm price of yoghurt sold to individual consumers in Johor fetches a relatively high price compared to other marketplaces within the three states. One possible reason for this higher price of yoghurt sold in Johor can be attributed to Singaporean consumers. In recent years, the currency exchange rate between the Singapore dollar and Malaysian ringgit has resulted in Singaporeans having higher purchasing power, which enables them to exercise this power by buying similar quality products available in Singapore from Johor. Johor, being very near Singapore, is the second–most visited state by Singaporeans (United Nations, 2019) who drive across to Johor during weekends for their weekly/monthly grocery shopping. Further, many Malaysians living in Johor commute daily to Singapore for work. With a salary in Singaporean dollar, they are willing to spend a little more on quality products as well. The high price paid by individual consumers offers an advantage to dairy farmers in Johor to increase their income level.

Yoghurt is easily available and accessible in numerous marketplaces in Johor. However, the picture is different in Melaka as the only distribution channel of yoghurt is via individual consumer. The lack of an efficient cold chain system could be a limiting factor in marketing yoghurt to a wider distribution network in Melaka.

In the marketplaces where yoghurt is available, the prices offered by Johor outlets are observed to be comparatively higher than those offered in Negeri Sembilan, except for retail outlets. Retail outlets in Negeri Sembilan are not only able to charge a higher price than Johor retail outlets but also among other outlets in Negeri Sembilan. This could probably be due to two reasons. One is that retail outlets in Negeri Sembilan has better cold storage facilities. Thus, due to food safety concerns, consumers are more confident in purchasing such perishable item from these outlets. Another probable reason is the low volume of farm-fresh

yoghurt supplied to retail outlets. In any event, a farmer generates more income if he sells to a retail outlet in Negeri Sembilan.

Table 5.6: Ex-farm Prices of Yoghurt (RM/litre)

Marketplace	Johor	Negeri Sembilan	Melaka	Difference (Max–Min)
Temple	6.00	—	—	—
Household	6.66	5.50	—	1.16
Restaurant	6.00	3.83	—	2.17
Retail outlet	4.88	6.75	—	1.87
Individual consumer	8.00	6.00	6.00	2.00

Source: Author's compilation.

- Market and ex-farm price for flavoured milk and ghee

Flavoured milk is mainly produced by commercial farms in Negeri Sembilan and sold to processors and private agents with an average ex-farm price of RM1.93 for 200 ml (Table 5.7). The flavoured milk is sold at night markets or selected retail outlets. Ghee is produced by small-scale farmers and is sold to individual consumers for RM10/250ml. The price of ghee is relatively high due to the following reasons:

(i) It is produced only if there is a request for it.
(ii) Only high quality of milk is used to make ghee.
(iii) A large amount of effort is required to produce ghee as the process is generally time consuming.

Table 5.7: Ex-farm Price for Flavoured Milk and Ghee

Dairy Product	Negeri Sembilan
Flavoured milk (200 ml)	1.93
Ghee (250 ml)	10.00

Source: Author's compilation.

- Market and ex-farm price of other dairy products and waste

Dairy farmers also market other dairy products such as ice cream and jelly when there is a demand and the price of the products is determined then. Cow dung is dried and used as fertiliser and is also sold to those who demand for it.

5. Discussion and Conclusions

In recent years, the dairy sector in Malaysia has continued to lag in terms of productivity and product diversification and quality, hence, increasing the importation of milk and dairy products. Further, the demand for milk and dairy products continues to increase annually; in return, due to the inability to adequately supply domestic milk to the market, Malaysia's dairy import bill has continued to escalate, contributing to the deficit of milk and dairy trade balance.

Programmes and policies on milk and dairy have been in place for almost 6 decades, yet Malaysia has been unable to sufficiently supply milk and dairy to her population. This is indeed troubling.

Small-scale farmers prefer to market milk and dairy products via informal markets, i.e. individual consumers, households, and temples. Small-scale farmers also spend a lot of effort establishing relationships with their customers; once trust is gained, they tend to have regular customers. The findings of this study confirm the findings of Boniface et al. (2010) and Rauyruen and Miller (2007) which reported that consumer loyalty is a result of trust established with suppliers. Informal markets pay a higher price for milk and dairy products as they demand quality products. However, farmers must make a trade-off: either reduce production costs or maximise profits when they decide to seek informal markets to sell their products. It would be helpful if the government formulates intervention strategies to assist these farmers establish contacts with informal markets so farmers can focus on delivering quality perishable products rather than spending so much time seeking new markets.

While majority of commercial farms prefer the formal market, i.e. cooperatives/MCCs, they also sell at informal markets, such as retail outlets, processors, milk agents, and restaurants. The formal market pays a relatively low price for milk compared to the informal market. However, commercial farmers can make up the loss in price by producing more milk.

Individual consumers from Johor and Negeri Sembilan and processors from Melaka have a high purchasing power and are thus willing to pay a higher price for milk and dairy products available in the market.

The Southern Zone of Peninsular Malaysia is considered the most productive zone for milk production in Peninsular Malaysia. The dairy landscape of this zone is rather interesting. A small population of commercial farms produce the largest volume of milk while a large population of small-scale farms produce a low volume of milk. Nevertheless, small-scale farms have been operating for many decades and have proven to be resilient under lagging conditions that have hit the dairy sector for over 6decades. However, their sustainability is of concern under current conditions, i.e. climate change and Malaysia's economic development.

With the significant number of small farm operations, it is crucial that an efficient cold chain system for milk and dairy products is established to store and transport these perishable items. Most small-scale dairy farms are in rural areas and farmers have to travel a distance to get to the nearest market or MCC (often located in town). Further, majority of them

transport fresh milk in a churn on a motorbike under a hot tropical climate. Under such extreme conditions, there is a high risk of contamination which ultimately affects the shelf life of milk. Hence, time is essential and an efficient low-temperature storage system will definitely help small-scale dairy farmers tackle food safety concerns, ultimately assisting them sustain their milk operation.

Small-scale farmers generally manage the farm themselves or with the help of household members or, in some cases, of unskilled foreign workers. They cannot hire skilled labour as it will add to their operating costs and eventually increase their production cost. While some small-scale farmers have begun to venture into upstream processes, such as processing yoghurt and ghee, only with the assistance of a female family member can this process be sustained.

Additionally, managing a dairy farm is not an easy task. There are no days off for a small-scale dairy farmer. Dairy cows must be milked every day, failing which will cause the cows to be in pain and can result in infection. Small-scale dairy farmers have a social relationship with their dairy cow and they take their responsibilities on their cows seriously. Most often, cows are treated as part of the farmer's family. Additionally, with the enforcement of the Malaysia Animal Welfare Act 2015, government officials are beginning to emphasise the importance of animal welfare to livestock farmers. Farmers are reminded to be kind and compassionate to their animals and to not abuse them to generate higher income (Suntharalingam, 2015).

Among other tasks, small-scale farmers have to seek inputs for the farm and cows, feed the cows, offer medical assistance, milk the cow, clean the farm transport milk to their customers, and establish and manage relationships with their buyers. These leave the farmer with little or no time to venture into producing value-added dairy products. They understand the huge income potential that can be gained from value-added products. But with time constraint and without adequate support on the farm, they can only manage the farm to sustain operations.

The types of milk and dairy products that are readily available are fresh milk, yoghurt, and flavoured milk. Depending on requests, ghee, ice cream, and jelly are also produced. Cow dung or waste generated by dairy cows also have demand. But the farmers tend to spend more time selling milk instead of focusing on transforming waste into wealth, since cash flow is of paramount importance to them. This study has demonstrated that the value-adding activity in the milk and dairy sector in Malaysia has a long way to go. It requires concerted effort from all stakeholders involved in the value chain to reach this goal. Malaysian farmers would indeed benefit to learn from dairy farmers in other countries on the best practices to realise this goal. The government sector can play a role in ensuring that programmes and policies pertaining to milk and dairy production are implemented well and that dairy projects must result in beneficial outcomes that would assist both the farmers and the nation through increased income and reduced trade deficit of milk and dairy products. The private sector can also assist by nurturing and mentoring farmers to increase the quality of milk production for milk farmers to have better market access and to ensure that milk supplied to the markets are safe to be consumed.

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Chapter 6

Indonesian Seafood Supply Chain

Suadi[*] and Eiichi Kusano

1. Introduction

The total population of Indonesia in 2017 reached 263,991,379 people; it is still growing about 1.1% annually.[1] The growing population needs a measurable and good food supply system because, based on the consumption patterns of Indonesians, food expenditure is still very dominant, especially in the lower class of society. The World Bank indicated that Indonesian expenditure for food and beverages on average was about 49%.[2] Nevertheless, the expenditure of the lowest class for food reached 56%. The monthly per capita expenditure in 2013–2017 also showed no significant change of proportion of expenditure for food and non-food consumption. Both expenditures share half of household expenditures. Processed food and drinks share 32.7%, followed by cereals (11.6%) and fish (7.7%). In addition, food expenditure increased on average about 8.6% per year.

The Indonesian economy is still growing and has potential to grow faster. Indonesia's gross domestic product (GDP) at current US$ reached $1,015.54 billion with annual GDP growth about 5.1%. Its GDP per capita at current US$ also increased from $3,113.4 in 2010 to $3,846.86 in 2017. The World Bank projected that Indonesia's GDP may grow to 5.3% in 2021.[3] Unfortunately, the role of agriculture, forestry, and fishing as the main food production sector tends to decline year to year, with contribution only at 13% of GDP (value added) in 2017, from 14% in 2010. On the other hand, importation of certain commodities has been increasing remarkably in order to fulfil the country's food needs Indonesia imported various food products such as salt for half of the total national need, 70% of soybean, 12% of corn, 15% of peanuts, 90% of garlic, 30% of beef, and 70% of milk (Husodo, 2014). FAOSTAT also depicted that based on data of net trade, the value of imported food, particularly for cereals and preparations, fruit and vegetables, meat and meat preparations, and dairy products (milk equivalent) is higher than export, except for fish and seafood that are mostly produced for export. The net trade of fish increased from US$1,566 million in 1995 to US$3,503 million in 2016.[4]

According to the International Trade Centre's top 20 export potential products of Indonesia to the world, seafood products, particularly frozen shrimp and prawn, placed tenth. The product performance shows the big potential to occupy the global market (unrealised

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[1] https://data.worldbank.org/country/indonesia?view=chart

[2] http://datatopics.worldbank.org/consumption/country/Indonesia

[3] Ibid no. 2.

[4] http://faostat.fao.org/static/syb/syb_101.pdf

potential of 42%), if the technological level improved and the prices are better or stable.[5] As an archipelagic state, Indonesia has a great opportunity to develop its marine and fishery sector to produce food from the sea. For capture fishery development, the maximum sustainable yield is projected to reach 9.9 million tons/year, based on the recent stock assessment,[6] with total production of 6.4 million tons in 2017.[7] Meanwhile, the potential area for aquaculture, which includes mariculture, is about 12.1 million ha; brackish water culture, 3.0 million ha; and freshwater cultivation, 2.2 million ha – capable of producing 16.7 million tons. The potential of aquaculture is not only based on the two-dimensional aspect of the space, but three dimensions of the water area (including the depth of water). This fact shows the big potential of fish and seafood production in Indonesian fishery. However, there are several challenges in promoting good management of the fish business: some are caused by the country's archipelagic state with scattered islands and production centres, limited production infrastructure and supporting facilities, high logistic cost, low product quality, and lack of human power. As an example, the recent report of the EU-Indonesia Business Network (EIBN) showed the main production site in the eastern part of Indonesia (share 65% of national production) still lacks cold storage. The cold storage is available in the city around the provincial capital instead of fishing ports (EIBN, 2016). As result, cold storages are left empty most of the time because they are far from the fishing port or lading place.[8]

This chapter aims to describe the situation of the Indonesian seafood supply chain through literature and case studies on different industry and seafood commodities. This chapter covers the following issues: overview of roles and trend in food retailing, food consumption and regulation, case studies of seafood supply chain, and challenges and opportunities of Indonesian seafood development.

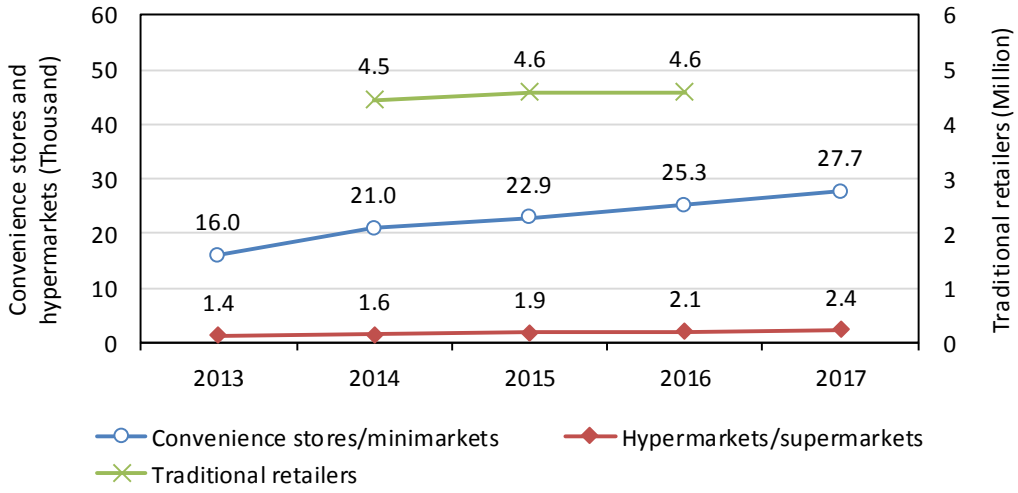
2. Retail Market and Food Retailing in Indonesia

Modern retailers in Indonesia total about 30,000 units, with total company or owner of about 600. Only 25% of retailers transformed to digital; about 75% still rely on the conventional approach. Various modern retailers in Indonesia include modern stores, department stores, boutiques, factory outlets, specialty stores, trade Centres, and malls/supermalls/plazas. However, the main market in Indonesia is the traditional market, numbering more than 4.5 million. USDA (U.S. Department of Agriculture) (2017) showed that the total number of outlets is also growing, such as convenient stores (15.6% per year) and hypermarkets (11.3%). However, traditional grocery retailers are not growing; they even declined in 2011–2016. The modern food retailers are owned by both domestic and multinational companies. The growing interest of consumers in modern outlets because of their good performance, better nutritional information, safe-to-eat products, and convenience will soon result in the modern food retailers' capturing the traditional food retailers' market share (Toiba et al., 2013). As a

[5] http://www.intracen.org/country/Indonesia/General-Trade-Performance
[6] Ministry of Marine Affairs and Fisheries Decree Number 47/2016
[7] http://sidatik.kkp.go.id/publikasi/index/12
[8] https://indonesien.ahk.de//fileadmin/AHK_Indonesien/Publication/PDF_Publication/-EIBN/EIBNSecRep2016_ColdStorage_FULL-19984.pdf

result, the rapid growth of the modern market has challenged the existence of the traditional market. Thus, the traditional market needs to adapt to the changing consumer choice while government support for innovative strategies is needed.

Figure 6.1: Number of Retailers in Indonesia



Source: USDA (2017).

Until 2017, almost 90% of the modern markets consisted of two groups, Alfamart (42.57%) and Indomaret (47.61%). These two convenience store groups increased in number, with Alfamart growing 2.04% and Indomaret, 1.97%.[9] However, other big stores like Ramayana, Giant, and Lottemart decreased.

The market value of supermarkets and hypermarkets was reported to be growing. In 2015–2018, supermarkets grew about 8.84% (compound annual growth rate [CAGR]), and hypermarkets at about 9.43% (CAGR). Unfortunately, the market value of department stores decreased by about 11.07% (CAGR), from Rp92.38 trillion in 2015 to Rp64.62 trillion in 2018. Some factors caused the decline, such as shift in buying behaviour to e-commerce, an increase in fixed costs which triggers a decline in competitiveness, and slowdown of the national economy. Some department stores started to close many of their outlets. However, the market value of the e-commerce industry grew 66.45% (CAGR) for 2015–2018, from Rp16.22 trillion in 2015 to Rp72.75 trillion in 2018 (USDA, 2017). This increase was also supported by the development of e-commerce in various types such as marketplace, customer-to-customer, and business-to-business e-commerce. The main advantages of e-commerce are cutting distribution and logistics lines, streamlining fix costs, and providing more product variations.

In general, the market value of the modern retail industry in Indonesia was estimated to grow 10.15% (CAGR) for the period 2015–2018, from Rp289.6 trillion in 2015 to Rp386.97 trillion in 2018. Food segment and fast-moving consumer goods or FMCG (for minimarkets,

[9] http://duniaindustri.com

supermarkets, and hypermarkets) were estimated to grow 12% (CAGR) in 2015–2018, from Rp181 trillion in 2015 to Rp249.6 trillion in 2018. This food segment and FMCG are classified as stable growth supported by the expansion of outlets. Table 6.1 shows the growth trend of modern retail market in Indonesia.

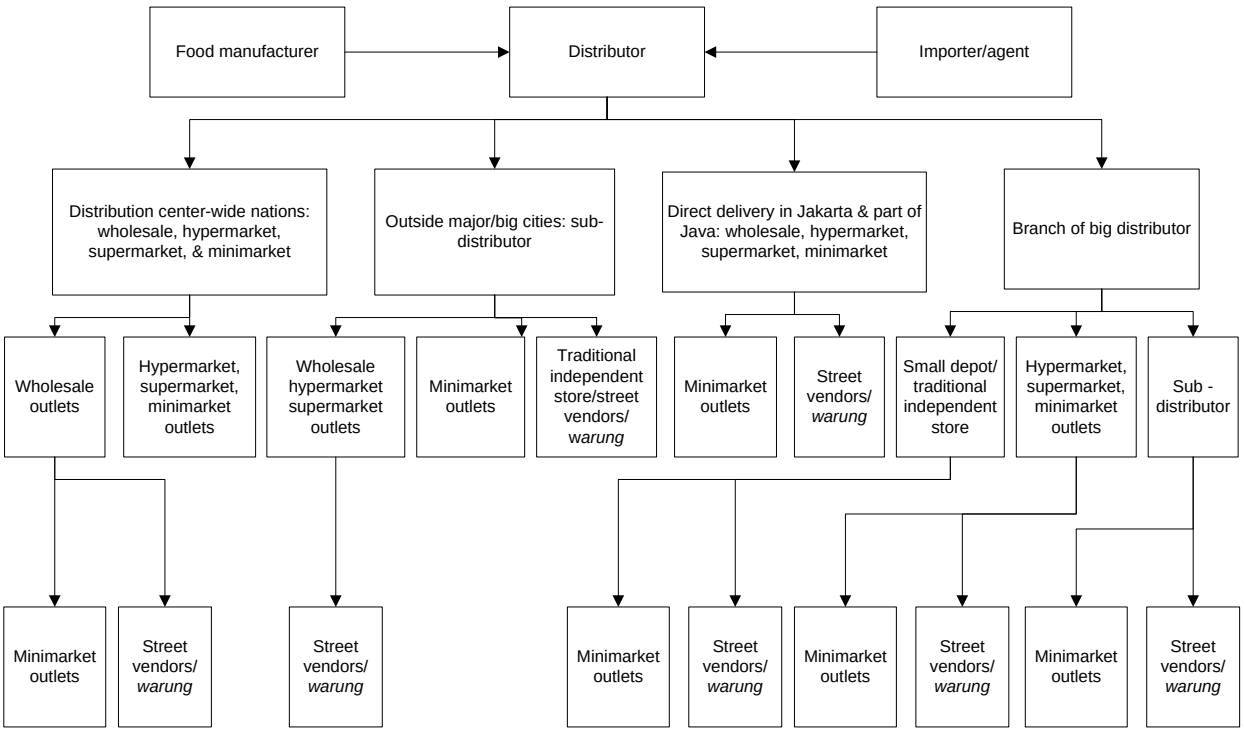
Table 6.1: Growth Trend of Modern Retail Market in Indonesia

Items	2015	2016	2017	2018
Overall market value of retail modern industry (Rp trillion)	289.6	314.82	342.73	386.97
Growth (%)	-	8.7	8.86	12.9
Market value of food & FMCG retail (Rp trillion)	181	199.1	219	249.6
Growth (%)	-	10	12	14
Portion of food retail & FMCG to overall market (%)	62.5	63.24	63.9	64.5
Market value of department store to total retail industry (Rp trillion)	92.38	85.89	70.09	64.62
Market value of e-commerce (Rp trillion)	16.22	29.83	53.64	72.75
Growth (%)	-	83.91	79.81	35.63
Portion of e-commerce to the total food & FMCG retail (%)	5.6	9.48	15.65	18.8
Market value of minimarket (Rp trillion)	101.36	112.49	125.27	146.01
Growth (%)	-	10.98	11.36	16.55
Portion of minimarket to total food & FMCG retail (%)	56	56.5	57.2	58.5
Market value supermarket (Rp trillion)	36.2	38.82	42.05	46.67
Growth (%)	-	7.23	8.32	10.98
Portion of supermarket to total food & FMCG retail (%)	20	19.5	19.2	18.7
Market value hypermarket (Rp trillion)	43.44	47.79	51.68	56.92
Growth (%)	-	10.01	8.14	10.14
Portion of hypermarket to total food & FMCG retail (%)	24	24	23.6	22.8

FMCG = fast-moving consumer goods.
Source: http://duniaindustri.com

Related to the distribution channel of the food sector in the retail industry, the GAIN Report (USDA, 2017) showed that food supply may come from the local/domestic food suppliers and import. The food will then be placed and distributed by distributors to various channels. From the distributors, it will be channelled to the wholesalers, hypermarkets, supermarkets, and minimarkets.

Figure 6.2: Typical Indonesian Retail Food Sector: Distribution Channels



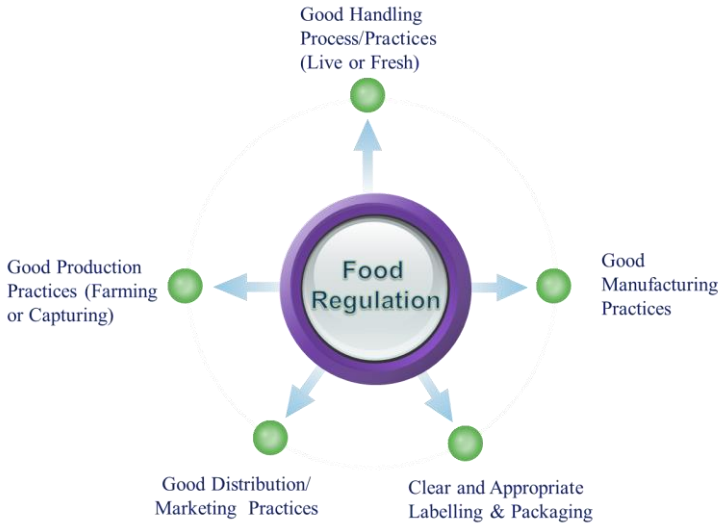
Source: USDA (2017).

3. Food Regulation

Food policy in Indonesia is basically regulated by Law No. 18/2012 on Food. According to this law, food supply must be sufficient; safe; of high quality; affordable; and in harmony with religion, beliefs, and culture. Domestic food production should be prioritised over imports (EIBN, 2017). There are also Government Regulation No. 69/1999 on Label and Food Advertising and Government Regulation No. 28/2004 on Food Safety, Quality and Nutrition. In addition are various related ministerial and other institutional decrees related to food issues.

The food regulations cover the issues on food safety, food quality and nutrition, food importation and exportation into and out of Indonesian territory, control and supervision, and community participation. Food regulations cover all aspects of the food/fish business process. In addition, new Law No. 33/2014 on the halal product assurance will also affect the food business process. Article 4 of Law No. 33 clearly states that products that enter, circulate, and trade in the territory of Indonesia must be halal certified. Therefore, halal certification is become an important instrument in the food business process in Indonesia.

Figure 6.3: The Regulation Aspects of Food Policy in Indonesia



Source: Author.

4. Current State of Indonesia's Fish and Seafood Industry

Fish does not only play an important role in income generation, employment, nutrition, and food security for many countries; it has also become a source of foreign currency earnings, particularly for many developing countries. By definition, fishery in Indonesia is defined as all activities relating to the cultivation and utilisation of fish resources and their environment, starting from pre-production, production, processing, up to marketing. Therefore, fishery is a business system that manages fish from the pre-production to the end market.

Exports of fish by developing countries, including Indonesia, rose from 37% of world trade in 1976 to 54% of total fishery export by 2014, valued at US$80 billion. In 2014, fishery net export revenues in developing countries reached US$42 billion, higher than other major agricultural commodities and even combined (FAO, 2016).[10]

China is a main fish producer and the largest exporter country. Norway places second as it supplies diverse products to the global market. Viet Nam is the third major exporter, overtaking Thailand (FAO, 2016). As an exporter country, Indonesia is still less competitive than Viet Nam and Thailand even though it is the second-largest producer of marine fish in the globe after China.

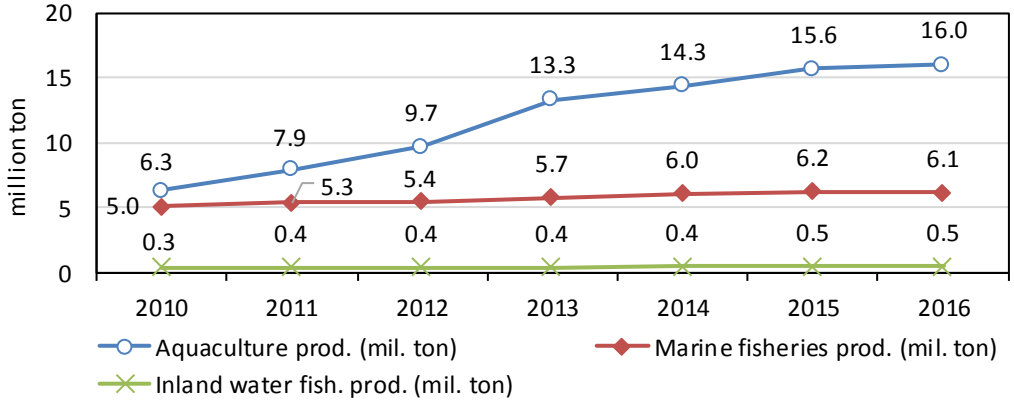
Fish production in Indonesia basically comes from capture fishery and aquaculture. The share of production from aquaculture grew rapidly to more than 20% per year before 2014 while production from capture fishery slowed down. Both fish production sources might be expanded as the fishery resources become available to exploit and land and aquatic

[10] http://www.fao.org/documents/card/en/c/2c8bcf47-2214-4aeb-95b0-62ddef8a982a (accessed 24 October 2018).

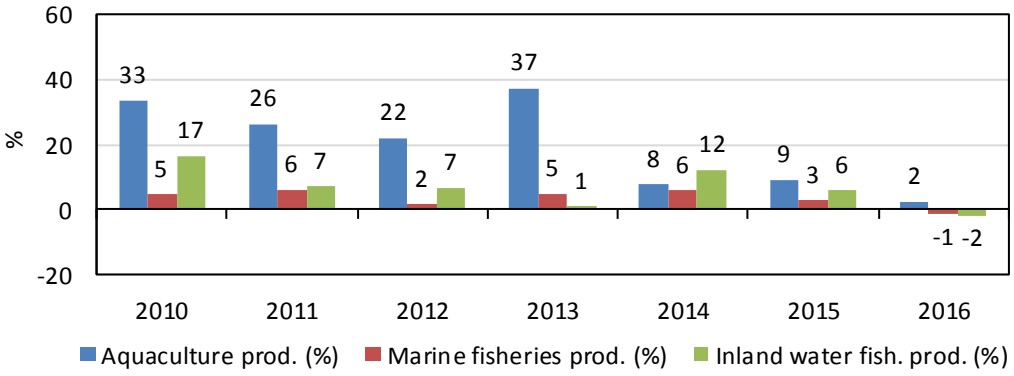
resources to cultivate. A 2016 fish stock assessment reported about 9.9 million tons of fish stock, while fish production in 2017 was only about 6.4 million tons.[11] However, there are several challenges to developing the seafood industry, such as production infrastructure and supporting policy.

Figure 6.4: Indonesian Fish Production Profile

A. Production quantity



B. Annual growth rate

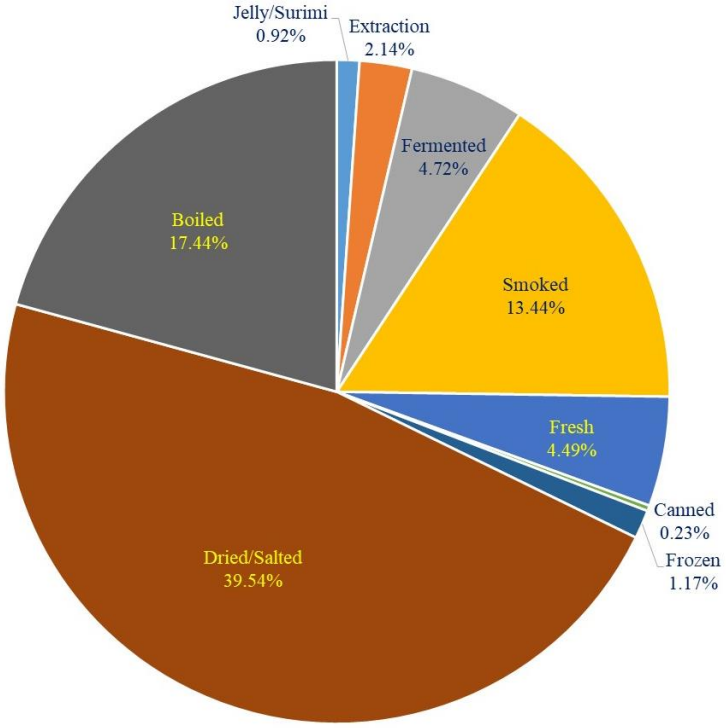


Source: BPS, https://www.bps.go.id/statictable/2014/01/16/1711/produksi-perikanan-menurut-subsektor-ribu-ton-1999-2016.html (accessed 22 February 2019).

The fish products are fresh (including frozen fish) and processed. Processed fish products, such as dried/salted and boiled, underwent traditional or simple processing. There are various types of processing, including surimi and canning.

[11] Ibid. Nos. 8 and 9.

Figure 6.5: Variation of Indonesian Fish Products, 2014



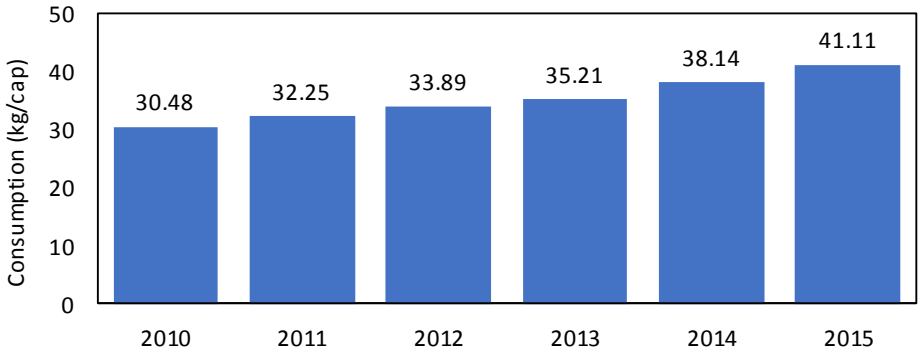
Source: Ministry of Industry (2017).

In 2010–2014, the production of processed fish products increased from 4,081,618 tons (2010) to 5,199,930 tons (2014). The average growth of the product was about 6.35% per year with the highest growth occurring in 2011 at 13.82%.

National fish consumption increases year by year and reached more than 40 kg/cap/year. The largest fish consumption in 2014 was found in Maluku Province (54.12 kg/cap/year), Southeast Sulawesi (50.77 kg/cap/year), Riau Islands (49.24 kg/cap/year), North Maluku Province (48.88 kg/cap/year), West Papua Province (48.16 kg/cap/year), and North Sulawesi Province (47.83 kg/cap/year). The provinces with the largest growth (above 10%) included the Special Region of Yogyakarta (DIY[12]) (22.28%), West Nusa Tenggara (14.78%), Central Java (12.31%), DKI[13] Jakarta (11.46%), and East Java (10.12%). In fact, DIY is one of the provinces with low fish consumption (21.74 kg/cap/year) but has potential to increase consumption of fish commodities.

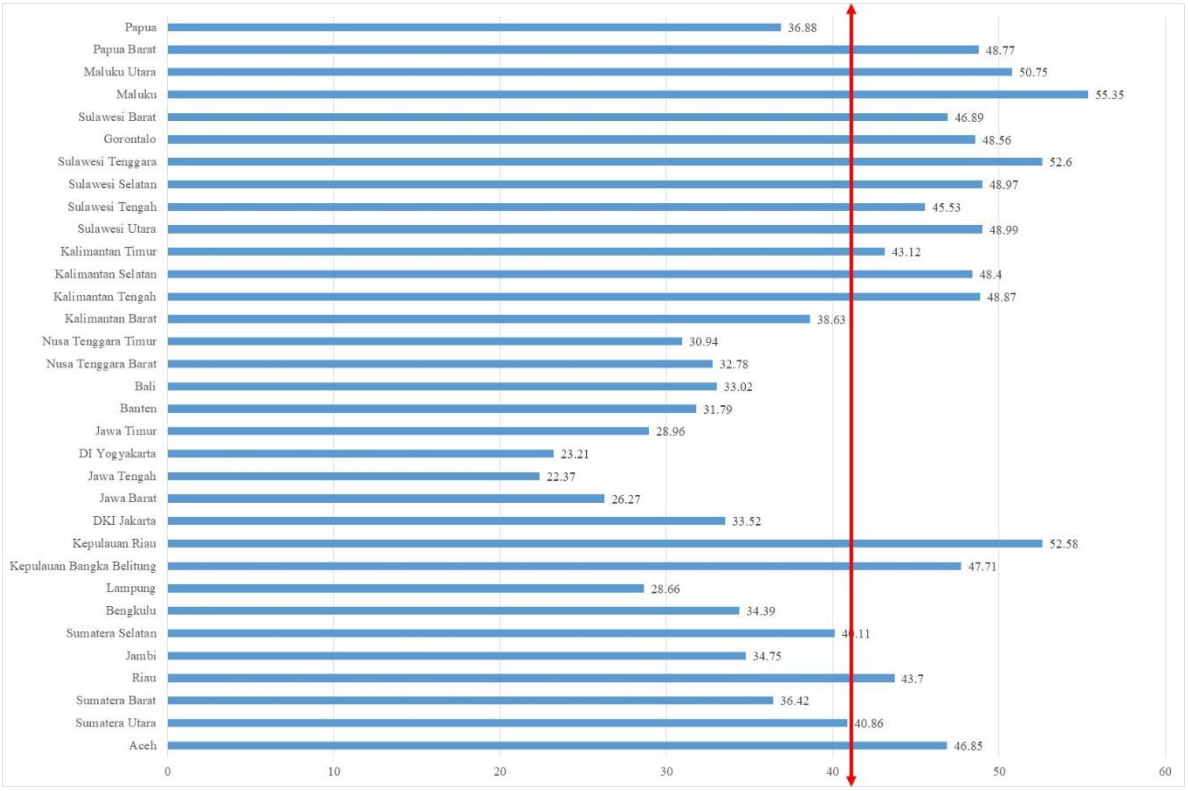
[12] Special Region of Yogyakarta: Daerah Istimewa Yogyakarta (DIY).
[13] Special Capital Region of Jakarta: Propinsi Daerah Khusus Ibukota (DKI) Jakarta.

Figure 6.6: Indonesia Per Capita Fish Consumption



Source: SIDATIK (Data Dissemination Information System and Marine and Fisheries Statistics), 2016.http://statistik.kkp.go.id/sidatik-dev/Berita/Analisis%20Angka%20Konsumsi%20Ikan%202010-2015.pdf (accessed 23 February 2019).

Figure 6.7: Indonesia Per Capita Fish Consumption, 2015 (kg/cap)

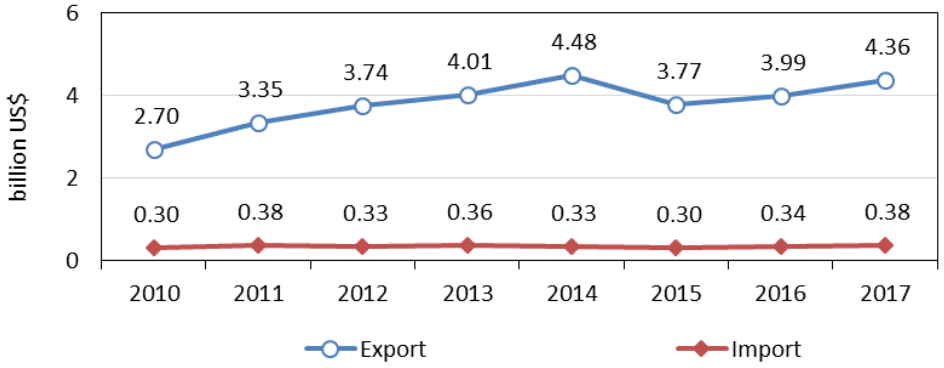


Source: Indonesia Ministry of Marine Affairs (KKP) http://statistik.kkp.go.id/sidatik-dev/Berita/Analisis%20Angka%20Konsumsi%20Ikan%202010-2015.pdf (accessed 23 February 2019).

Indonesia's main fishery export products are shrimp, tuna, cob, skipjack, seaweed, crabs, and pearls. On the other hand, Indonesia also import fish products such as fish flour and fresh/frozen fish. In 2010–2017, the export value increased but declined in volume. In 2010, the export value was US$2.70 billion, and increased to US$4.48 billion in 2014. In 2015, due to various policies issued by the Ministry of Marine Affairs and Fisheries (MAF), the export

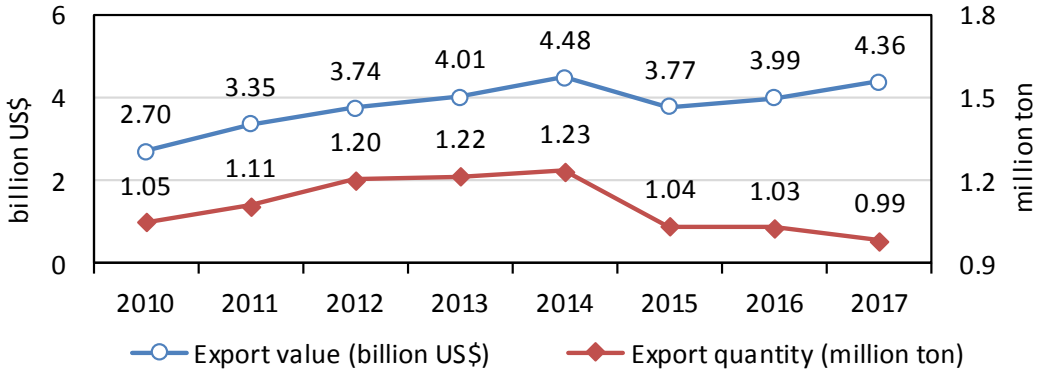
value decreased to US$3.77 billion. The export value in 2017 was almost the same as 2014 (about US$4.36 billion) but volume was still lower than in 2010–2104.

Figure 6.8: Trends in Indonesia's Fish Export and Import, 2010–2017



Source: UN Comtrade.

Figure 6.9: Value and Volume of Indonesia's Fish Export, 2010–2017



Source: UN Comtrade.

Asian countries are the main export market for Indonesia's fish and seafood products, followed by America and Europe. The United States is the main market, followed by Japan and China. This data shows a major shift in the main market for fishery products for decades – from Japan (whose share during the 1980s was more than 80% and in the 1990s, more than 50%) to new markets in America and Europe.

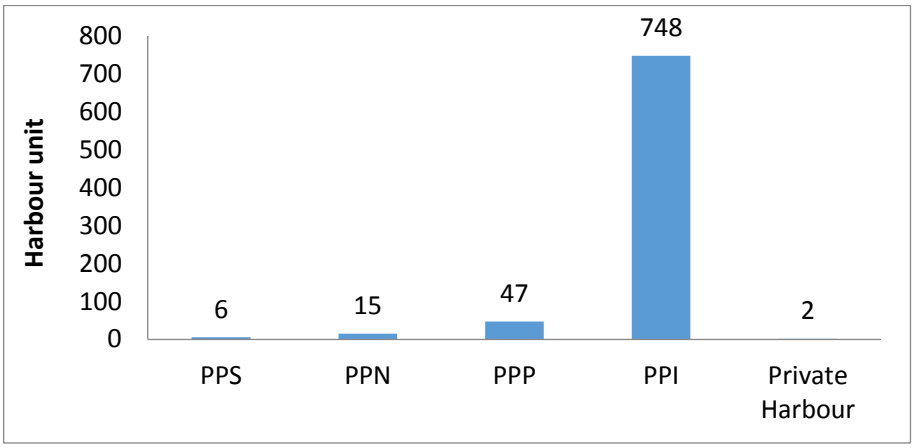
Several challenges in the fish and seafood industry development of Indonesia need appropriate strategies.

Lack of Feasible and Well-managed Fish Harbour

The fishing ports in Indonesia are divided into four classes: ocean fishing port or PPS (class A), *nusantara* (archipelagic) fishing port or PPN (Class B), coastal fishing port or PPP (class C), and fish landing base or PPI (class D). The differences in the port class are based on the capacity and services that can be provided. Class A means the port is equipped with complete

facilities (primary, functional, and supporting facilities) for the largest scale fishery to operate. The total number of fishing ports is 818 units. There are 6 units of PPS, 15 units of PPN, 47 units of PPP, one of which is managed by the Ministry of MAF and the 46 are managed by the provincial government. Meanwhile, there are 748 units of PPI and two units of private fishing ports (Figure 6.10). This information shows that the majority of fishing ports only support traditional and small-scale fishery and modern fishing harbours are lacking to support large-scale fishery.

Figure 6.10: Distribution of Fishing Ports in Indonesia Based on Class, 2015

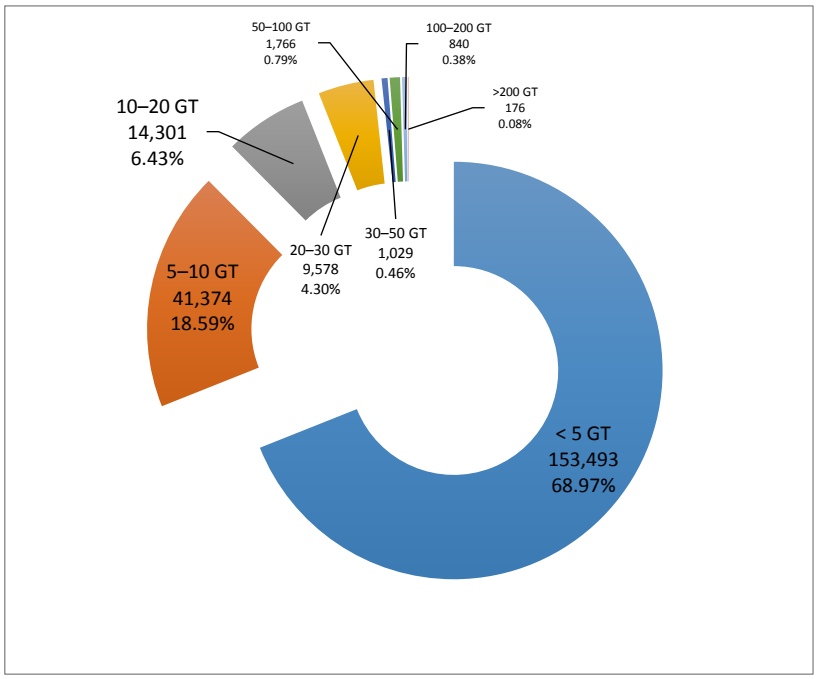


Source: SIDATIK (2015).

Weak Structure of the Capture Fishery Industry

Indonesian fishing vessels are small-scale motorboats with less than 5 gross tonnage [GT]). They number 153,493 units or 68.97%, followed by 41,374 units (18.59%) of vessels of 5–10 GT, and 14,301 units (6.43%) of 10–20 GT. Overall, the total number of fishing vessels increased in 2009–2014. However, the increasing number was dominated by motorboats with less than 5 GT (from 105,121 units to 153,493 units), 5–10 GT motorboats (from 32,214 units to 41,374 units), and those with 10–20 GT (from 8,842 units to 14,301 units).

Figure 6.11: Structure of Fishing Vessels in Indonesia's Capture Fishery Industry, 2014



GT = gross tonnage.
Source: SIDATIK (2015).

Figure 6.11 shows the lack of medium- to large-scale fishery. The current number of fishing vessels with more than 30 GT is only 1.71% of the total vessels; in many cases, they often face difficulties in anchoring because of the limited carrying capacity of fishing ports. Thus, it is necessary to support the large fishing vessels (with more than 30 GT). Improving the structure of fishing vessels to ensure the growing medium- to large-scale fishing industry is strongly related to the improvement of the state and function of fish harbours and human capital. In addition, to ensure the sustainability of the business and fishery resources, good fisheries governance particularly through a tight permission system is needed. Such governance could also be the way to fight illegal, unreported, and unregulated fishing.

Lack of High Value-added Products

As mentioned, most dried/salted, boiled, and paste fish products were processed in traditional ways. The value-added products need to be promoted to respond to the changes in the consumption and lifestyle of consumers.

Fish and Seafood Quality and Safety Issues

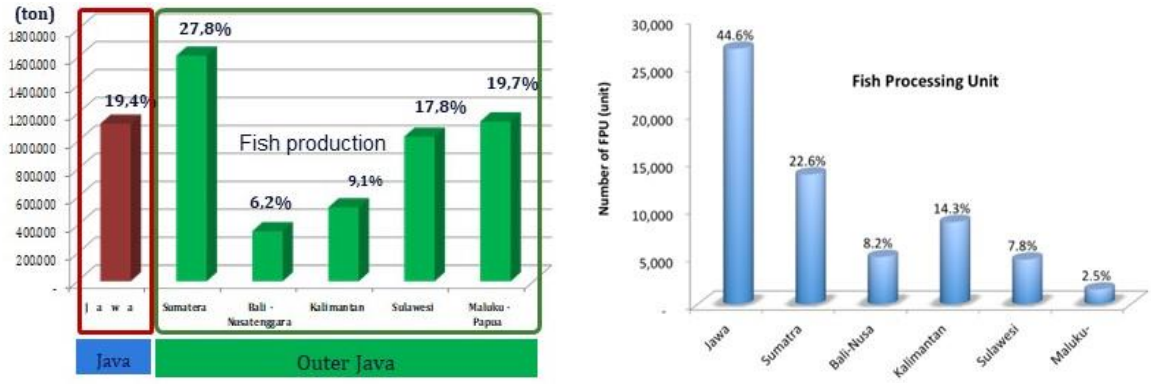
Many seafood products were rejected in the targeted market due to quality issues. It is important to secure and improve the quality and safety of seafood products. The improvement could be conducted along the supply chain of seafood products – from

handling in the fishing boats, landing places, to the processing units up to the consumers. The fish business may generate value-added products through improvement of handling and processing (to generate new products) and producing live fish product. The study of Hartana (2016) indicated that in 2005–2014, the US and Europe refused Indonesia's fish products. In the same period, the US Food and Drug Administration reported as many as 699 cases and Europa-RASFF, 29 cases. The main causes of refusal by the US were filthy and salmonella-infested fish from Indonesia; the EU found issues of histamines and poor temperature control (*The Economist*, 2016). This information shows the need to pay attention to the quality and safety of fish products which are also clearly related to the lack of a cold chain system.

High Disparity of Production and Processing Sites and Logistical Costs

The limitations of supporting infrastructure in fish production centres have led to a high cost economy in the fishing industry. The expensive logistics costs, low quality of seafood products, and high disparity of prices are the effects of these limitations. *The Economist* (2016) stated that underinvestment had sent Indonesia's logistics costs soaring, averaging 27% of GDP in 2004–2011, compared with 25% in Viet Nam, 20% in Thailand, 13% in Malaysia, and 8% in Singapore).

Figure 6.12: Main Locations of Fish Production (2012) and Fish Processing Unit (2014)



Sources: Figure 6.10 and KKP (2014).

Weak Cold Chain System

As previously explained, cold storage, as an important part of the cold chain system to ensure food safety and security, is not available in the production centres. In some cases, it is available in the provincial capital but it is not so close to the main fishing ports or landing places and are often left empty. Thus, improving the operation of national fish logistics will be needed soon.

Lack of Market Competitiveness

As an exporter country, Indonesia is still behind other Southeast Asian countries, particularly Viet Nam and Thailand. Even though it is the second-largest fish producer in the world, there is still potential to expand production and market. *The Economist* (2016) stated that Indonesia exports only US$4.2 billion-worth of fish annually, compared with US$5.7 billion for Viet Nam and US$7.2 billion for Thailand, both of which have smaller coastlines and lesser territorial water.

6.5. Seafood Supply Chain Model: A Case Study

The case study of six seafood businesses aim to find opportunities and challenges in different types of seafood businesses in Indonesia as domestic and export market–oriented commodities and in the type of marketplace, particularly in the traditional market, as main transaction place for most Indonesians.

Lobster Supply Chain Model at the Southern Coast of Java

Lobster, a valuable marine resource in the southern coast of Java, particularly in Yogyakarta Special Province (DIY), triggered social change among farmers and fishers. The high economic value of lobster, as shown by its high price per kilogram ranging from Rp300,000 to Rp1,000,000 in DIY depending on species and size, increases the intensity of its exploitation. To conserve the lobster resources, government issued new policy on prohibition of lobster catch with certain conditions. This case study aims to describe the supply chain model of lobster and opportunities for better management at the southern coast of Java.

Lobster fishery at the south coast of Java can be categorised as small-scale fishery. The fishing fleet uses outboard motor boats with gill nets and *krendet* (trap net) as main fishing gears, and operates for 1 day. Five main species of lobsters are landed: *Panulirus penicillatus, P. homarus, P. ornatus, P. versicolor, and P. longipes.*

The catch is generally sold by fishermen through fish auction and directly to middlemen. Since not many landing sites conduct fish auctions, fishermen then directly sell their catch to middlemen. Prices are generally determined by buyers.

The total stock of lobster in the Indian Ocean at the southern coast of Java (Fishing Area No. 473) is about 844 tons per year, with exploitation level (E) at 0.54. According to Ministry of MAF Decree No. 47/2016, it is categorised as fully exploited, meaning that the fishing effort needs to be secure at that level with tight monitoring. Compared to other fishing areas in Indonesia, the state of lobster exploitation at the southern coast of Java is the lowest. Therefore, there is still opportunity to promote lobster fishery with better management even though the central government through the Ministry of MAF released a new policy (Decree No 1/2015 revised to No 56/2016) to control the allowable size.

After the new lobster regulation issued in 2015, only lobster of standard size could be auctioned and sold to exporters. The standard size allowed is a minimum carapace length of

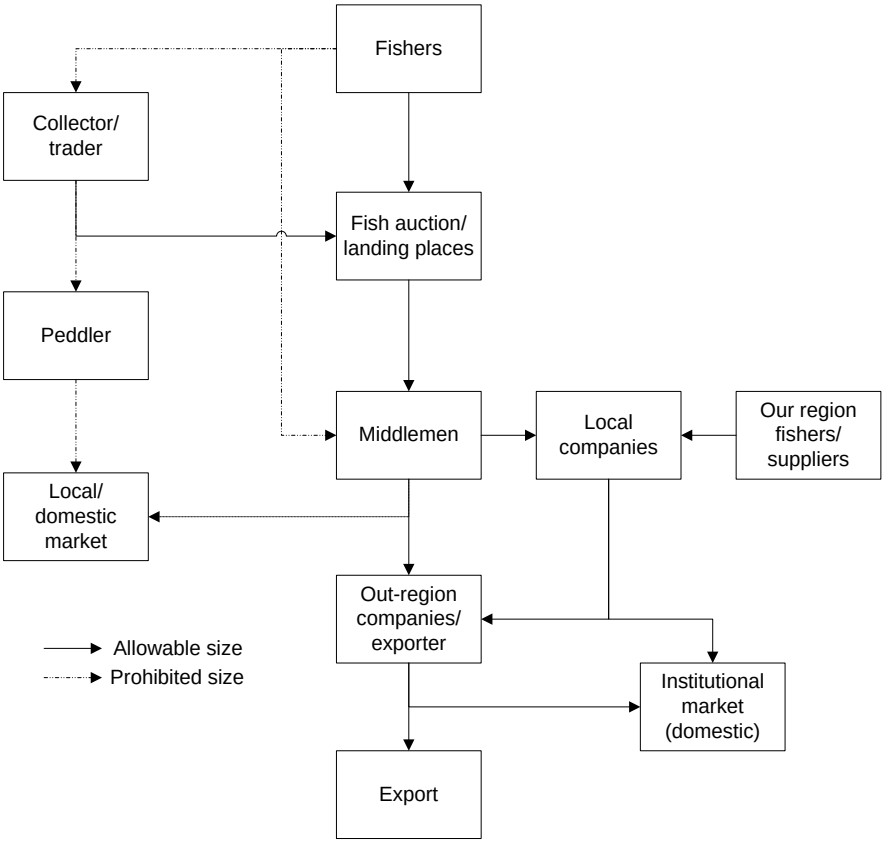
8 cm and/or a minimum weight of 200 grams. Collector/middlemen sell the lobster from auction to local companies (at the south coast of Java) and these companies sell the product to other companies outside the area. The two main markets are Bali and Jakarta and lobster is usually exported. In addition, these two regions are also the main domestic market for lobster.

The study also found that undersized lobsters are also traded, especially in the areas around fish landing places, which are also regional tourism centres. Until now, there are still debates related to the academic foundation on the regulation of lobster size allowed be sold. However, the uncertainty and weak law enforcement, on one hand, and availability of lobster markets for all sizes (including prohibited size) on the other hand, threaten the sustainability of lobster resources on the south coast of Java and of the lobster supply chain.

Figure 6.13 shows two main characteristics of the lobster supply chain in the southern coast of Java: (i) regulated or allowable size model and (ii) prohibited size model. The first model has many players, involving the fishers, auctioneers, traders, companies as exporter, and various logistic services. Most of the lobster from fishers is sent to the domestic and/or export markets. In the second model, lobster is provided only to local consumers through peddlers or small-scale traders directly selling the product to consumers, particularly tourists.

Lobster from fishermen is sent by suppliers (mainly middlemen) to several large companies or collectors in Yogyakarta, Cilacap, and Pangandaran (southern coast of Java), and Semarang and Jakarta (northern coast of Java). Collectors also send lobsters to Bali, an outer island of Java. Exports are generally carried out by companies based in Jakarta. Based on discussions with the office of Fish Quarantine Agency of Yogyakarta, lobster shipping traffic through Yogyakarta's Adisucipto International Airport showed there were 123–278 certificates, with live lobsters numbering 35,675–93,629 in 2016–2018, in addition to non-living lobsters.

Figure 6.13: Lobster Supply Chain Model at the Southern Coast of Java



Source: Author.

As lobster must be kept alive to keep its high value, the capture techniques, handling, and transporting are still a challenge. Therefore, better technology is needed to ensure a high survival rate in lobster fishery. The lobster market is still expanding, targeting export markets and high-class consumers, particularly in main cities and/or tourism sites such as Bali and Jakarta. Nevertheless, the local market for undersized lobster must be controlled to avoid the catch that may trigger the rapid decline of lobster stock. Therefore, lobster management must be enforced and the solution to the current situation must be discussed with all actors in the lobster industry. The awareness of fishers, traders, and consumers related to lobster regulation mush be raised through various government programmes, such as extension and education programmes and alternative livelihood promotions. Such effort is needed because the bigger the lobster size, the higher the price. For example, a 200–300 gram *P. ornatus* costs only Rp400,000 per kilo, but as the weight increases to more than 1 kilo, the price goes up to more than Rp1,000,000 per kilo. Similarly, the price of *P. longipes* is only Rp310,000 per kilo for 200–300 grams, but increases to Rp720,000 per kilo if it weighs more than 300 grams.

The continuity of supply from capture fishery is still emerging, but lobster culture still lags. The promotion of aquaculture is needed, starting from research and development of lobster hatchery. This effort will impact the growing of a new industry, lobster culture, and the rebuilding of lobster stock through a restocking programme.

Anchovy Supply Chain Model in Medan City, North Sumatra

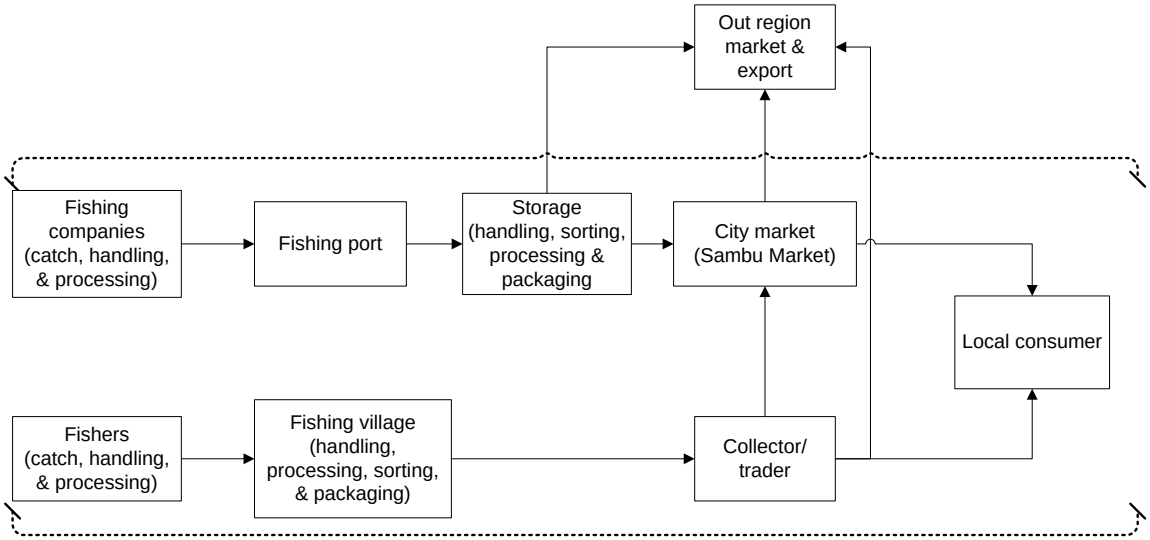
This study was conducted in two close research sites with different characteristics: (i) Belawan Bahari Village (fishing village) and (ii) Belawan Ocean Fishing Port (PPS) Medan City, North Sumatra. Belawan Bahari fishermen carry out anchovy fishing operations for 1 day and land the catch directly around the fishermen's settlement. For the PPS, fishers generally serve fishing companies. Thus, the respondents of this study are fishermen who captured/landed their catch, particularly anchovies in Belawan Bahari village and related buyers, and respondents in fishing ports (anchovy fishing and processing companies and their buyers).

The landing in the fishing village was recorded by the local government and that for the fishing port was conducted by the port authority. Based on data from the fishing port, total landed in 2017 was 28,709 tons (valued at Rp826,172,604,000), a significant decline from 2012 (63,305 tons valued at Rp1,532,813,242,000). Ten dominant catch landed in PPS Belawan: (i) mackerel scads – 7,371 tons (25.7%); (ii) common squid – 4,909 tons (17.1%); (iii) Indian mackerel – 2,215 tons (7.7%); (iv) lizardfish – 2,118 tons (7.48%); (v) mollusc goatfish – 2,002 tons (7%); (vi) croaker – 1,472 tons (5.1%); (vii) anchovy – 1,384 tons (4.8%); (viii) yellow stripe scads – 1,159 tons (4%); (ix) Japanese threadfin bream – 1,092 tons (3.8%); and (x) cuttlefish – 836 tons (2.9%). Most of the catch was sold as fresh fish product (74% of total production) (KKP, 2017) while anchovies were mostly sold as processed product.

Anchovy (*Stolephorus* sp.), locally well known as *teri medan*, is a high-value commodity. The average price is recorded at Rp80,000 to Rp100,000 per kilogram.

Figure 6.14 shows two main supply chain models of anchovies: (i) fishing village–based production (community based) and (ii) fishing port–based production (enterprise based). The main difference between the two models is the role of the trader, which is obvious for the community-based model. However, the city market is the central market for anchovies before these are distributed to the local markets, out regions, and the export market. This figure shows the important role of the traditional city market in the supply chain model. As discussed, the city market still plays a central role in the economic activities of many cities in Indonesia.

Figure 6.14: Anchovy Supply Chain Model in Medan City, North Sumatra



Source: Author.

Anchovy is captured by trawler, set lift nets, and *bagan* (lift net). The catch is sorted to separate anchovies from other fishes, and then cooked in a drum with a capacity of about 50 kilograms. Boiling and slicing are conducted on the fishing boat, and the drying process on the ground in the port area or fishing village, and then packaged for the market. The total volume of about 1,384 tons of anchovies was processed in port, though this number declined compared to a few years back. Rahayu et al. (2017) recorded that, in 2015, 23 companies in the fishing port produced 2,319.2 ton of anchovies. The prohibition of trawling in 2015 decreased anchovy production.

The main market of the production-based supply chain model is the city's central market. Almost half of production is distributed to the main market and other markets around the city. Nevertheless, the anchovy is also distributed to other main cities, such as Pekanbaru, Palembang, Padang (Sumatra islands), and Jakarta (Java island). For the export market, the product is mainly exported to Southeast Asian countries and Japan.

Anchovy fishery still faces some challenges. The release of the trawling prohibition policy in 2015[14] significantly impacted anchovy fishery as shown by the declining fish production. Although the policy has been 'loosened' due to demonstrations by various groups of activists and fishermen, the impact was not fully restored. The trawling policy is still not cancelled; therefore, more environment-friendly fishing technology is needed in anchovy's fishery. In addition, most anchovy products are handled on board (sea) and the drying process on land; most dried products are sold directly to the local and domestic market and a few for export. Value-added products other than dried are limited and need to be promoted through new product innovation and packaging. In the meantime, the industry still faces low product quality and safety issues.

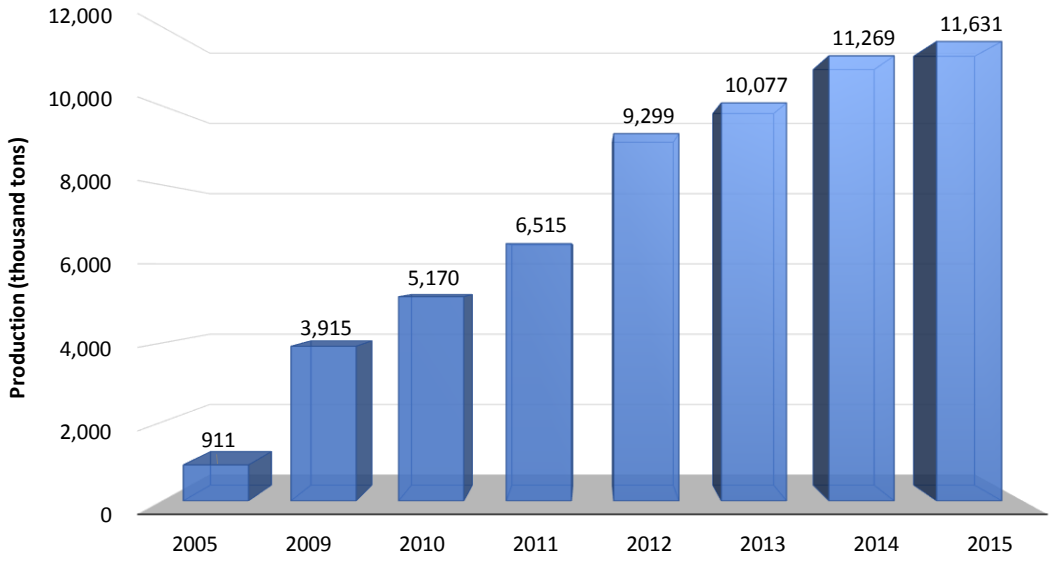
[14] Ministry of MFA Decree No. 1/2015 revised to 56/2016.

The anchovy industry still relies on small-scale individual business and lack of collective-based business such as fishery cooperative and/or other business entities. Fish products are, therefore, scattered in terms of location of production, price, and quality. The market of anchovies as other fish products is still open for the domestic and export markets. There are also various opportunities to prepare anchovy products to be easy to cook, ready to eat, and with longer shelf life.

Seaweed Supply Chain Model in Makassar, South Sulawesi (Processing Unit)

China and Indonesia are the main producers of world seaweed, each with a share of 47% and 38.7%, respectively, of the total production of about 30.05 million tons (FAO, 2018). Indonesian seaweed production increased almost three times between 2010 and 2015. The rapid growth of seaweed culture is due to the development of cultivation of *Kappaphycus alvarezii* and *Eucheuma* spp., which are the main raw materials for carrageenan extraction.

Figure 6.15: Indonesia's Seaweed Production



Source: FAO (2018).

Seaweed has potential for development for several reasons, mainly:

- Various species are feasible to develop in wide development areas.
- Business capital is relatively small, the technology level is simple, and the harvest age is relatively short (1.5–2 months).
- Revenue is high, so there is potential to increase the income of the community and the region.
- Product can be diversified up to more than 500 end products.

- Provide high employment opportunities,
- It has domestic and foreign market opportunities.
- It can empower coastal communities.

In addition to the development of the food industry, the development of the health industry, cosmetics, fertilisers, and seaweed-based renewable energy requires large seaweed supply. Potential areas for the development of seaweed production centres are actually in disadvantaged areas, especially in eastern Indonesia (KTI). At present, from 183 districts in disadvantaged regions in Indonesia, 70% are estimated to be in KTI, an area dominated by many islands. Some potential areas and which have been designated as centres for seaweed development are Gorontalo Province, Southeast Sulawesi, Central Sulawesi, South Sulawesi, Maluku, North Maluku, West Nusa Tenggara, and East Nusa Tenggara.

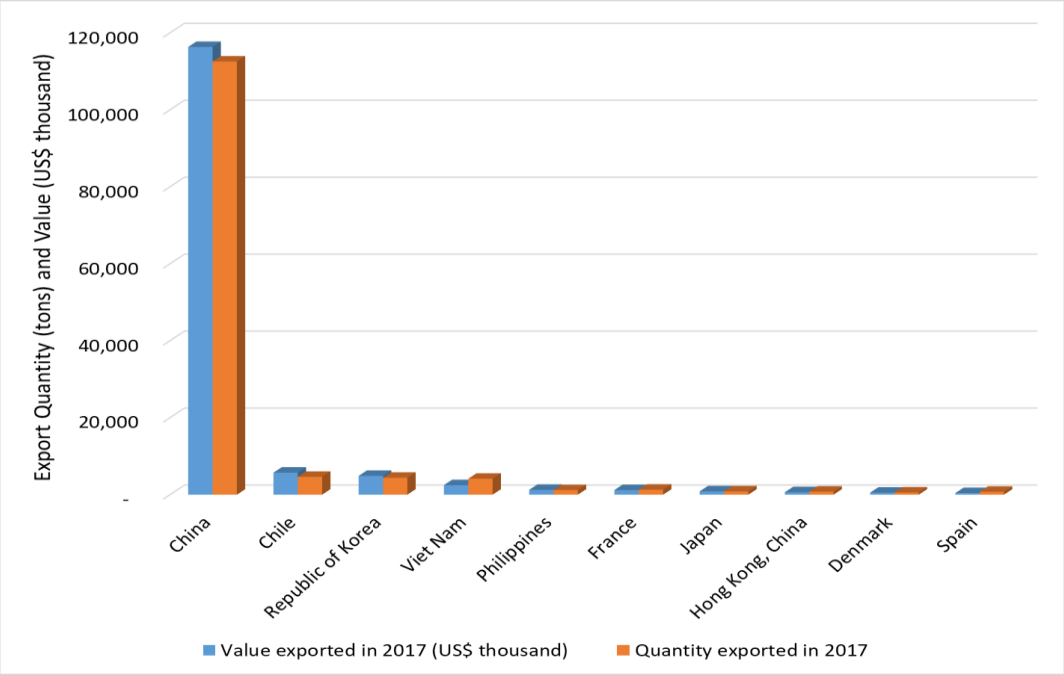
Not only upstream development but downstream development is also a strategy in increasing commodity value added. Therefore, the downstream improvement is expected to have an impact on strengthening the industrial structure, increasing added value, and fulfilling the domestic market and increasing exports of processed seaweed. Because of increasing market demand, the price of seaweed in the international market has reached US$2 per kilogram (Tempo, 2013). Unfortunately, until now most Indonesian seaweed is generally exported in the form of raw materials, particularly dried seaweed. On the other hand, processed seaweed products such as agar, carrageenan, and alginate are still imported in large quantities at high prices.

This case study was conducted at a seaweed processing company, so-called RAPUD, that exports dried seaweed to an industrial estate in Makassar City, South Sulawesi. The business started by educating seaweed farmers on how to cultivate seaweed, then buying their product. The company even provides capital for production equipment. The company, categorised as the early players in the seaweed business, was founded in 2002. The warehouse/processing capacity of the company is around 1,000 tons per month but currently only about 400 tons per month are processed. Companies buy dry seaweed from local suppliers or assisted farmers (around Sulawesi) and outside the island, especially Kalimantan and Tual, Maluku. Shipments from Sulawesi island use trucks; those from outside the island use marine transport. Purchases are made with two systems, namely, the contract system and fee system. The main buyer of dried seaweed for the company in this case is the Philippines, but now other markets such as Europe also buy dried seaweed. However, recently the main market of Indonesian seaweed is China (Figure 6.16). The export trend of Indonesian seaweed was also dynamic, which grew faster in 2013–2015 and declined in 2016 (Figure 6.17). One reason for this, particularly the decline in 2016, was the prohibition policies to export dried seaweed.[15] In addition, the seaweed business still has many challenges, such

[15] https://ekonomi.bisnis.com/read/20151102/99/488214/arli-larangan-ekspor-rumput-laut-mentah-2020-perlu-kajian-mendalam.

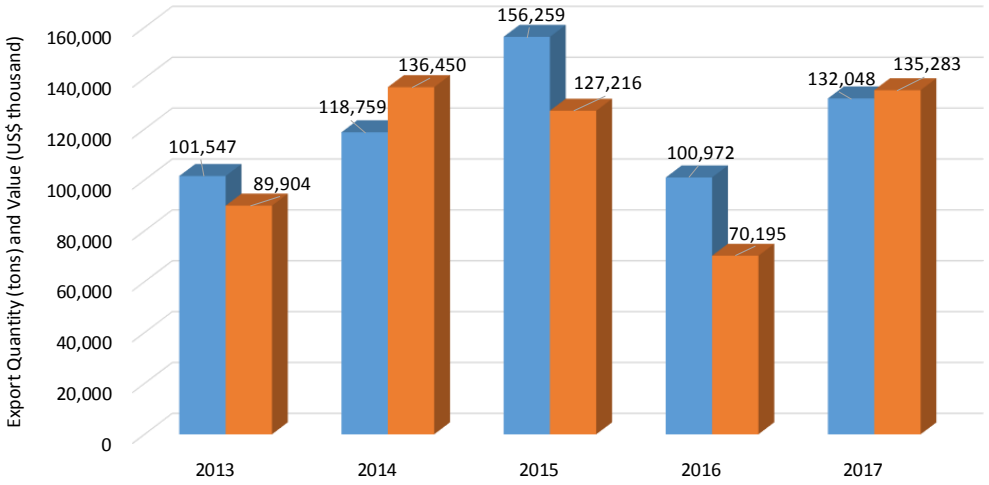
as mix cropping pattern in which different species are cultivated in the same or nearby area, competition among buyers for seaweed, seaweed diseases, and the quality of seaweed.

Figure 6.16: List of Main Importing Markets for Seaweed Product (HS Code 121221) Exported by Indonesia in 2017



Source: International Trade Centre database, http://www.intracen.org.

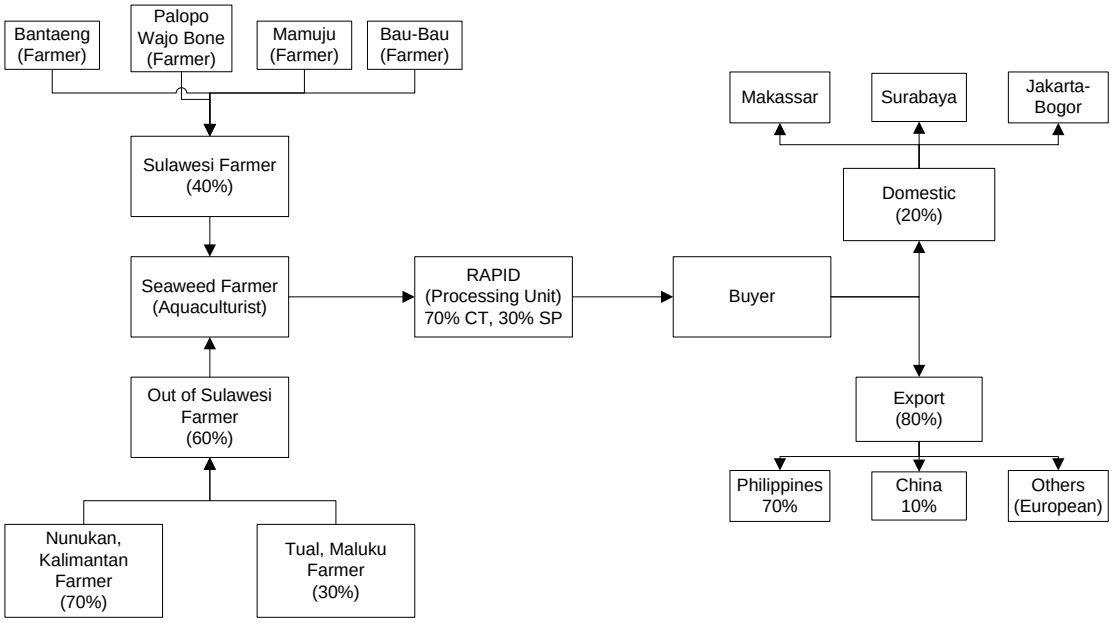
Figure 6.17: Export Trend of Seaweed Selected Product (HS Code 121221) from Indonesia, 2013–2017



Source: International Trade Centre database, http://www.intracen.org.

Figure 6.18 shows the typical supply chain model of the seaweed industry in the study site. The main players in the business are farmers, collectors, processors (companies), and buyers. The industry in the case study relies on dried seaweed from around Sulawesi and other islands in the eastern part of Indonesia. Nevertheless, more than half of raw materials are supplied by farmers from other islands. The distant source of raw materials has created logistic problems due to the high cost of transporting raw materials from producers to processors. The high competition over the local seaweed caused the company to find other suppliers from outside the province (islands). To ensure the sustainability of dried seaweed supply, the processors collaborated with producers (seaweed farmers) on technical assistance, seaweed farmers' training, and financial capital support. However, the seaweed farmers are not well organised; therefore, it is important to strengthen collective-based seaweed production to fulfil the need for standardised seaweed products from farmers and to facilitate empowerment and cooperation.

Figure 6.18: Seaweed Supply Chain Model in Makassar, South Sulawesi



Source: Author.

Indonesia, particularly South Sulawesi, is the major and rapidly growing producer of seaweed, particularly for raw materials of carrageenan extraction. Seaweed culture can potentially optimise marine space and solve many coastal community problems, such as poverty, as it can be a new source of income. Nevertheless, seaweed production still faces the problem of good seed quality and occurrence of diseases, locally called *ici-ici,* that may cause total loss of seaweeds.

The current seaweed industry mainly focuses on the upstream side of the business, particularly on producing wet and dried seaweed (farmer to processor), or lack of value-added product (advanced processing industry). Most seaweed products, particularly dried

seaweed, are exported as raw materials. Therefore, the downstream step is expected to impact on strengthening the industrial structure, increasing added value, fulfilling the domestic market, and increasing exports of processed seaweed.

In particular, the export market for seaweeds, whether as raw material or end product, is still expanding. The domestic market, particularly for food and health, is also growing. However, the processing industry is still lacking in number and many in the industry rely only on dried seaweed products.

Fish Supply Chain Model at Traditional Markets in Yogyakarta City

The number of traditional markets in Indonesia is very large, more than 13,450 markets, with total traders reaching 12.63 million people. The market is not only a place of economic transactions but also a public space where social interaction takes place. However, the traditional market mostly has a negative image of being chaotic, uncomfortable, and a place with minimal facilities. Revitalisation of the traditional market is needed and is a long-term investment as part of the city's development. In many cities in Indonesia, the traditional market symbolises the face of the city – a well-organised traditional market means the city is also well managed. The traditional market has also become a national indicator of domestic inflation.[16]

This case study has been conducted in one of the central markets in Yogyakarta city, the so-called Beringharjo Market. It is the largest traditional market in Yogyakarta owned and managed by the city of Yogyakarta. This market is located in the Malioboro area, which is an area at the centre of DIY. The strategic location and proximity to tourist centres makes Beringharjo Market the main destination of raw materials of any product, including fish. In terms of fish consumption, this province is one of the lowest fish consumers compared to the other provinces of Indonesia. But the growth in consumption recently became the highest in the country. It was projected that, until 2014, the province needed about 89,614.30 tons but the fish products were mainly imported from other regions around the province.

The study showed that fish commodity in Beringharjo Market consists of marine, freshwater, and processed fish, such as salted fish and *bandeng* (milkfish) *presto* (softened bone) product. About 86% of fresh fish in the market comes from outside DIY and only about 14% are local fish. Ninety percent of freshwater fish is from outside DIY and ten percent is from a local area in DIY. Salted fish and milkfish as raw material are both 100% from outside DIY.

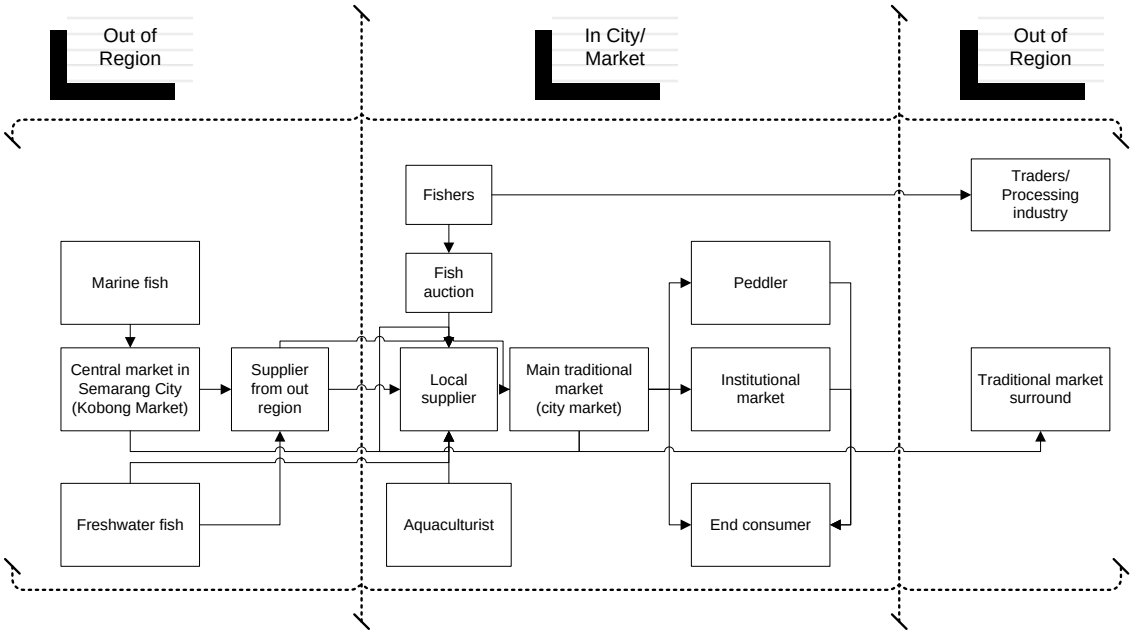
Analysis of the supply chain pattern of fish processing units (UPI) in DIY shows a distinctive pattern in supply chain management, especially in the supply of raw materials to UPI. There are two general trends from the case study in DIY related to the management of raw materials from marine products: (i) UPI generally manages raw materials that are not from

[16] Traditional markets provide the majority of people's basic needs and are central to regional economic activities, so the dynamics of prices of basic necessities in the traditional markets might become an indicator of regional economic conditions.

DIY but imported from outside DIY, and (ii) DIY fishery products as a source of raw materials are generally brought outside DIY. These findings illustrate the characteristics of UPI that have little connection with DIY production or local DIY suppliers for the supply of raw materials. This is caused by several factors, including processed fish whose species are scarce or are not produced in DIY such as milkfish, limitations and uncertainties of local fish as raw materials, and local fish that tend to have good distribution channels outside the region.

Figure 6.19 shows a supply chain model for fresh fish involving three parties: the suppliers, the sellers, and the ultimate customers. The supply chain model for processed fish involves four parties: the suppliers, the wholesalers, the retailers, and the ultimate consumers. Finally, the supply chain model for milkfish comprises the suppliers, the UPI, the wholesalers, and the ultimate consumers.

Figure 6.19: Fish Supply Chain Model at Traditional Market in Yogyakarta City



Source: Author.

The traditional market, as found in this case study, has become a place for nurturing entrepreneurs and prospective entrepreneurs with their own capital. Nevertheless, most such entrepreneurs lack an understanding of consumer behaviour, including in seafood products. Therefore, apprenticeship, training, and education are needed. In addition, the traditional market as, in this case, also provides various fish products – marine fish, freshwater fish, and processed fish – that are originally from various regions. Being a perishable good, fish gets easily spoiled without a cold chain system. Therefore, it is important to improve the distribution and cold chain management systems in the traditional market. Provision of support for traders, such as for insurance and financial capital, is still needed.

Tuna and Tuna-like Supply Chain Model at Fish Processing Unit in Bitung City, North Sulawesi

The city of Bitung is located on the edge of the Pacific Ocean. The city is the main producer of fish, particularly tuna and tuna-like, in North Sulawesi Province and Indonesia. The city's fishing industry is centred at the Bitung Ocean Fisheries Port (PPS). Based on the 2016 PPS Bitung Annual Report (PPS, 2016, 12,973 fishing fleets visited the port, including 1,592 outboard motor boats (12%), most of which were motorised boats under 30 GT (76%), and the remaining motorboats were over 30 GT.

Fish production is mainly through purse seine fishing gear (77%), followed by pole and line (10.9%), and handline (9.8%); total fish produced was 46,522 tons. Fish production grew from 30,018 tons in 2012 to 111,315 tons in 2014. However, in 2015, it declined significantly and had not returned to a convincing growth in 2016, reaching only 46,552 tons. This decrease was mainly due to new regulations relating to capture fishery to reduce the problems of illegal, unreported, and unregulated fishing.[17]

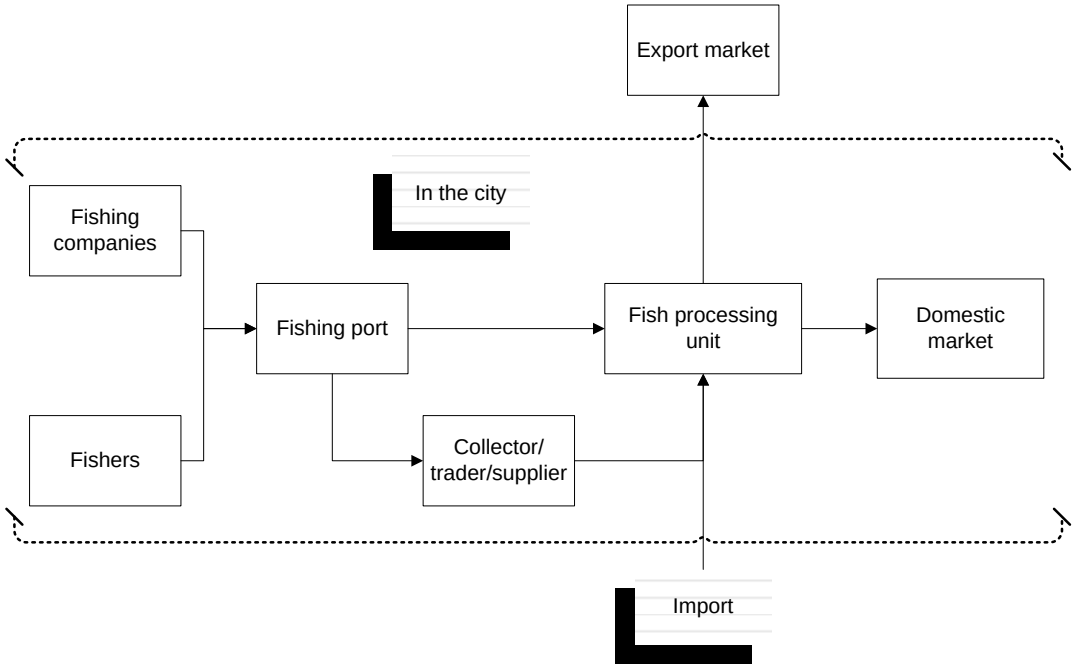
Skipjack tuna and tuna are the main fish products landed in Bitung PPS. In 2012–2016, the average production of skipjack tuna reached 34,001 tons/year, while that of tuna was 11,826 tons/year. In addition to skipjack and tuna, cob is also an important commodity in the Bitung PPS. The average production of cob reaches 7,166 tons/year.

Overall, there are 60 fish processing companies (large-scale UPIs) and two of them are no longer operating. The main products of UPI are various processed tuna, cob, and skipjack, both in the form of fresh, frozen, or canned fish. The city is the centre of the fish processing industry, particularly for tuna commodities. In addition to the large-scale fish processing industry, Bitung city also has a growing group of fish processing totalling 21.

The fish processing industry mostly processed fish for the export market. Fish exports continued to increase in 2010–2014, from 29,109.8 tons in 2010 to 32,574 tons in 2014. However, export volumes declined to 18,658.4 tons in 2015 and 15,800.4 tons in 2016. The new regulation related to fishery management, such as prohibition of transshipment and ex-foreign fishing vessels, created a raw material shortage for the industry.

[17] Illegal, unreported, and unregulated (or IUU) fishing is a broad concept found in all types and dime nsions of fisheries, on the high seas and in areas within national jurisdiction. It concerns all aspects of and stages in the capture and utilisation of fish. It may sometimes be associated with organised crime, http://www.fao.org/iuu-fishing/background/what-is-iuu-fishing/en/ (accessed 22 May 2019).

Figure 6.20: Fish Supply Chain Model of Tuna and Tuna-like in Bitung City



Source: Author.

Two main policies directly impacted Bitung city's fishing industry: (i) the Ministry of MAF Decree No. 56/2014 concerning temporary termination (moratorium) of licensing of capture fisheries business and (ii) the Ministry of MAF Decree No. 57/2014 concerning the termination or prohibition of transshipment activities. In addition, the UPI in Indonesia is dominated by traditional home-based UPI (accounting for 97.67%); modern units including this case study account for 2.33%. Therefore, supporting the growth of such modern UPIs is important.

The banning of foreign and ex-foreign fishing vessels, the government's policy to fight illegal fishing, since 2014 has significantly impacted the fishery industry and the city of Bitung, as the region heavily relies on the fishery industry. Fish production even declined 59% in 2015 (to only 45.209 tons). Such situation impacted on the UPI that was having difficulty getting raw materials. As a result, processing units were forced to reduce the number of workers; some of them closed and did not operate anymore.

The decline in fish production will automatically reduce the industry's market share, which is marked by a decline in fishery product exports. To deal with the issues, the processing units imported raw materials from other countries and transported in from outside the region. Reassessment of current policy particularly by promoting the development of national fishery will be needed.

Based on the recommendation of the Regional Fisheries Management Organization, increasing the number and capacity of the national fishing fleet to exploit tuna resources would need support from the policymakers such as simplifying and accelerating the licensing

process. Empowering and increasing the role of national fishery companies[18] are needed to manage the upstream side of the tuna fishing industry.

The national fish logistics system[19] could be improved by strengthening the national tuna commodity business chain. This effort can be pursued by developing eastern Indonesia as a source of raw materials while strengthening the infrastructure for the fish processing industry and still maintaining Indonesia's western region as one of the centres of the fish processing industry.

6. Conclusion

Fishery plays an important role for Indonesia as a main source of animal protein and primary nutrition for most people, of main livelihood and income, and of foreign exchange for the country.

Despite being an exporter country, Indonesia is still behind other countries, particularly Viet Nam and Thailand even if Indonesia is the world's second-largest fish producer and there is potential to expand its production and markets. Its strong outward-looking policy must be in balance with its inward-looking policy orientation because of the rapidly growing new trend in fish import in the last decade.

The fishery sector received a big push when the current government clearly stated the need for the country to be with the 'world maritime centre' (*poros maritim dunia*) and issued Presidential Instruction No. 7 of 2016 on Accelerating the Development of the National Fisheries Industry. The strategy is expected to resolve the fundamental problems of fishery related to the lack of infrastructure of fishery production, the weakness in fish supply chain and logistics, the lack of fish quality, and less harmonious fishery policies.

Strengthening the fish business in the upstream sector should be prioritised to ensure the development of downstream industries. With the potential of fishery resources, Indonesia could become the world's fish barn (*lumbung ikan dunia*).

A few challenges need to be addressed in each supply chain:

- In the upstream (production) site

The lack of supporting production infrastructure, such as the lack of modern and well-managed fishing ports, still emerges. Most or more than 91% of the total fishing ports are of lowest class or traditional and nature based. The fishing ports also lack facilities such as cold chain systems. A national fish logistic system should be implemented to optimise the use of fishery resources and to ensure food safety and food security.

The main production facilities are also weak. Most of the fishing vessels are small scale (87.6% are under 10 GT) and dominate coastal-based fishery. This fishery is also challenged

[18] State-owned enterprises: *Badan usaha milik negara* (BUMN).
[19] National Fish Logistic System: *Sistem Logistik Ikan Nasional* (SLIN).

by the declining trend in coastal-based fishery resources. The promotion of middle- to large-scale fishery (offshore fishery), which is serviced by only 1.71% of the total fishing vessels (with less than 30 GT), is needed. In the meantime, the training of fishers and managers for the medium- to large-scale fishery is needed to ensure the availability of human capital to manage the fishery.

As shown by the case of anchovies and lobster fishery, two examples of coastal-based fishery, it is important to enhance proper fishery management to ensure the sustainability of the fishery and community livelihood. Meanwhile, there is still opportunity to expand fishery to the offshore.

In terms of mariculture, particularly seaweed culture, the problems of good seed quality and occurrence of diseases, such as *ici-ici*, are still emerging. Therefore, a seaweed seedling system and/or centre that can produce good quality and superior seeds is important.

- In the midstream (handling and processing) site

The lack of a cold chain system that impacts the quality of fish products still emerges. The rejection of seafood products by the market is mainly due to quality issues. Therefore, implementing and improving a national fish logistic system is important to secure and improve the quality and safety of seafood products. Emerging logistical problems result in high-cost fishery, low quality of products, and big price disparities. The improvement could be implemented along the supply chain of seafood products – from handling in fishing boats, to landing places, to the processing units until the final consumers.

The case of anchovies and seaweed shows that most fish products are processed in a traditional way (dried/salt, boiled, and paste). Value-added products must be promoted to respond to the changes in the consumption and lifestyle of the consumers.

High-value products could be promoted by producing live fish, such as in the case of lobsters. In fact, many mariculture products, such as grouper, also keep their high value added by being sold alive. Therefore, it is important to improve the handling and transportation system from the producer to the consumer.

- In the downstream (market) site

The fish market is open and growing for the domestic and export markets. Indonesia's domestic consumption trend shows that fish consumption is still growing. In addition, the export market of Indonesian seafood also increases, even though growth has been slow since 2015 due to various policies that impact on the processing industries that could not achieve their normal producing capacity.

The competitiveness of Indonesia's seafood products is still weak. As an exporter country, Indonesia is behind other countries, such as Viet Nam and Thailand in terms of value-added products. While Indonesia is the world's second-largest fish producer, there is still potential to expand its production and its markets.

The role of the traditional markets in Indonesia's domestic market is obvious. The traditional markets provide various fish products – marine, freshwater, and processed fish – that are originally from various regions. As perishable goods, fish products easily get spoiled due to the lack of cold chain systems. Therefore, the distribution and the cold chain management systems in the traditional market should be improved.

Despite these challenges, fishery products can potentially support Indonesia's economic growth as a source of livelihood of fishers.

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Chapter 7

Summary and Policy Implications

Eiichi Kusano

This publication sought ways to improve the agri-food producer's profitability by utilising the food value chain (FVC) through case studies in Thailand, Viet Nam, Malaysia, and Indonesia. Findings and suggestions are sprinkled throughout each of the previous chapters. This chapter extracts and reconstructs some essential policy implications from the case studies.

1. Increase in Productivity and Product Quality (Thailand, Fresh Fruits)

To drive the transition from the traditional to the modern value chain corresponding to higher requirements of consumers and buyers, producers need to reduce production and marketing costs and ensure high-quality products through good farming practices. A growing demand for organic products would limit chemical inputs by farmers. The just-in-time or stable supply of agri-food products requires knowledge and production systems to minimise seasonal and yield variations. In addition, producers need to cope with the problems of a declining labour force and ascending labour costs.

Devising Food Safety Rules Acceptable to All Stakeholders

The most challenging issue is to devise the appropriate food safety rules or institutions and incentives that are acceptable to all stakeholders. Development and dissemination of the traceability system and documentation, which allow consumers and retailers to trace products back to the farm, would also contribute to overcoming a bottleneck in the export of agri-food products. Such rules should be enforced at reasonably low costs for all stakeholders in the FVC. Close cooperation among the government, the private sector, civil society organisations, and non-governmental organisations (NGOs) is required.

Encouragement of Collective Actions or Horizontal Cooperation

The collective action realised through community enterprises or cooperatives can share input costs, especially labour cost, within the FVC. That would be a major means for small-scale producers who do not have enough assets to respond to various issues arising from the transition of the FVC.

Application of Modern Technologies

New types of agri-food production and marketing based on modern digital technologies, such as precision farming and marketing utilising social media, would increase the level of automation and reduce input costs.

2. The Rise in Resilience against External Shocks (Thailand, Broiler)

Quick Adaptation of Technologies and Strategies against External Shocks

Companies should quickly adopt new technologies and maintain a tight control of information flowing within their companies to adapt to new requirements and changing consumer preferences on social, environmental, and animal welfare concerns.

Strategies such as a business-to-business linking foreign trading firms with a high-quality or made-to-order product and government-to-government negotiations to mend the broken trade links between nations can also be effective against trade disruptions.

Development of Mechanisms for Risk Sharing and Reduction against External Shocks

Risk-sharing arrangements within the FVC would reduce farmers' risks of heavy debt and bankruptcy against serious external shocks, such as bird flu outbreaks. The government and the industry need to constantly monitor possibilities of such external shocks and establish an effective warning and preventive system.

Utilisation of Global Value Chain or Foreign Direct Investment

The global value chain (GVC) can be actively utilised as one of the competitive strategies to be a winner in the intensifying international competition and to avoid risks of import restrictions. The approach of foreign direct investment (FDI) varies differently according to the local context, such as market preferences and local demands for the product, infrastructure readiness, local resource availability, and government policies and regulations.

Two approaches were observed in the case of the broiler industry in Thailand. First is the investment in feed businesses and employing local contract farmers to scale up production gradually at the same pace as local demand. Second, the investment decision into the more developed economy was in the direction of rapid growth through mergers and acquisitions.

3. Enhancement of Vertical Collaboration (Viet Nam, High-quality Rice and Milk)[1]

Enhancement of the Functions of Marketing Actor or Buyer in the FVC

Strengthening the marketing actor's functions in the FVC would increase value added and farmers' income. The case study of high-quality rice shows how the cooperative of paddy collectors[2] significantly contributed to the increase in value added through the exploration and quality control of the product.

- Intensive investment for research and development to realise higher-value products: The model cooperative of the paddy collectors, rather than concentrating on limited goods, has diverse commercial products, including white rice, brown rice, germ rice, and alcohol. The cooperative has also been exploring by-products which can potentially become commercial products with high value. Intensified investment in research and

[1] The first three in the total of five policy recommendations are drawn from the study of the high-quality rice. The last two are summaries of the results of the study on fresh milk.
[2] Tien Phong Cooperative (TPC) in Batxat District, Lao Cai Province.

development is required to create new products and new features and to enhance the value of core products.[3]

- A wide range of intervention into the FVC to control the product quality: The model cooperative intervenes in whole stages of the FVC to control product quality, and not only collects products. For example, the cooperative has provided farmers all the inputs including certified seeds, helped reap and collect paddy, and invested in modern machinery systems for post-harvest processing. Those investments realised higher quality and productivity of rice as well as enhancing linkages in the FVC.

Support by Secondary Actors or Relevant Stakeholders Surrounding the FVC

Secondary actors or relevant stakeholders not directly involved in the FVC, such as provincial government and non-government organisations (NGOs), can play important roles for poverty reduction, improvement of the livelihood of local people, and multifaceted rural development by intervening in the FVC.

- Industry promotion: Agri-food industries can be progressed through various services based on development plans and supporting programmes of the government. These include production zoning, management of agricultural inputs, provision of certified seeds, a subsidy of input costs, and dispatch of technical staff for technology transfer. Bodies responsible for industrial development can also support to promote agri-food industries by providing aid for agricultural machines, advertising products through regional festivals and showrooms, and creating training on business skills for local agricultural enterprises.
- Banking services: Formal financing suppliers must reduce the complexity of the procedures and improve the quality of credit assessment to select and fund potential customers while ensuring minimum payment risk. Many farmers are facing financing shortage, which leads to lower investment in agricultural production. However, according to the survey on high-quality rice, they could not access bank credit due to complicated documents and collaterals as banks required. The case study on fresh milk suggests that governments provide priority loans or funds to dairy farmers in order to create a good environment for developing the FVC.
- Other services: In the case of the fresh milk value chain in Viet Nam, a private dairy company in collaboration with an insurance agency introduced veterinary service for vaccination and disease management, and a scheme for dairy cow insurance and dairy price insurance as important services to stabilise the FVC.

Prevention of Illegal Actions by Technology Progress and Reform of Consciousness

[3] Such research can consider the possibility and appropriateness of the expansion of various products.

The case study in Viet Nam reported an illegal action, deliberately mixing ordinary types of rice with high-quality rice. Such action would be caused by under-exploitation of main products and by-products due to outdated processing technology and lack of innovation. Upgrading the current technology in processing and paying more attention to innovative higher-value products are recommended. Furthermore, increasing awareness of the long-term benefits of quality and customer service is necessary.

Encouragement of Vertical Linkages Beneficial to Farmers

Results of the cost–benefit analysis show that farmers can benefit when they can manage production cost well, even if they cannot get high cash receipts. Thus, this study emphasises the importance of contracts between buyers and suppliers which can contribute to cost reduction and efficiency of farm management.

- Farmer's contracts on purchasing inputs and selling outputs: The case study shows that input prices supplied by a milk company based on a contract is lower than those from various suppliers without contracts. Thus, although this suggestion would largely depend on the market condition, the contract between farmers and input suppliers can be beneficial to ensure the stable and affordable source of input goods, including feeds. A stable and sufficient supply of feeds would contribute to the production of higher quality milk.

  The contract on purchasing raw milk by milk collectors would also stabilise the milk production of farmers in some cases. Such a contract would be necessary for farmers when the explicit coordination of dairy plants on the milk collectors is weak.[4]

- Technical support and training courses for farmers: Contracts containing technical support by input suppliers or buyers would benefit the farmers. Dairy plants of a company in Viet Nam provide training of technicians and farmers, analyse the quality of milk, hire land and farm buildings, manufacture concentrated feeds, provide technical and veterinary services, and guarantee credit to buy cattle.

- Support to enhance the bargaining power of farmers: Depending on the contract, farmers can just be price acceptors and are not able to impose or negotiate prices. In the study site in Viet Nam, the dairy plant also decides the location, policy, rights, benefits, and responsibilities of each side for the milk collection processes. Thus, support to enhance the bargaining power of farmers is necessary. Some dairy farmers in the study sites have linkages with the associations of local farmers and war veterans. Those organisations can support farmers in terms of financial concerns or market power.

[4] The contract between dairy farmers and milk collectors is not essential when farmers have a contract with a dairy plant, which explicitly coordinates milk collectors.

4. Expansion of Market Channels Particularly of Small-scale Producers (Malaysia, Milk)

Many small-scale farmers and their labour shortage seem to essentially restrict the production of high-value goods according to the case study in Malaysia. Large-scale commercial farmers who profit with the volume of milk supply can minimise market risks and transaction costs through the contract with cooperatives or milk collection centres. However, small-scale farmers producing a limited volume of milk may not profit when they sell milk and its products in the formal market.

Support to Small-scale Producers for Accessing Informal or Niche Markets

Interventions to develop distribution channels in informal or niche markets, which offer higher prices for fresh milk, might benefit farmers. The results of the case study show that the ex-farm price of fresh milk is higher in informal markets, such as a consumer visiting a farm, temple, or house, than the formal market, namely, cooperatives or milk collection centres. Small-scale farmers are required to seek informal markets on their own, and that sacrifices time and money in managing farms. It would be helpful if the government formulate intervention strategies in assisting these farmers to establish contacts with informal markets.

Development of Cold Chain System to Realise a Wider Distribution of Perishable Products

Establishment of an efficient cold chain system, including transportation and storage for milk and dairy products, is crucial since most small-scale dairy farms are located in rural areas away from large consumer markets. An efficient cold chain system would enhance the marketing of perishable products to a wider distribution network. The case study also suggests better cold storage facilities to enable retail outlets to expand their market since they can drive to buy yoghurt from farmers, thus resulting in higher ex-farm prices.

5. Improvement in Distribution and Production Systems to Fully Utilise Resources (Indonesia, Various Seafood)

Improvement in the Distribution System to Circulate Fresh or Live Products

Value addition to seafood highly relates to processing and distribution technologies and systems. The case study in Indonesia repeatedly mentions the need for the cold chain system in the entire FVC – from handling in the fishing boat, landing, processing, to distributing and keeping the freshness and better hygiene of the products. Improved technologies are also needed to ensure a high survival rate from capture to distribution of live lobster and many live maricultural products such as grouper, which are sold at high prices.

Appropriate Conservation and Full Utilisation of Fishery Resources

Resource management to enable sustainable production is a problem specific to capture fishery. The case study suggests the importance of investment for production resources, technology development, and sufficient consideration of policies to fully utilise and save resources.

- Investment for infrastructure and human capital to access potential fishery resources: The case study suggests the potential to expand offshore fishery while fishery resources in the coastal area, where Indonesian vessels mainly operate, show a declining trend. Offshore fishery requires investment in large-scale fishing ports with modern equipment and human capital to introduce vessels with medium to large capacities.
- Research and development for improving fishing and aquaculture technologies: Environment-friendly fishing technologies or capturing techniques are needed, as mentioned in the case study on anchovies fishery. Similarly, the development of aquaculture would reduce overfishing, which lags behind capture fishery in the case of lobster production in Indonesia. The aquaculture of lobster needs to start with initial steps, such as research and development of hatchery. In terms of mariculture, particularly seaweed culture, a seedling system and centre that can produce good quality and superior seeds are necessary to improve seed quality and prevent diseases.
- Reassessment of regulation policies for conservation and management of marine resources: Various policies to conserve marine resources, such as regulations on specific fishing, fishing method, and selling, have been implemented in Indonesia in recent years. Two issues are stressed in the case study: one is the drop in the production of capture fishery and deficiency of locally supplied raw materials for the processing industry, and another is the relaxing of the regulation. Careful reassessment of current policies, including their scientific foundation, may be required to avoid the over-suppression of the local economy and the loss of substance of the regulation.

We should not easily generalise policy implications without careful consideration since the study sites and target items vary and are limited. Despite that, our study sheds light on obstacles for developing the FVC, which more or less exist in many ASEAN member states. It further provides ideas to solve that. Our study outputs are expected to serve as a clue to deeper arguments, and to contribute to improving the FVC and profitability of agri-food producers in ASEAN.