Chapter 6

The Cold Chain in Myanmar

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September 2019

This chapter should be cited as
Min, A. and S. Htut (2019), 'The Cold Chain in Myanmar', in Kusano, E. (ed.), *The Cold Chain for Agri-food Products in ASEAN.* ERIA Research Project Report FY2018 no.11, Jakarta: ERIA, pp.169-242.

Chapter 6

The Cold Chain in Myanmar

Aung Min[32] and Theint Sandy Htut[33]

6.1. Introduction and Background

Study background

The agri-food market in Southeast Asia has been activated by the steady population and economic growth and the deepening regional and international economic integration. However, the agri-food sector in this region still has unresolved issues, such as the low-income of small-scale farmers. There is plenty of scope for improvement in the food value chain (FVC) containing the whole process of production, processing, circulation, and trade of agri-food products, from institutional and technical aspects.

This study focuses on demand for refrigerated and frozen cargo by-products; selected agricultural products, such as fruits and vegetables, livestock products, fishery products, processed food, and chemical products to understand the cold chain logistics sector of Myanmar. Agricultural, livestock, and fishery are included under the agri-food industry. Foreign trade is the one sector that is vastly driving cold chain demand. Myanmar's agricultural foreign trade amounted to US$2,928 million in fiscal year (FY)2017/2018, from April to March, of which US$1,519 million was from border trade and US$1,409 million from normal trade. However, the foreign trade of agriculture-related cold chain products was not even 1%. It contributed only US$20 million in the same FY which was conducted via sea. Cold chain usage for agricultural products is not found at border trade. Most traded items are fruits, vegetables, vegetable seeds, and a few amounts of flowers.

The use of the cold chain for agriculture is still in its earliest stage and it has the most potential for growth in the future with the support from both the private and public sectors, such as businesses, NGOs, internal organisations, and the government. As for livestock and fishery, in the same FY, they contributed US$91 million and US$609 million, respectively. In the livestock sector, the trade of dairy products is also contained. In terms of cold chain logistics, more reefer containers and generator-equipped tractor trailers and third-party logistics (3PL) cold chain warehousing providers are needed. This particular study will analyse the whole cold chain landscape of Myanmar in relation to its market size for each product category while portraying the supply chains, cold chain assets, and human resources. Then, it will identify the current issues and challenges faced by the sector and recommend the related governments to take the necessary measures accordingly.

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Study objectives

The project aims to study cold chain logistics in Myanmar in the following scopes:

1. Current situation of the cold chain in Myanmar
2. Issues and challenges of the cold chain
3. Government policy to support its development
4. The mid-term prospects of the cold chain

Research methodology

The study of the cold chain in Myanmar was carried out by the Research Division of Myanmar Marketing Research and Development Company (MMRD) in November and December 2018. In order to portray the whole cold chain landscape, desk research and interviews with various stakeholders, including associations, logistics service providers, and users were conducted (Table 6.1). Desk research is done by collecting secondary data from various sources and previous reports as per the requirements. Expert interviews are conducted with pivotal associations that have direct contact with the cold chain. The study takes place in Yangon, Mandalay/Pyin Oo Lwin, Muse, and Ayeyarwady. The main routes covered are AyeyarwadyYangon and Yangon – Mandalay/ Pyin Oo Lwin – Muse.

Table 6.1: Sample Allocation

Description	Sample Size
Expert Interviews	
Myanmar International Freight Forwarders Association (MIFFA)	1
Myanmar Food Processors & Exporters Association	1
Myanmar Retailors Association	1
Cargo Truck Association	1
Myanmar Fisheries Federation (MFF)	1
Myanmar Fruits & Vegetables Association	1
Service Provider Interviews	
Transportation service (trucking gate)	3
Cold storages/ processing plants	6
3PL logistics companies	11
Customers Interviews	
Food processors	3
Poultry & meat processing plants/ slaughters	2
Importers/exporters	7
Retail – supermarkets	2
Pharmaceutical companies	2
Farmers	6
Total	46

Source: Authors.

6.2. Current Situation of the Cold Chain

Demand for refrigerated and frozen foods

The cold chain, as a subsector under the logistics industry, has every possibility of growth as long as there is demand in the country to transport its perishable produce. A country's potential for the cold chain can be estimated just by looking at its available volume of products that might need cold storage or transport. Fishery, livestock, agricultural, pharmaceuticals, and processed foods are the most visible product categories that use the cold chain.

Fishery products and processed foods; excluding dairy products, such as cheese, are the only categories that are transported frozen. They are mainly export or import items with less than 20% of total production. With that, more than 80% is going in the chilled stage mixed with crushed ice and is dedicated to domestic consumption. This traditional cold chain is still dominating the modern cold chain. Refrigeration is being utilised for storage and transport of perishables: livestock products such as meat and dairy; selected agricultural products such as flowers, fruit and vegetables; and pharmaceutical products such as vaccines. Here again, export/import items are the ones that commonly use refrigeration to meet international standards. Pharmaceuticals are an exception; it is the only category that has to use refrigeration even locally. Otherwise, for domestic consumption, the vast majority of the three categories mentioned are all distributed in chilled conditions using crushed ice.

In terms of trucking, the use of refrigerated trucks or reefer containers; twenty-foot equivalent unit (TEU) and forty-foot equivalent unit (FEU) are in demand mainly from export/import businesses while the rest depends on ice supply, insulated box trucks and general freight trucks. A few exceptions are top businesses in retail, hospitality, and other high-end markets. They are demanded to use modern cold chain facilities to sustain product quality. That being said, the volume of cold chain demand is described as the sum of domestic distribution, export and import as in Table 6.2.

Table 6.2: Current Cold Chain Demand in Myanmar (FY 2017/2018 based)

Category	Ordinary		Refrigerated		Chilled/cold		Frozen		Total	
	Ton	%	Ton	%	Ton	%	Ton	%	Ton	%
Fishery domestic distribution	–	–	–	–	5,309,233	34.90	–	–	5,309,233	34.90
Fishery export	–	–	–	–	–	–	568,227	3.73	568,227	3.73
Fishery import	–	–	–	–	–	–	15,616	0.10	15,616	0.10
Meat domestic distribution	2,829,910	18.60	–	–	–	–	–	–	2,829,910	18.60
Meat export	–	–	804	0.01	–	–	–	–	804	0.01
Meat import	–	–	789	0.01	–	–	–	–	789	0.01
Dairy domestic distribution	2,278,430	14.98	–	–	–	–	–	–	2,278,430	14.98
Dairy import	–	–	23,342	0.15	–	–	–	–	23,342	0.15
Selected agricultural products domestic distribution	4,145,245	27.25	–	–	–	–	–	–	4,145,245	27.25
Selected agricultural products export	–	–	14,118	0.09	–	–	–	–	14,118	0.09
Selected agricultural products import	–	–	25,444	0.17	–	–	–	–	25,444	0.17
Pharmaceuticals (vaccines) import	–	–	2,618	0.02	–	–	–	–	2,618	0.02
Total cold chain potential (B = C + D)	9,253,586	60.82	67,115	0.44	5,309,233	34.90	583,843	3.84	15,213,777	100.00
Current cold chain demand (C)	–	–	67,115	10.31	–	–	583,843	89.69	650,958	100.00
Cold chain potential (D)	9,253,586	63.54	–	–	5,309,233	36.46	–	–	14,562,818	100.00
Cold chain demand for local consumption (A)	–	–	52,194	0.97	5,309,233	98.74	15,616	0.29	5,377,042	100.00

Sources: Central Statistical Organisation (CSO, 2018), Department of Fisheries (DOF, 2018), and Myanmar Customs Department (2010).[34]

[34] For detail data on trade, authors requested Myanmar Customs Department directly as ad hoc basis. The same applies to the following tables and figures.

- The transition of consumption in refrigerated and frozen foods

In FY 2017/2018, the total domestic consumption of fishery, livestock, and agricultural product categories combined was about 12 million tons, of which fishery contributed the most at 43.16% followed by agricultural at 33.71% and livestock at 23.13%. However, only 5.4 million tons was demanding the cold chain. Fishery is the main sector making use of the cold chain; 5.3 million tons for domestic distribution and 15,616 tons for imports. The rest, 52,194 tons, makes up the import of meat, dairy, and selected agricultural and pharmaceutical products, such as vaccines. In addition, fishery domestic distribution is vastly through the traditional cold chain, which is the use of ample ice supply instead of running the chilling system of a truck or a warehouse.

Table 6.3: Current Cold Chain Demand for Domestic Consumption in Myanmar (FY 2017/2018) (A)

Sr.	Category	Tonnage	% Contribution
1	Cold/chilled	5,309,233	98.74
2	Refrigerated	52,194	0.97
3	Frozen	15,616	0.29
	Total	5,377,042	100.00

Sources: CSO (2018), DOF (2018), and Myanmar Customs Department (2010).

With the abundance of natural resources, keeping products in the frozen stage is not common or necessary for Myanmar for local consumption, except for ready-to-eat processed food items, for example, dumpling and ice-creams. In many countries with a developed cold chain sector, the storage of fruit and vegetables and other commodities in the freezing stage for sale at a future date is already widespread. But in Myanmar, it is still in the early developing stage and therefore Myanmar is still relying on imports in times of supply shortage. Freezing for future sale is mentioned in a later section[35] and in the strawberry distribution case study[36]. If this were to become mainstream, cold chain demand for local consumption would go up.

[35] The subsection titled ‘Selected agricultural products’ under 'Demand for Refrigerated and Frozen Cargo by Product' in this section.

[36] The subsection titled ‘Cold chain logistics for strawberry’ under ‘6.4. Case Study’.

- The transition of import of refrigerated and frozen foods

The use of modern cold chain facilities has been increasing along with increasing foreign trade. Specifically, the import of fresh seafood and these facilities simultaneously gained momentum after 2015. Fishery imports increased fivefold from 3,014 tons in 2015 to 15,616 tons in 2018. Meat imports are also rising in response to the growth of the hotel and tourism industry and the entrance of well-known international fast food chains, such as KFC and Lotteria. The dairy sector saw a gradual decline of trade, yet it seems reasonable when checking with the steady increase of domestic production. Of the imported dairy items, high-quality processed products, such as whole and skimmed milk powder and cream milk are standing at the top, as the local dairy sector still needs a lot of improvement, especially regarding technical know-how and raw supplies.

In FY 2017/2018, the top seafood exporters into Myanmar were Thailand, Switzerland, and Indonesia while meat was sourced mainly from Thailand, Brazil, and the Netherlands. Dairy products are mainly imported from New Zealand, Australia, and Germany. Seafood comes in the frozen stage, while meat and dairy come with refrigeration. Once arrived at Yangon Ports, reefer containers carrying these products are plugged in at dedicated charging facilities powered by the port. After customs procedures, containers are unplugged from charging and sent to the respective processing plants or factories. Continuous chilling/cooling may not be guaranteed at all times as the vehicles used are usually not equipped with generators. However, this is not that of a big issue as it seems given the distance and time; some factories are located at the industrial zones which are of a short distance from the port and thus take less time, an hour or so. In this case, reefers are only driven vehicle-powered. Some products are not even powered throughout the short intercity trip. The vast majority of imports are to fulfil local demand whereas very few of them, especially seafood, are imported for local processing and then export back to the countries of origin on Cut-Make-Pack (CMP) basis.

Table 6.4: Transition of Import of Refrigerated and Frozen Foods

FY	Fishery		Meat		Dairy		Total	
	Tonnage	US$ Million	Tonnage	US$ Million	Tonnage	US$ Million	Tonnage	US$ Million
2014/2015	3,014	2.25	153	0.57	62,460	97.02	65,627	99.84
2015/2016	2,736	3.57	150	0.64	61,408	98.29	64,293	102.5
2016/2017	12,777	2.86	276	1.38	56,527	87.90	69,579	92.14
2017/2018	15,616	5.40	789	2.49	23,342	60.31	39,747	68.2

Source: Myanmar Customs Department (2010).

Demand for refrigerated and frozen cargo

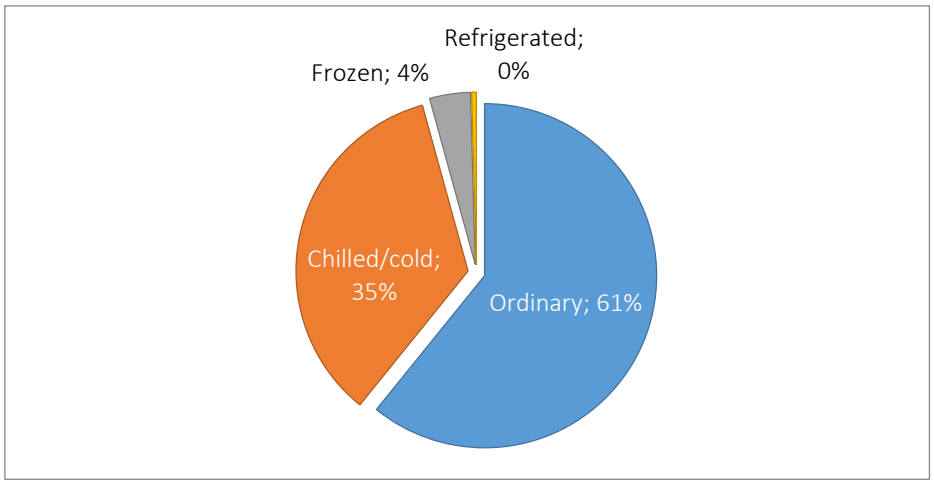
Logistics services in the country are demanded in four distinct ways depending on the temperature control requirements by different product category, such as livestock, fishery, agricultural and chemicals or pharmaceuticals. In this subsection, logistics will be defined as a combination of transport and storage. Controlled temperatures differ based on each product or its shelf life. Common temperature adjustments found are frozen: -25°C to -18°C, chilled or cold: -5°C to +15°C, air-conditioned or refrigeration: +15°C to +25°C, and ambient: +25°C and above. Ambient is a logistics terms used for dry goods that can be kept at room temperature with no further temperature adjustments. For example, fishery products need to be kept at frozen temperatures to maintain their quality while ambient is in use for most consumer goods.

Technically, in countries with developed logistics sectors, cold chain utilisation is common sense for the distribution and storage of all possible perishable products. On the other hand, non-perishables or dry goods use traditional logistics with ordinary temperature. But this is not entirely the case for Myanmar. As analysed in Table 6.2, the product categories named under “Ordinary” which make up the vast majority of the country’s total cold chain potential, are only utilising traditional logistics for the whole supply chain. This is more than half, at 60.82% or 9.3 million tons in volume. It is possible that it would demand cold chain in the future in line with the growth of the economy and thus the logistics industry.

It also needs to be noted that the base statistics for agriculture-related product categories, such as “Selected agricultural products domestic distribution”, “Selected agricultural products export” and “Selected agricultural products import”, are all filtered to get a more realistic look at the industry’s actual potential. Therefore, these statistics only represent cold chain needs rather than the whole agricultural industry. Other product categories that need

do not appear in Table 6.2 are “Dairy export”, “Domestic distribution of pharmaceuticals” and “Pharmaceuticals export”. This is due to the fact that their volume is insignificant to be shown. Specifically, for pharmaceuticals; it is a given that local supply should be enough to consider export. Yet, Myanmar has a supply shortage to even fulfil the local demand. With that, the cold chain is potentially in demand from the remaining 39.18%, of which the chilled category contributes the most, with 34.90%: 5.3 million tons, accompanied by frozen 3.84%: 0.6 million tons and refrigerated 0.44%: 0.07 million ton, respectively.

Figure 6.1: Percentage Contribution of Total Cold Chain Potential in Myanmar (B)



Sources: CSO (2018), DOF (2018), and Myanmar Customs Department (2010).

To be more specific, it is only the ordinary category that is not utilising the cold chain, i.e. of the total volume of 15 million tons. Therefore, it can be concluded that the country’s cold chain sector represents the remaining 6 million tons, combining the refrigerated, chilled or cold, and frozen categories. The sector can be presented with each category divided as followed in Table 6.5. This conclusion is under the assumption that the industrial-wide value or size of the sector, i.e. 6 million tons, represents the absolute value of product tonnage with no further specification; whether they are for storage, transport only, or both, and the fact that they are using the traditional or modern cold chain.

Table 6.5: Current Cold Chain Sector of Myanmar in FY 2017/2018 (C and D) (Ton)

Sr.	Category	Modern Cold Chain (C)	Traditional Cold Chain (D)
1	Chilled/cold	–	5,309,233
2	Refrigerated	67,115	–
3	Frozen	583,843	–
	Total	**650,958**	5,309,233

Sources: CSO (2018), DOF (2018), and Myanmar Customs Department (2010).

Myanmar's current cold chain demand can be described in two ways; traditional and modern. The former would be the 5.3 million tons, which consists of bucket and crushed ice transport or storage dedicating for domestic distribution of fishery products. This is a bit different from its counterpart of foreign trade and from other product categories. It is stored in frozen temperatures and transported in chilled conditions. If it was stored before distribution, utilisation of the frozen category would go up. The percentage increase is not yet known and needs to be verified with thorough ground checks. It can also be concluded that 5.3 million tons or 89% of total demand for cold chain is a huge potential if it were to be transformed into the modern chain. Anyhow, both of these can be reasonably referred to as Myanmar's cold chain demand in that they both utilise means to sustain product quality with temperature control.

Demand for refrigerated and frozen cargo by product

Myanmar's total cold chain demand of 650,958 tons can also be presented by product categories, including but not limited to fishery, meat, dairy, agricultural, and pharmaceuticals. In general, all product categories named here have already been arranged with the cold chain throughout the supply chain in most developed economies. If Myanmar's logistics industry were to be developed together with its economy, the potential of the cold chain, a sub-sector under the logistics industry would leap to 15 million tons, which is threefold the sector's current size.

Table 6.6: Cold Chain Demand by Product Category in FY 2017/2018 (Ton)

No.	Category	Current Demand		Potential Demand		Total Demand	
		Tonnage	%	Tonnage	%	Tonnage	%
1	Fishery	583,843	89.69	5,309,233	36.46	5,893,076	38.74
2	Meat	1,593	0.24	2,829,910	19.43	2,831,503	18.61
3	Dairy	23,342	3.59	2,278,430	15.65	2,301,772	15.13
4	Selected agricultural	39,562	6.08	4,145,245	28.46	4,184,807	27.51
5	Pharmaceutical	2,618	0.40	0	0.00	2,618	0.02
	Total	**650,958**	**100.00**	**14,562,818**	**100.00**	**15,213,777**	**100.00**

Sources: CSO (2018), DOF (2018), and Myanmar Customs Department (2010).

- Fishery products

Myanmar's fishery sector has long been accustomed to cold transport, although its way of the cold chain may not necessarily mean our modern cold chain facilities, such as reefers and cold storages. The total production of fishery products was 5.9 million tons in FY 2017/2018. In the same FY, fishery trade worth US$717 million has been conducted, which accounted for 583,843 tons. Of this, 97% was exports and 3% was imports, with each contributing to US$712 million and US$ 5 million, respectively.

Table 6.7: Annual Statistics of Fishery Products from FY 2015/2016 to FY 2017/2018 (Ton)

FY	Production	Export	Import	Consumption
2015/2016	5,591,830	368,971	3,014	5,225,595
2016/2017	5,675,470	438,707	2,736	5,249,540
2017/2018	5,877,460	568,227	12,777	5,324,849

Sources: DOF (2018) and Myanmar Customs Department (2010).

The coastal regions, such as Ayeyarwady, Tanintharyi, Rakhine, Mon, and Yangon, are the primary sources of various fishery products. Aquaculture farms are also in place and they are mostly targeted towards locals, unlike sea fisheries which are highly demanded from foreign importers. Yangon is the main fishery distribution centre in the country distributing fresh seafood; both wild and farmed from its two main fish markets, namely Central San Pya Fish Market and Shwe Padauk Fish Market in Yangon, to all parts of Myanmar. The cold chain brings the finest quality to its users along with its convenient cooling/chilling systems.

However, for traditional transport, the manual workforce has to be extensively used for loading and unloading while the freshness of goods is compensated with ample ice supply and cold boxes. There are 301 ice plants in Myanmar, all owned and operated by the private sector, with a daily output of 6,786 tons. As described below in Table 8, one-third of them are accumulated in the Yangon area or the central distribution centre.

Table 6.8: Ice Plants by State and Region

Sr.	State/Region	Unit	Capacity (Tonnage/Day)
1	Yangon	106	2,364
2	Tanintharyi	48	2,536
3	Rakhine	39	456
4	Ayeyarwaddy	70	869
5	Mon	29	528
6	Mandalay	7	30
7	Shan	2	3
	Total	**301**	**6,786**

Source: DOF (2018).

Aquaculture

Of the total fishery production, 19% was from aquaculture, which is about 1 million tons. There are 491,345 ponds in Myanmar, and Yangon is the main destination for their outputs. The mode of transport depends on the location of the farm. For inland water transport, primarily picked freshwater farm fish have to be loaded into a boat together with crushed ice in the ratio of 1:1 to maintain the temperature below 4°C. The boat has to be filled with poly vinyl chloride mesh beforehand to keep the melting of ice at minimum. They are all designated to Yangon landing sites or auction area at jetties, from then to winning processing plants/cold storages or the two fish markets.

As for land transport, general boxed trucks are mostly used, and they have to be loaded with crushed ice first at the nearest ice plant; many of them can be found in major regions. After that, fish is picked and loaded at the farm using manual labour. When loading, it is a

requirement to keep fishery products in ice in 1:1 ratio[37]. However, some fish farms and trucks apply the ratio 1:2 to gather more fish in one go; with that combination, a 19ft truck can carry up to three tons of fish with 1.5 tons of ice. Most of the time, they are directly sent to the central fish market, San Pya. Here, the direct linkage or negotiation between fish wholesalers in the market and the farm may apply instead of auctioning.

Fisheries

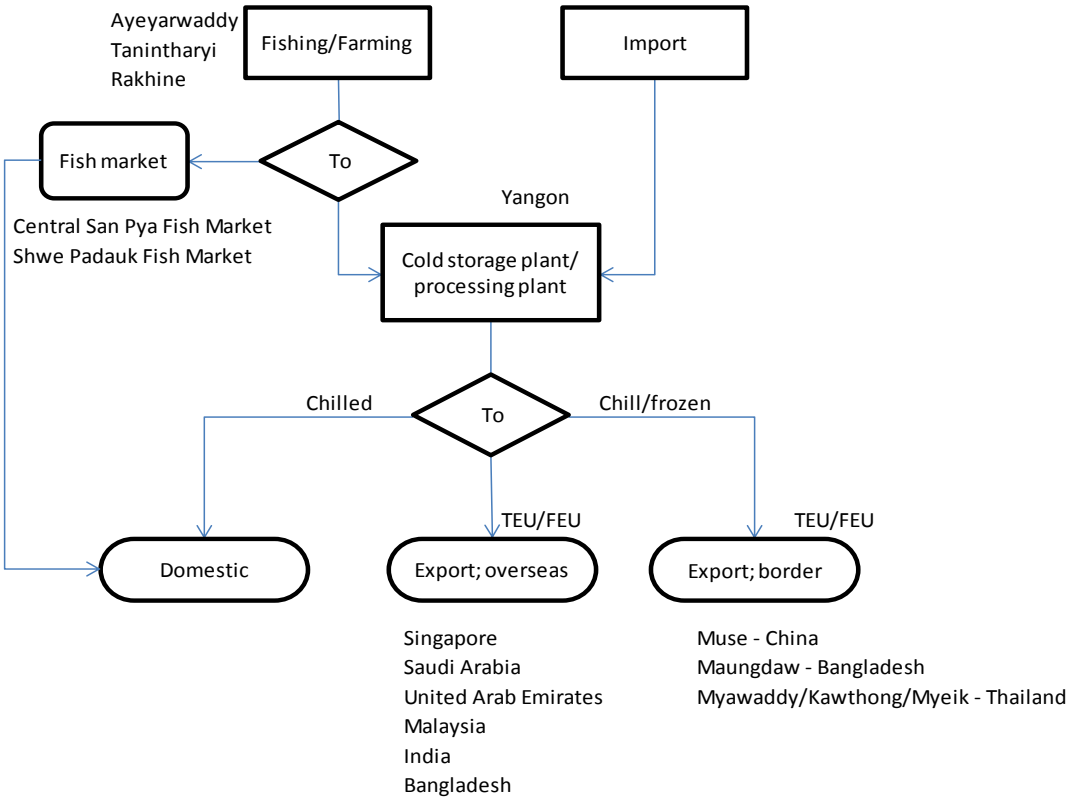
The rest, 81%, makes up natural catching or fishing. Of this, marine fishery makes up 3.2 million tons or 54%, followed by open fisheries: 1.3 million tons at 21% and leasable fisheries: 0.3 million tons at 6%. After catching, fish are kept in plastic barrels; which are placed in the fish hold, with crushed ice at 1:1 ratio to maintain the temperature below 4°C. They are transported from fishing grounds to Yangon jetties for auction, and fishery processors and exporters are usually the main participants. Fish caught at sea are landed at jetties within 1–5 days depending on the location of the fishing ground. At the auction area, all kinds of seafood are washed with clean water and sorted for sale. Each type is displayed in steel trays mixed with crushed ice and is set for different prices. After auction, they are transported from the jetty to processing plants or cold storages, and the two fish markets with insulated box trucks or with general trucks; in which are iced boxes filled with ice and fish. The fish auction is held once a month while shrimp and prawn auctions are there every day.

Domestic distribution flow of fishery products

As the distribution hub of all fishery products, Yangon is made up of two central fishery wholesale markets; San Pya and Shwe Padauk, and a few others including Pazuntaung Naungdan and Annawa markets. All fishery products that end up in the two markets are directed towards the rest of Myanmar, including the top cities, namely Kalay, Tamu, Myitkyeena, Muse, Chauk, Taunggyi, Aung Ban, Loikaw and Myawaddy. They go until Bangladesh, India, China, and Thailand through border towns.

[37] Myanmar Fishery Federation (MFF) adopted the guidelines for cold chain management of fish and fishery products in ASEAN region.

Figure 6.2: The Flow of Fishery Products in Myanmar



Source: Authors.

As stated above, the traditional cold chain is still heavily used for domestic distribution. Seafood mixed with ice is loaded into box trucks and directly transported, or it is put into ice boxes and transported with general trucks; usually six wheelers. The former is common for Yangon intercity while the latter is typical for long haul. Maintaining product quality sounds difficult and inconvenient considering the conventional way of the cold chain. Uninterrupted free flow of products is hard to achieve as transits or stops at second cities, for example, Mandalay, are necessary to further reach the remote areas while sustaining product quality. Fish farms get rid of this hassle; but at a cost of bargaining power and consumers do not have many choices of fishery varieties.

Figure 6.3: Activities at Central San Pya Fish Market, Yangon

Source: Authors.

Figure 6.4: Refrigerated Trucks Lined at San Pya Fish Market, Yangon

Source: Authors.

Yangon had a fishery supply of 267,890 tons in FY 2017/2018; which would equate 734 tons of movement a day. The local production for the whole country was 5.9 million tons. Although fishery production is increasing, widespread use of modern cold chain facilities for domestic distribution has not been found, except for some imported premium seafood volume for retail, as they are all transported chilled with normal trucks. Modern cold chain demand is mainly driven by high-end markets, such as supermarkets, hotels, and fine dining restaurants for quality and safety control. In FY 2017/2018, there were imports of 15,616 tons of fishery products into Myanmar.

Table 6.9: Annual Imports of Fishery Products

FY	Volume in Tons	Value in US$ Million
2015/2016	2,736	3.57
2016/2017	12,777	2.86
2017/2018	15,616	5.40

Source: Myanmar Customs Department (2010).

With Yangon being the centre of all high-end communities, it is safe to assume that these imports are designated to cold storages and processing plants in Yangon. They are then distributed within Yangon and to other big cities where a high-end consumer base is present, generally Nay Pyi Taw and Mandalay. If this was the case, then the percentage of modern cold chain usage for domestic distribution of imported fishery would be only 0.26% of the total cold chain potential of 15 million tons compared to fishery exports that contributed 9.64%. The rest of the local distribution of 90% is through the traditional cold chain.

Export flow of fishery products

In Myanmar's fishery export sector, sea fishery has better prices rather aquaculture farming. In FY 2017/2018, fishery exports reached 568,227 tons, which was an increase of 129,520 tons from the previous year. In terms of value, it was US$712 million in FY 2017/2018, an 18% increase from the previous year. The top seafood buyers are Singapore, Saudi Arabia, China, the United Arab Emirates, and Malaysia. Border exports are conducted with neighbouring countries, such as Thailand and China, while the rest are through normal

exports. Exported fishery products are mostly acquired from auction and are first processed; with minimal processing, freezing, and packing at processing plants in Yangon. Minimal processing includes washing, weighing, belly-gutting, and peeling.

Table 6.10: Annual Export of Fishery Products

FY	Volume in Tons	Value in US$ Million
2015/2016	368,971	502.63
2016/2017	438,707	605.82
2017/2018	568,227	711.72

Source: DOF (2018).

Only after that are they ready for export standards and are transported to either Yangon Port or the respective border towns, namely Maungdaw (Bangladesh), Muse (China), and Myawaddy, Kawthaung, or Myeik (Thailand). As for the neighbours of India and Bangladesh, normal trade is more utilised due to infrastructure limitations, for instance, severe road conditions en route to destination cities or border towns. TEU and specially FEU reefer containers are used for export. The export quality for normal trade is unquestionable and meets international cold chain standards. However, for border trade, some reefer containers are equipped with generator sets, while the others are only powered by vehicles. There are even cases of frozen transport without continuous chilling. This seems feasible given the time, distance, and the duration of products staying in the frozen stage with no refrigeration until they reach the destination.

To summarise, fishery is the most significant of all categories of cold chain demand and holds the largest share of cold chain demand at 98.87%. This is out of 6 million tons inclusive of bucket and ice transport. Regardless of the actual practices on the ground, it remains the largest with 89.69% for the authentic total cold chain demand of 650,958 tons (Table 6.5), even when the massive local distribution volume of 5.3 million tons that utilises the traditional cold chain is excluded. Given that trade volume is the only factor driving the authentic cold chain demand, especially export, exports are increasing at a steady rate of avg. 9% every passing year, which can be seen in Table 6.11. Thus, it can be concluded that cold chain demand is likely to increase in the future.

Table 6.11: Annual Foreign Trade of Fishery Products

FY	Export		Import		Total Trade	
	Tons	US$ Million	Tons	US$ Million	Tons	US$ Million
2015/2016	368,971	502.63	3,014	2.25	371,985	504.88
2016/2017	438,707	605.82	2,736	3.57	441,443	609.39
2017/2018	568,227	711.72	12,777	2.86	581,004	714.58

Sources: DOF (2018) and Myanmar Customs Department (2010)

- Livestock products

Livestock products include meat: pork; beef; mutton, poultry: chicken; duck, and dairy products. In this subsection, meat refers to both meat products and poultry unless specified, whereas dairy means dairy products, such as milk, milk powder, cheese, etc. Meat production is more accessible to the masses, even to far-off regions. Consequently, the extensive use of storage and transportation facilities for local consumption is with general trucks only. In FY 2017/2018, domestic meat production was 2.8 million tons; this was a decline of 120,302 tons from previous the year. In the same FY, 804 tons worth US$3 million were exported overseas, largely to Singapore, Malaysia, New Zealand, and the United States.

Table 6.12: Annual Statistics of Meat Products from FY 2015/2016 to FY 2017/2018 (tons)

FY	Production	Export	Import	Consumption
2015/2016	2,889,610	197	149	2,889,562
2016/2017	2,951,016	355	276	2,950,937
2017/2018	2,830,714	804	789	2,830,699

Sources: CSO (2018) and Myanmar Customs Department (2010).

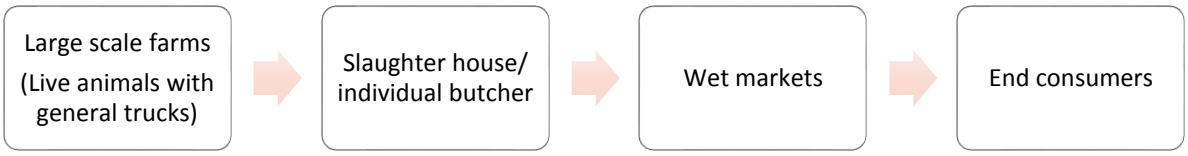
Livestock farming

Of the total production, meat contributes 44% and poultry 56%. Large-scale livestock farming is a major supplier of meat production in Myanmar, while a few small-scale farms are operated by rural households. They are found in every big city supplying enough for regional consumption. Live animals are sent with general trucks from the farm to wholesalers for butchering then to wet markets, or directly to wet markets. The domestication of poultry is common for rural households and therefore is readily available at all times. Some of those

households are sole proprietors in poultry production and distribute the output to nearby areas or towns on a regular basis or when demanded. For them, transportation is not limited to trucks, could sometimes be a motorcycle.

Contract farming for the livestock sector is also developed, particularly for poultry, although they are designated for Yangon. They are mostly located around the Yangon region, such as Bago, Thikekyi, Inta Gaw, etc. Myanmar C.P. Livestock (MCPL) is one of the market players in contract farming. From the contracted farm, live birds are transported to the firm's butchering factories, and from there to dedicated clients and markets. But, most of the time, for the vast majority of consumption, meat is produced by local butchering businesses each day and is transported to wet markets or delivered door-to-door to restaurants. They are based in every big city and general light trucks are mostly used for commercial distribution to the mass market. Slaughtering licences are also held by individual butchers and are mostly for meat such as beef, pork, and mutton.

Figure 6.5: The Flow of Livestock Products in Myanmar



Source: Authors.

Cold chain distribution flow of meat products in Yangon

Again, for Yangon consumption, meat production can be divided into two categories; meat products, such as beef, pork, and mutton, and poultry, such as chicken and duck. Generally, the purchase of fresh meat products at supermarkets is not mainstreamed in Myanmar. As a result, cold chain demand, which is mainly driven by modern supermarket chains, are only limited to a few percentages compared with the total volume. However, the cold chain is apparently used for all export/import meat products as it is a minimum requirement for quality control.

Meat production is mainly handled by Ywar Thar Gyi Slaughter House in East Dagon Township and two others in Hlaing Thar Yar and Kyeemyindaing. Freshly butchered meat cuts and

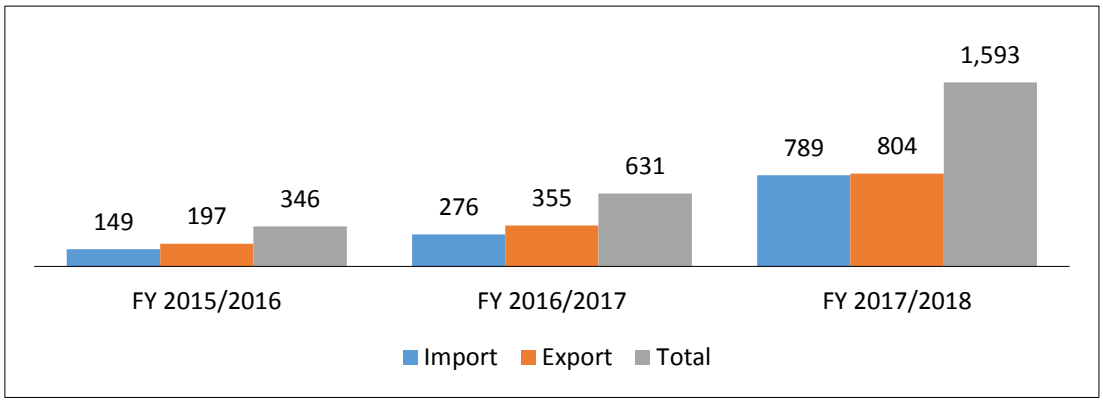
carcasses are delivered to wet markets before daybreak with general trucks. Some of them are sent to City Mart's warehouse, while a few are ordered by restaurants and hotels. As for poultry production, Chicken and Duck Market in Mingala Taung Nyunt Township, Myanmar C.P. Livestock (MCPL) and Japfa Comfeed Myanmar Co., Ltd (Japfa) are the key players. Chicken and Duck Market is the main poultry wholesale centre in Yangon. Japfa is a leading supplier of poultry products and its main business is the manufacturing of animal feeds. Japfa distributes 10,000 whole chicken birds; that is about two tons of meat each day with refrigerated box trucks. There are five trucks in its ownership with a capacity ranging from two to four tons. Temperature setting in the truck is chill or air-conditioned.

MCPL is a major user of the cold chain in the livestock sector. They have under them many lines of business that are closely associated with poultry production, which nearly covers the whole value chain; from breeding, hatchery and farming to finished goods production. MCPL is partnering with KOSPA Limited, the second largest 3PL cold chain service provider in terms of asset, to fulfil its cold chain needs. The cold chain comes into play when the finished goods; meat and processed foods such as sausage need to be delivered to City Mart. They are loaded into the three-ton refrigerated box truck using cold boxes. The controlled temperature in the truck is between 0°C and 10°C. Further information about MCPL can be assessed in detail under Section 6.3.

Trade of meat products

Premium meat consumption has been on the rise since 2016 in response to the growth of the hospitality industry and hotels and fine dining restaurants. These high-end markets demand premium quality at all time, and consequently the cold chain becomes a basic necessity. In FY 2017/2018, the total foreign trade volume of meat products reached 1,593 tons with each accounting for US$2 million in value. Most imported items were chicken: 111 tons and beef: 66 tons. They were mostly imported from Thailand, Brazil, and the Netherlands. They can be found largely at City Mart's Marketplace and fine dining facilities in hotels and restaurants, such as steak houses. As for exports, pork is the most exported item with a volume of 386 tons, followed by chicken and beef at 190 tons and 151 tons, respectively. The top meat importers are Thailand and the Netherlands. The trade is conducted via land for Thailand and sea for the Netherlands.

Figure 6.6: Annual Foreign Trade of Meat Products (tons)

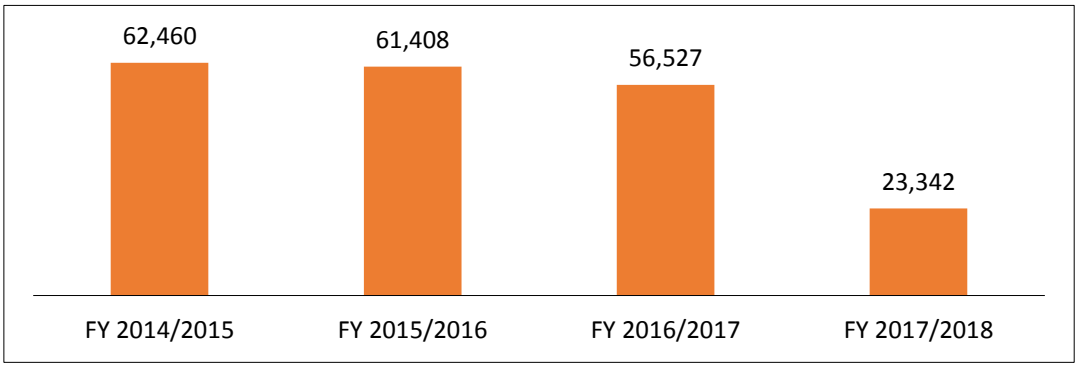


Source: Myanmar Customs Department (2010).

Dairy products

Dairy is another product category that cannot be ignored as the cold chain is essential to keep processed foods such as cheese and butter in good shape. Pure or raw milk is produced largely in the country, which can be verified with government statistics; 2.3 million tons in FY 2017/2018. However, the dairy processing sector has yet to be developed in order to keep pace with the appearance of bakeries and confectionary production, for example, Dutch Mill or other First Moving Consumer Goods (FMCG) products such as coffee mix, tea mix. Therefore, local consumption is still relying on imports. The top imported products are milk powder, cream milk and skim milk. These accounted for US$ 60 million or 23,342 tons for the same FY. The importing amount is shrinking over the years, which can be seen in Figure 6.7.

Figure 6.7: Annual Import of Dairy Products (tons)



Source: Myanmar Customs Department (2010).

This means the local industry is catching up, even though at a slower pace, and the sector's total production output is still hard to grasp. The top imports of dairy products by country are New Zealand, Australia, and Germany, with each contributing 36%, 14%, and 12%, respectively. In the matter of the cold chain, storage appears to be more in demand than transport. Depending on the product, cold boxes are more widely used for local distribution rather than refrigerated trucks.

In brief, the livestock sector, a combination of meat and dairy is not using the cold chain for local distribution, except for foreign trade. On the other hand, on a more positive side, it can be concluded that the sector has potential given its worth of 5.1 million tons. This is 34% of the total volume with cold chain potential. The current demand of the cold chain is only 0.42%, which is 24,935 tons or US$ 65 million in value.

- Selected agricultural products

There appear to be very few amounts of agricultural products that demand the cold chain, largely due to the fact that Myanmar is an agri-based economy with plentiful fresh produce available all year round. Cold chain demand is only driven by export produce items and imports of produce that cannot be fully cultivated locally and is demanded, particularly from the hospitality industry. In FY 2017/2018, the production of agricultural products was 4.16 million tons; of which, fruit comprised 18% and vegetables 82%. In this figure, only the selected items with cold chain potential as well as the items that are of significant yields are included.

Table 6.13: Annual Statistics of Selected Agricultural Products (tons)

FY	Production	Export	Import	Consumption
2014/2015	4,165,384	–	–	4,165,384
2015/2016	4,224,876	–	–	4,224,876
2016/2017	4,362,192	10,881	15,571	4,366,882
2017/2018	4,159,363	14,118	25,444	4,159,363

Sources: CSO (2018), Myanmar Customs Department (2010).

Table 6.14: Production of Major Selected Agricultural Products in FY 2017/2018

Category	Volume in Ton	% Contribution
Major Selected Fruits		
Mango	415,096	9.98
Watermelon	317,018	7.62
Strawberry	1,571	0.04
Total	*733,685*	*17.64*
Major Selected Vegetables		
Tomato	1,173,258	28.21
Potato	499,949	12.02
Cabbage	451,442	10.85
Cauliflower	345,149	8.30
Mustard (leaf)	294,298	7.08
Gourd	272,678	6.56
Radish	263,838	6.34
Lettuce	103,894	2.50
Carrot	17,586	0.42
Asparagus	3,587	0.09
Total	*3,425,679*	*82.36*
Grand Total	**4,159,363**	**100.00**

Source: CSO (2018).

In the same FY, 25,444 tons worth US$33 million agriculture products were imported into Myanmar. Of the 25,444 tons, vegetable products contributed the most at 84.31%. As for exports, fruit contributed 81% and vegetable products 19%, respectively. Flowers were also exported, but only around 5 tons. Therefore, the current cold chain demand for domestic consumption of agriculture products is estimated to be 4.15 million tons, which is 99% of the total volume of selected agricultural products of 4.18 million tons. This is the combined value of production and import in FY 2017/2018. Both exports and imports are done via sea trade.

Table 6.15: Foreign Trade of Agricultural Products in FY 2017/2018

Category	Volume in Tons	US$ Million
Export		
Fruits	11,428	2.25
Vegetable	1,580	0.59
Vegetable Products	1,105	1.28
Flower	5	0.00
Total	*14,118*	*4.13*

Import		
Vegetable	11,731	6.03
Vegetable Products	9,720	20.04
Fruits	3,992	6.48
Flower	0	0.00
Total	*25,444*	*32.56*
Grand Total	**39,562**	**36.69**

Source: Myanmar Customs Department (2010).

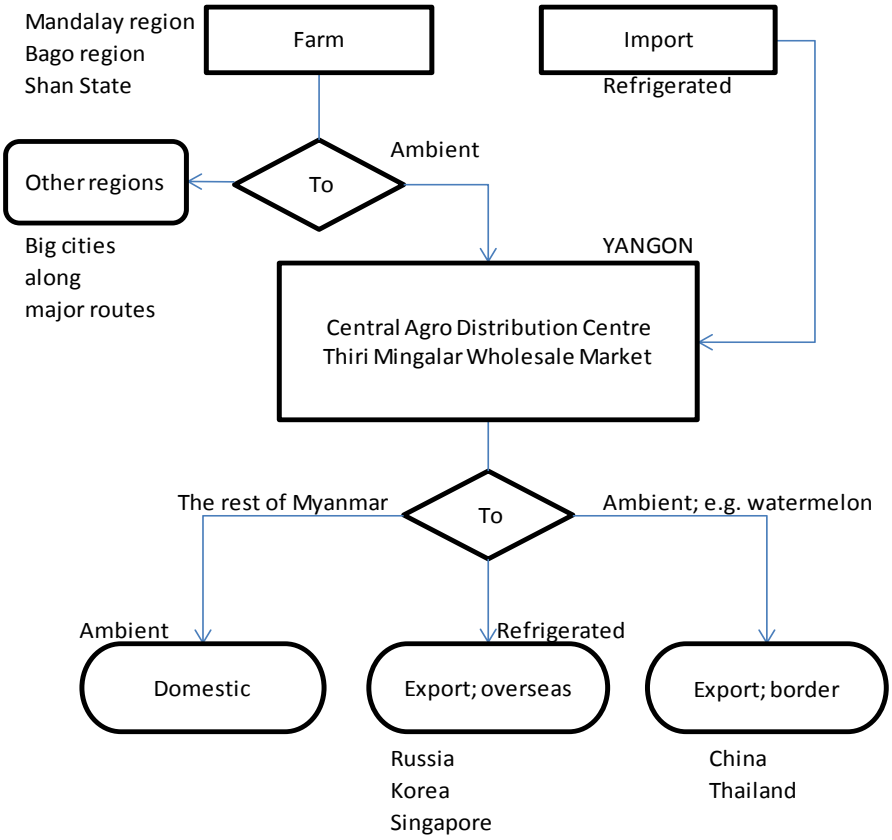
The major cultivation areas of the selected products in Myanmar are Mandalay Region: Pyin Oo Lwin; Mandalay; Nay Pyi Taw; Kume, Shan State: Aung Ban; Heho; Thibaw, and Bago regions. Yangon is apparently the main distribution hub of all agricultural products, while a point-to-point pattern can also apply depending on the route and distance. For example, produce grown in Shan State may directly go to Mandalay, rather than through Yangon; the central distribution hub. Thiri Mingalar Wholesale Market is the main market in Yangon for all agricultural products from across Myanmar. The establishment of the new market, Danyingone Wholesale Market is also in progress. The plan is to settle residents from Thiri Mingalar Market at the new market. More detailed information is described below at the end of this subsection.[38] Fresh produce is largely transported dry with express buses and general trucks (12 wheelers).

Less than 1% of produce that ends up in Thiri Mingalar market comes by the cold chain; demand is driven by traders. Traders that are involved in export/import or that prefer rather high-quality fresh produce usually request refrigerated transport from growers. Delivery is door-to-door; one of the benefits of the cold chain. Otherwise, for other buyers that target local consumption, the transport destination is the market rather than the company. Only from there, produce is delivered to final buyers such as modern retails namely City Mart, hotels and high-end restaurants. City Mart has connections with brokers; liaisons between growers and the mart. Brokers are in charge of procuring or collecting fresh produce. For technical-knowhow, Myanmar cannot produce certain fruit and vegetables all year. In this

[38] See 'Establishment of State of the Art Wholesale Market in Yangon' under 'Potential Agricultural Products' in this subsection.

case, brokers have to import them from overseas. For example, bell peppers are imported from Thailand when in the off-season.

Figure 6.8: The Flow of Selected Agricultural Products in Myanmar



Source: Authors.

Cold chain demand for agricultural products

Agri-cold chain demand is driven by traders in Yangon. Some traders have contract farms in some regions, while the vast majority of sourcing is from individual growers. The top distributed items are flowers, such as chrysanths, fruits, namely strawberries, dragon fruit, and grape, and more than 20 varieties of vegetables. They are mainly cultivated in Pyin Oo Lwin, Mandalay, Nay Pyi Taw, Heho, Loikaw, and Naung Tayar. The cold chain is demanded for long-haul transport from those areas to Yangon Thiri Mingalar market. Drop-off locations can be specified based on the preferences of the buyers. There are only two major processing

factories in Myanmar for fresh produce; dehydration and freezing. Production output is about 150 FEUs which is half its actual capacity. They are exported to Japan. Pickup from the farm is generally done through general light trucks, however refrigerated trucks would be utilised for the varieties mentioned 2019 onwards to keep the exact quality from harvest.

Figure 6.9: Cold Chain Product Flow for Fresh Produce in Pyin Oo Lwin City, Mandalay Region

Collect produce at the farm; e.g. flower

Sent to PSL's truck staion/ packing centre

Initial cleaning & packing for freshly picked produce at the centre; chinese broccoli

Put fruit and vegetables into stackable basket; e.g. tomato

Initially packed produce in the truck; chinese broccoli and mustard greens

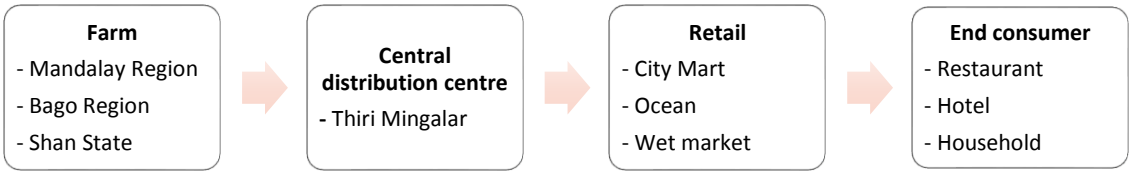
Isuzu Elf 3ton reefer box truck at the centre, waiting to be sent to PSL's main truck staion in Anee Sakhan

Source: Authors.

Go Green is one of the traders in Yangon that has its own fresh produce store. It gathers organic fresh produce, including flowers from growers throughout Myanmar, especially from Pyin Oo Lwin and adds value with proper packaging and labelling to make it ready for sale. The sale is mainly through the store, while the products can also be found on City Mart's shelves. Premium Sojitz Logistics (PSL) is the sole third-party cold chain service provider for the city. PSL deploys two refrigerated trucks to the city unloaded every day which carry back full truck loads of produce to Yangon. The controlled temperature in the truck depends on the type of produce, but is about 8°C. The company purchases about 20–30% of flowers from

the city with the cold chain. Unlike fruit and vegetables that can be carried together, dedicated trucks are required for flowers based on seasonality. Stackable moving baskets are used for loading vegetables, while corrugated cartons are used for flowers and some fruits. A fruit carton box weights about 10 kg and a vegetable basket about 20 to 30 kg. For flowers, about 18 bundles can be filled in carton boxes, and up to 100 carton boxes can be loaded into a refrigerated truck.

Figure 6.10: The Flow of Fresh Produce in Yangon Region



Source: Authors.

Potential agricultural products

Strawberry: Local production of strawberries was 1,571 tons in FY 2017/2018. The strawberry season starts from November and ends in May, before monsoon. There is a steady flow of them, about 10 tons each day from Pyin Oo Lwin to Yangon with the cold chain. About 40 tons of them are being frozen at PSL cold store to make up for the off-season. During those times, they are distributed to cafés and other drink and juice stands in Yangon. Representatives from Germany also studied about strawberries in Pyin Oo Lwin and Taunggyi. With the support of GIZ, about 20 acres are getting required certificates for export to the European Union and other countries. Currently, 20 tons is being grown as an export sample to Russia. If successful, about 40 acres of strawberry plantation would definitely need the cold chain.

Carrot: Carrots are in demand all year round, particularly in Yangon as they cannot be grown in Myanmar for technical reasons. Therefore, carrots have to be imported a lot during monsoon from China. Each week from August to October, a carrot trader has to import two truckloads of them with semi-trailers to fill up the demand shortage. Once they reach Yangon, they are stored in the fish and prawn cold storage. Some traders want to distribute them

directly from Pyin Oo Lwin to Mandalay without going through Yangon, which is now the case. Carrots are largely grown in Pyin Oo Lwin and Taunggyi, and its season falls between December and May, a period of the highest yields bearing the finest quality. But there is not a single facility in the city to store them for later use to meet the demand. In the future, the dehydration of carrot and cabbage, the ingredients for instant noodles, will be possible with the technical support of Korea and factory construction and operation.

Mango: China buys the vast majority of fresh mangoes, but the export is through the border with general trucks. Only a few of them, about 36 tons, are exported via sea freight with reefer containers. The major buyers are Russia, Korea, and Singapore. They are grown in the Nay Pyi Taw and Mandalay region. Dehydration of mangoes is also expected in the near future. A new solar-powered cold storage has been placed in Palate Township in Mandalay region for fresh produce. Up to 5 tons of produce can be stored in it. In addition, they are expected to be exported into Thailand in 2019 with the cold chain.

Dragon fruit: some growers are test-growing the fruit; commercial plantation will be considered according to its fertility and productivity. It is the cheapest fruit during the season; about a hundred Kyat[39] per unit. Therefore, related stakeholders are planning to add value to it with dehydration under the support of Taiwan in terms of technical knowhow.

Though it seems like baby steps, the development work in the sector is taking shape steadily. Some noticeable works are as follows:

Establishment of solar-powered mobile cold rooms at farms for fresh produce: The Myanmar Fruit, Flower and Vegetable Producer and Exporter Association (MEVP) is drawing up many plans for the development of the agricultural cold chain sector. One of the many plans is to construct a cold storage facility for fresh produce in each main city for each region: Monywar in Sagaing Region; Min Dat in Chin State, Myit Kyee Nar in Kachin State, Dawei in Tanintharyi Region, etc. Produce will then be consolidated and sent to the two central cold storage facilities. They will be located in Titar Oo for Upper Myanmar and in Bago or Kyaung Kone in Ayeyarwaddy for Lower Myanmar. Freight transport is planned to be with reefer containers only. However, implementation will depend on the funding availability. Therefore,

[39] 1 Kyat = 1/1500 US$

to fulfil current needs in the short term, the association is planning to place a 5-ton solar-powered reefer container down at the farm with the support of GIZ. When the full consolidation is reached, an unloaded reefer trailer would be sent to the farm for goods transhipment.

There are 32 small associations for produce. Capacity building campaigns, including knowledge sharing of cold chain technologies, are planned to be delivered to those associations. They in turn will reach the farms for re-sharing. Awareness-raising campaigns will also be delivered to traders to encourage them to use cold chain logistics for all their export produce. This will be done by stressing the benefits that cold chain can bring over traditional logistics such as traders' produce meeting the international standard or export quality and therefore, gain the best price.[40] Additionally, it is heard that there is a conceptual plan to build a new agricultural distribution hub in the Nay Pyi Taw and Mandalay region. If it were to be materialised, current agricultural product flow; shown in Figure 6.10, will change accordingly.

The private sector is also contributing partly to the sector's development. In Palate city in the Mandalay region, a test-running 5-ton mobile cold storage has been provided by Natural Farm Fresh Myanmar Co., Ltd in collaboration with the Indian Start-up, EcoZen.[41] Electricity would not be a problem as they are solar-powered. The company is a social enterprise as well as an entrepreneur empowering growers and their direct communities. It is partnering with Convestro and DEG KfW, for technical and funding support.[42] Its main business function is providing solar drying technologies for produce; initiation with spices such as chilli, turmeric, and ginger. This technology reduces 30% wastage to upstream final products while adding value to the low-earning fresh produce for farmers. It is part of a public–private partnership project called Economic Transformation through Food Security. Myanmar is one of the three countries that the project is based on. So far, the company has installed 11 solar dryer domes in Shan State, Yangon, and the Mandalay region, while Thailand has about 600 units. The finished processed products of chilli, turmeric, and ginger are being exported to overseas markets, and the cold chain is being used until they reach export markets.[43] If the test-

[40] Interview to Myanmar Fruit, Flower and Vegetable Producer and Exporter Association.
[41] Convestro (n.d.).
[42] Phuong (2018) .
[43] Natural Farm Fresh Myanmar (2019).

running succeeds, hopefully, the steady installation of cold storage will come along just as solar dryers.

Establishment of a state-of-the-art wholesale market in Yangon: The new Danyingone Wholesale Market has been developed jointly by Myanmar Agro Exchange Public Limited (MAEX) and the Yangon City Development Committee (YCDC). The development has three phases; the opening of the shops in phase 1 and cold storages in phase 2. The final phase is expected to be completed by the end of 2019. The Yangon Government will take charge of the operation once it becomes fully functional. So far, phase 1 has been carried out and space rental started in October 2018. However, it would take some time before residents become entirely resettled from Thiri Mingalar Market as it is still in progress. Currently, two 40-feet reefer containers have been placed on the premise for early use prior to phase 2. They are powered by the facility's electricity supply and storage is free of charge as of now.

Figure 6.11: Two Reefer Containers Placed at the New Danyingone Wholesale Market

Source: Authors.

Unlike the old Thiri Mingalar Wholesale Market, this newly developed establishment aims to go beyond its primary function of a wholesale market and provide unparalleled services, i.e. to promote the entire agricultural supply chain. This includes the enhancement of farm produce quality that is in line with export standards and providing necessary support until they reach foreign markets. It is also planning to connect growers directly with end customers. Given the fact that cold storages are placed at its core phase, the entire agricultural supply

chain landscape might change depending on how well it is implemented and promoted. Businesses also agree that awareness-raising among stakeholders, particularly consumers and growers is a basic necessity for the development of the cold chain sector. Despite its ambition, the completion of phase 2 or cold storage construction appears to be behind schedule; it was initially planned to be accomplished by June 2018.

Figure 6.12: Building 1; the Fruit Wholesale Centre of the Danyingone Wholesale Market

Source: Authors.

The facility is constructed on YCDC's 85-acre land and once completed, it would become a hub for all perishables Myanmar has to offer, including fruit and vegetables, flowers, dried fish, and fresh meat and fish and other agricultural products. It has the capacity to accommodate 5,600 shops and 2,500 vehicles. To go with the modern outlook, facilities such as petrol stations, restrooms, recreation centres, wholesale centres, and vegetable washing areas are included. Other wholesale markets for agricultural products, though they might not be as massive as this, are also being constructed in Nay Pyi Taw, Mandalay, and Muse.[44]

To sum up, 6.08% of agricultural products are demanding modern cold chain services; i.e. to recap, the use of facilities, such as reefers. This equals 39,562 tons in volume. Potential produce for future commercial plantations is strawberries, carrots, dragon fruit, avocados, and flowers, for which the varieties are still to be specified. Flower plantation is said to be designated for export markets only. The cold chain demand of the sector can reach up to 4.2

[44] Tun (2017).

million tons, which is 28% of the cold chain sector. In fruit variety, mango bears the highest possibility with 9.98%, accompanied by carrots at 0.42% and strawberries at 0.04%. That would leave vegetables, which represents 82.36%.

- Chemicals/pharmaceuticals

The cold chain is in demand for health products, such as vaccines and snake antivenom, in order to sustain constant quality from the day of manufacture to the day of expiry. Temperature adjustments have to be carefully set, which usually are between 2°C and 8°C, while ensuring for the temperature does not reach under freezing point. A certain amount of them are being imported into Myanmar as local supply does not meet the demand. In FY 2017/2018, vaccine imports totalled 2,618 tons with a value of US$ 22.78 million. 86% of them worth of US$ 17.58 million are dedicated for human needs and they come via air freight. Between 20 and 30 carton boxes are imported per shipment.

During transit, they have to be lined with frozen ice packs to keep the temperature under 10°C. As for other drugs, such as tablets and pills, they come in general TEU and FEU via sea and land. Large storage space is not necessary for vaccines as the stock is kept low. Only the required amount is imported for its expensive nature. It is plenty if the space is 18.5 sqm (200 square feet) wide; about the size of a garage. They are stored in the cold room with the temperature adjustment between 2°C and 8°C. A general warehouse with below 25°C room temperature is acceptable for other drugs.

Top vaccines distributors in the field are Mega, AA, DKSH and Capital Diamond Star. Distribution is with air-conditioned trucks; though it used to be express buses. When transporting, they have to be put into foam cooler boxes lined with ice packs. These ice packs can last 24 hours, 36 hours, or 48 hours and are used accordingly based on the distance of transport. Other drugs are not that temperature-sensitive compared with vaccines. Therefore, they are mostly distributed with general trucks, except for the top-notch companies, such as above, that use air-conditioned trucks.

- Processed foods

Processed foods are divided into two categories. The first category includes fruit and vegetable-based processed food, such as jam, jelly, pickles, and syrup. The latter includes processed seafood and meat, such as meatballs, fillets, and sausages. There are other categories of processed foods such as dairy, microwave meals, or convenience foods and many more. The main emphasis here would be the only two mentioned.

Fruit and vegetable-based processed foods

There are many local agri-food processors, but they are all spread out producing small scale, mainly for some big markets such as Yangon and Mandalay. There is no evidence of cold chain usage for local consumption or distribution of those products, except for wine with a trivial amount. However, there are about 150 40-ft reefer containers departing for Japan fully loaded with processed vegetables every year.

They are the work of Myanmar Belle and Myanmar Agro Foods Companies, the sole manufacturers of export-quality dehydrated and frozen vegetables in Myanmar. Both companies are owned by a single entity. The company has a joint venture with a Japanese logistics company, Logitem, for its cold chain requirements. With Logitem at its side, the company's business operations cover nearly the whole agricultural supply chain and the inbound supply chain, such as contract farming and processing for outbound until export. The distribution of fresh produce to local supermarkets and restaurants is only through general logistics or express buses. It also engages in seafood exports, but only agricultural products will be emphasised here. The dehydration factory is in Taunggyi and the frozen factory is in Nay Pyi Taw. Raw supplies for dehydration are cabbages, mustard leaves, garlic, and carrots. They are grown in Shan State, namely Heho and processed in Taunggyi, and transported directly to the Yangon International Port in FEU reefer containers, owned by the entity. The products are used as ingredients in instant noodle. Refrigeration temperatures in the reefers are set below 25°C.

As for frozen vegetables, produce such as ladyfingers, spinach, taro, green beans, and green soybeans are the inputs. They are sourced in nearby regions of the factory in Nay Pyi Taw, which is mainly meant for seafood processing. Starting from 2019, leaf-type vegetables, such

as mustard leaves, which are grown in Loikaw, Pyin Oo Lwin and Naung Tayar, are going to use refrigerated trucks for transport from the farm to the factories; transportation of others, such as cabbages and carrots, will remain as they are with general light trucks. Freezing will take place in the cold storage in Nay Pyi Taw, which has a capacity between 600 and 800 tons. After that, products will rest at the temporary 400-ton chilled room before reaching the certain amount to fill up the FEU. Only after that will the entity deploy an empty reefer container from Yangon for product pickup. The trailer will then drive directly down to the port for export. The factory's full production capacity is 300 FEUs, though only 150 FEUs are produced each year depending on trade demand. The company is expecting to export frozen mangoes next year.

Seafood and meat-based processed foods

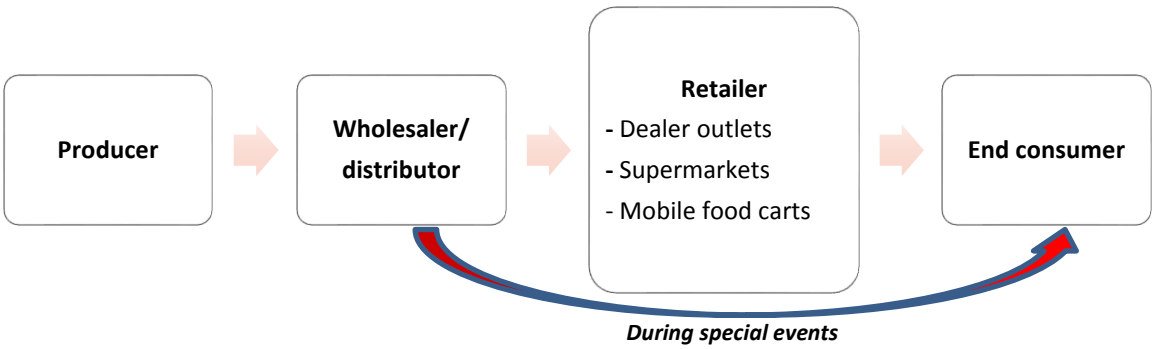
Processed seafood and meat are contained in this category. The available products in the market are processed meat, such as chicken fillets, meatballs, and sausages, and processed seafood, such as fish fillets, fish balls, and artificial crab sticks, etc. They are considered a type of hearty snack that goes along with different beverages and also are convenient to get. Therefore, frequent, but fewer amounts of purchases for consumption are common among the urban population, especially young people. But hotpot restaurants demand a larger quantity of them as the ingredient. There are very few manufacturers or suppliers of the product and all of them reside in the Yangon region. But product reachability is considerably high in comparison to other foodstuffs; they can be found selling as a fast food in a mobile food cart at every possible corner of the street, as in many tea houses in Myanmar.

Figure 6.13: Processed Meat and Seafood Displayed at Hotpot City Yangon

Source: Authors.

Demand is generally the highest during Christmas and New Year. There are two channels that they can reach to final consumers. Under normal growth, sales are through retailers. However, during special events, direct sales from the wholesalers or mainly through producers' outlets are possible. There is no evidence of the cold chain for distribution except for storage at the production plant, which is necessary before the order placement. Most of the time, the distribution of processed foods from producer to wholesaler and then to retailers are with general light trucks. Cold boxes are used to maintain quality. This does not apply to City Mart, which has its own storage facility. The producer transports goods to the storage when an order is placed or at regular intervals.

Figure 6.14: Product Flow of Processed Seafood and Meat in Yangon Region



Source: Authors.

Figure 6.15: Processed Meat and Seafood Found at City Mart Supermarket

Source: Authors.

6.3. Major Players in the Cold Chain

Main players in storage services

Suppliers in cold storage can divided into two; own account operators, and common users of third-party service providers. In the first category are processing plants and cold storages monopolised by the fishery sector. Some of them own insulated box trucks or other freight vehicles, even freezer trucks if it is an exporter. The outsourcing of assets or storage space to a third party is not common for the sector. However, it is possible for them to rent out space for storage or transport to small-scale businesses that do not have owned assets and properties. According to the MFF, Myanmar has 113 cold storage plants with a total capacity of 54,490 tons in 2018 as described in Table 16 below. A typical operator would have its own cold processing plant, standalone cold storage, and even an ice plant or possibly an aquaculture farm, though it is not always the case.

Table 6.16: Registered Cold Storages and Processing Plants in Myanmar (2018)

Sr.	Region	Unit	Capacity in Tons
1	Yangon	69	47,000
2	Tanintharyi	20	2,940
3	Rakhine	9	1,110
4	Ayerwaddy	8	1,100
5	Mon	6	1,340
6	Shan (Muse)	1	1,000
	Total	**113**	**54,490**

Source: DOF (2018).

As for third-party cold warehousing services, there are not many suppliers; no more than 10 of them in Myanmar. To clarify, third party here means common user facility, which could be for any type of goods from any sector. Most of the suppliers are joint ventures with Japanese logistics companies, except Ryobi Myanmar, which is wholly Japanese owned and operated. It is also the largest 3PL cold store facility in Myanmar. 3PL cold storages can only be found in Yangon. The profiles of top 3PL logistic service providers can be seen in the Appendix.

Table 6.17: Top 3PL Cold Chain Warehousing Service Providers in the Yangon Region

Sr.	Operator	Capacity (Sqm)	Capacity (Tons)	Location
1	Ryobi Myanmar Distribution Service Co., Ltd	4,584	11,460	Thilawa SEZ
2	KOSPA Limited	3,960	9,900	Mingalardon
3	Phee Central Logistics	929	4,645	Shwe Pyi Thar
4	Premium Sojitz Logistics (PSL)	1,701	4,253	North Dagon
5	Premium Worldwide	1,360	3,400	Hlaing Thar Yar IZ
	Total	**11,854**	**33,658**	

Source: Authors.

To sum up, Myanmar has a capacity of 88,148 tons of cold storage to fulfil its cold chain needs. Its own account capacity is only from the fishery sector. If businesses from other sectors were included, the storage capacity would vastly increase. For example, Mega, Pahtama Group and DKSH provide services to businesses, yet they operate more as distributors. Besides, the fishery sector is the largest contributor for cold chain demand. Therefore, own accounts in other sectors were not considered in the list shown in Table 16.

Table 6.18: Estimated Cold Storage Capacity of Myanmar in 2018

Sr.	Category	Capacity in Tons
1	Own account cold storage	54,490
2	3PL cold chain warehousing	33,658
	Total	**88,148**

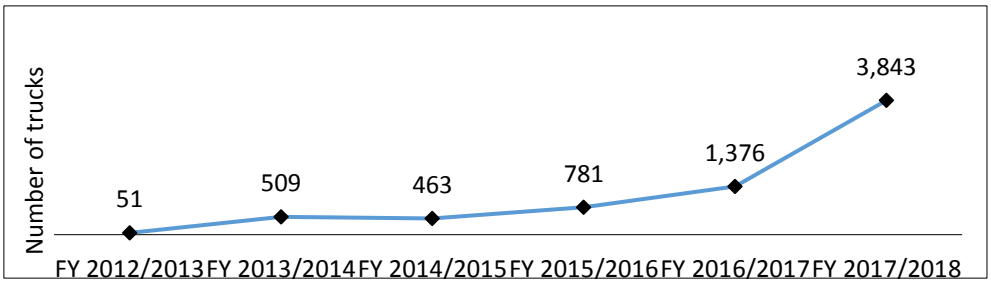
Source: Authors.

Main players in transportation services

In terms of assets, the size of Myanmar's cold chain sector is worth 7,023 trucks; all are refrigerated box trucks. The common user service providers shown in Table 6.17 own just a few of them. The rest are operated by own accounts or businesses, and they provide services to the related sectors. For example, fishery exporters rent out cold chain transport to other fishery businesses. The top suppliers of refrigerated trucks are businesses from the fishery sector and distribution companies, such as Mega and DKSH and other private businesses. These companies operate hundreds of cold chain assets, but it is found that cold boxes are more in use rather than running the truck's refrigeration or chilling system. While most

transported goods are fresh perishables, non-perishables such as consumer goods are also using insulated box trucks substantially though with no refrigeration, just to keep products out of rain and dust. More than 90% of these are used trucks imported from Japan. Top imported brands are Mitsubishi, Daihatsu, Toyota and Nissan. There are also local businesses that do reconditioning works for assets owners, including the service to make in-truck compartments for different temperatures. Figure 6.16 shows the import of cold chain trucks has been on the rise since 2014.

Figure 6.16: Annual Import of Refrigerated Trucks (FY 2012/2013 to FY 2017/2018)



Source: Myanmar Customs Department (2010).

It is said that on average, only 10% of reefer containers are in utilisation for foreign trade. In terms of prime movers, each trucking operator has between 10 and 30 of them. Some big operators have a fleet over 200. But, none of them are equipped with generators except for a few of them, which is said to be about 10, according to a spokesperson from the Myanmar Container Trucks Association (MCTA). Just as 3PL warehousing, there are no more than 10 cold chain transportation service providers, as listed below in Table 6.19. Some logistics companies are export-oriented and, consequently, they deploy their own fleet of semi-trailers which can carry any type of container. Therefore, they are not considered as the key players even though they own hundreds of assets. To clarify again, 3PL refers to service providers that are actually using the authentic cold chain for the distribution of products. They provide services to every business; not limited to a single product category in certain sectors. There are many 3PLs that are not included in this list as they operate less than three refrigerated trucks.

Table 6.19: Top 3PL Cold Chain Transportation Service Providers in the Yangon Region

Sr.	Operator	Box Truck (Qty)	Location
1	Nature Logistics	5*	Pabedan
2	Premium Sojitz Logistics (PSL)	27	North Dagon
3	SENKOSMI	16	Insein
4	Myan Express	12	South Oakkalapa
5	Ryobi Myanmar Distribution	10	Thilawa SEZ
6	KOSPA Limited	10	Hlaing Thar Yar
7	Phee Central Logistics	10	Botahtaung
8	Premium Worldwide	6	Hlaing Thar Yar Industrial Zone
	Total	**96**	

Note: * refers to semi-trailers equipped with a generator set.

Source: Authors.

The most common brands for tractor units are Nissan, Hino, Sino, Mitsubishi, Fuso, Toyota, and MAN, while Daihatsu, Mitsubishi, and Toyota are mostly found for reefer box trucks. There are slight differences, but not significant gaps among the purchase prices based on the brand model and capacity. However, the market price mentioned below can be a good reference as they come from reliable sources; i.e. big operators that are actively involved in the field. For example, Moe Nan Taw is a highway container trucking service provider with its 100 semi-trailers up and running on the major routes such as Yangon – Pathein, Yangon – Mandalay and till Muse. Export/import businesses are its main clients and chicken by-products, chicken feed, fish, and prawns are the top items transported.

Table 6.20: Estimated Purchase Prices of Cold Chain Trucks (2018)

Sr.	Description	Est. Brand New Truck Price (MMK)	Est. Second-hand Truck Price (MMK)
1	10ft box truck	18,000,000	15,000,000
2	14ft box truck	24,000,000	20,000,000
3	16ft box truck	27,000,000	23,000,000
4	19ft/21ft box truck	30,000,000	25,000,000
5	Reefer container	100,000,000	50,000,000

Source: Authors' interview to Moe Nan Taw Transportation, Royal Link Transportation, Myan Express.

Main users of cold chain logistics

The top three businesses will be discussed under this subsection. They include City Mart Holdings Limited to represent the retail sector, Myanmar C.P. Livestock Company for processing, and Premium Distribution Company for trading.

- City Mart Holdings Limited (CMHL); retailer

City Mart Holdings is the largest retail group in Myanmar with a supplier network of about 3,000 companies. Under its umbrella are well-recognised brands, namely City Mart, Ocean, Marketplace, Season's, City Express, Shabushi, and Pizza Hut. To be more specific, it has established 20 supermarkets, 7 hypermarkets, and 45 convenience stores (City Express) throughout Myanmar, mainly in Yangon, Mandalay and Nay Pyi Taw. With its largest network brings the need for cold chain usage to maintain its standing and further grow its business. Premium Distribution Company (PDC) has been its main associate company handling food wholesale until its departure from the group for the joint venture with Japanese Sojitz Logistics Company which is known as PSL.

The procurement of premium quality meat, seafood, dairy products, and other foodstuffs mostly goes into Marketplace, which targets the high-end sector. Direct sales or outsourcing services are also provided to hotels and fine dining facilities. Meanwhile, Ocean and City Mart outlets are inclined towards the mass market and grocery shoppers. Currently, the group has its own storage facility in Tharketa Township. For transportation capacity, it has 60 cold chain trucks, 33 frozen and 25 chilled, at its disposal, which were operated by PDC prior its departure from the group. or the frozen type, 22 of them are 14-ft trucks and 11 are 10-ft trucks. For the chilled type, 16 are 10-ft trucks, nine are 14-ft trucks, and two are 20-ft trucks. In times of inventory excess, the group outsources dedicated storage space to PSL and other 3PL service providers.

- Myanmar C.P. Livestock Company (MCPL); meat processor

Myanmar C.P. Livestock Company or MCPL is one of the major suppliers of poultry products, both fresh and processed. It is operating more than 200 outlets in Myanmar, mostly accumulating in Yangon. The sale of fresh chicken and processed meat, such as meatballs and

sausages, are through its outlets and City Mart. Whole chicken birds are also distributed to wet markets in Yangon. MCPL has its own cold storage facility with a capacity of 7 tons; 5 tons for frozen and 2 tons for chilled. Temperature can vary depending on the duration of storage, from -25°C to 4°C. Storage space and transportation is outsourced during times of excess demand. Transportation is mainly handled by KOSPA for distribution of chicken to its main client KFC, which carries out regular inspection every three months or six months for quality control. Therefore, cold chain usage is necessary. Apart from that, delivery of meat to its clients including hotels and restaurants are mostly done with company own insulated box trucks. Cold boxes are largely used during transport to maintain quality.

- Premium Distribution Company (PDC); meat trader

Premium Distribution Co., Ltd is a trader of premium quality meat, seafood, and other foodstuffs. Its main clients are City Mart, high-end restaurants, and hotels. PDC signed a joint venture and combined with Japanese Sojitz Logistics Company, which called forth the split-up with the City Mart holdings. The joint venture (JV), called PSL, is now fulfilling its cold chain needs for its own joint venture, which is providing third-party cold chain services to businesses in Myanmar, while PDC shifts its emphasis on the import or trade of premium quality seafood, meat and various foodstuffs. PSL handles both urban and long-haul city-to-city cold chain transportation services; it is mentioned under the strawberry case study. PSL's cold chain capacity can be assessed in Table A.3.

Table 6.21: Top five Meat Traders in FY 2016/2017

No	Meat Exporter	Meat Importer
1	Premium Distribution Co., Ltd	Premium Distribution Co., Ltd
2	Agri Trade International Ltd.	Agri Trade International Ltd.
3	Grand Wynn Enterprises Ltd.	Grand Twin Brothers Ltd.
4	Advance Seafood Co., Ltd	Top Home-made Foodstuff Trading Co., Ltd
5	Top Home-made Foodstuff Trading Co., Ltd	Mandalay Bay Company Limited

Source: Myanmar Customs Department (2010).

6.4. Case Study

Cold chain logistics for fish and prawns

Various fishery products are sourced primarily from Ayerwaddy, Rakhine, Tanintharyi, Yangon, and Mon. They are also imported, although domestic production is more than enough for local consumption. Fish and prawn exports into China made up 9% of Myanmar's total fishery export in FY 2017/2018 which was valued at US$ 17.85 million. This was 13,949 tons in volume and simply indicates the demand for the cold chain as they are being transported frozen in refrigerated trucks. As for domestic consumption, the use of cold chain trucks is not that widespread with distribution heavily relying on ice supply to keep goods in chilled condition.

Aung Kyaw Zaw Company is a fishery business in Yangon with own aquaculture farm and ice plant. Output from the farm is mostly transported to San Pya Fish Market, then to the exporter. It is also a supplier of ice for roundabout areas. As can be seen in Figure 18, only ice is used to keep products fresh although the truck has a refrigeration system.

Figure 6.17: Company's Fish Farm in Ayeyarwaddy Region

Source: Authors.

Figure 6.18: Aung Kyaw Zaw Ice Plant in the Ayeyarwaddy Region

Source: Authors.

Figure 6.19: Aung Kyaw Zaw Ice Plant in the Ayeyarwaddy Region

Source: Authors.

Figure 6.20: Aung Kyaw Zaw Ice Plant in the Ayeyarwaddy Region

Source: Authors.

Figure 6.21: Loading Ice into a Refrigerated Truck from Company Owned Ice Plant

Source: Authors.

Figure 6.22: Loading Ice into Cold Boxes from Company Owned Ice Plant

Source: Authors.

Figure 6.23: Loading Fish from an Aquaculture Farm along Yangon Pathein Road

Source: Authors.

Figure 6.24: Loading Fish from an Aquaculture Farm along Yangon Pathein Road

Source: Authors.

Figure 6.25: Loading Fish from an Aquaculture Farm along Yangon Pathein Road

Source: Authors.

Generally, Myanmar's exporters deal directly with Chinese traders and deliver goods from Yangon to Muse, and from then to China via Muse border trading posts. There are about 20 Chinese traders (seafood importers). FEU reefer containers and refrigerated 12-wheeler box trucks are mainly used, carrying 16 tons and 29 tons of truckload, respectively. To name a few, Nan Htike Thazin, Taw Win Thazin, Ngwe Pinlae and Tun Thawtar are major players or fishery exporters in Muse's cold chains sector, but they all reside in Yangon. There is already a steady export of fisheries via Muse; it reached record high in the first half of October 2018 at about 130 trucks. Under normal growth, on average, eight cold chain trucks go to Muse each day.

Table 6.22: No. of Cold Chain Trucks Coming into Muse Each Day (Under Normal Growth)

Exported Products	Type of truck	No. of Trucks	Total Volume in Tons
Frozen fish/prawn	Refrigerated 12-wheeler box truck	3	48
Frozen fish/prawn	FEU reefer container	5	145
	Total	8	193

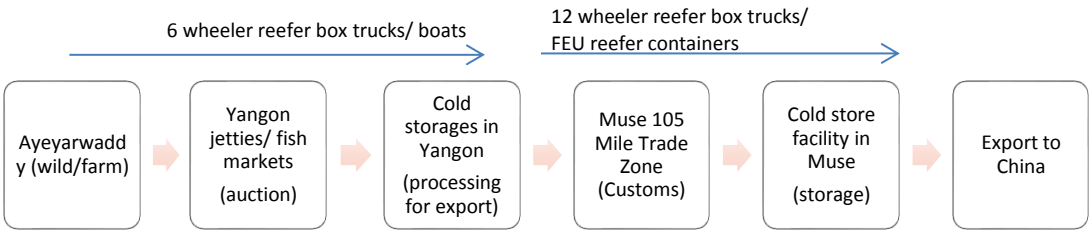
Source: Authors.

- Product flow of exported fish and prawns

The primary source of fish and prawns for China is the Ayeyarwaddy Region. Exported goods are mainly purchased at auction, and procurement from Yangon's Central Fish Market can also happen when the demanded export quantity does not meet or exceed the acquired fishery volume. There are also cases when the processor or exporter operates its own fish farms around Yangon or in Ayeyarwaddy. Regardless of the distance, refrigerated six-wheeler box trucks are generally used for domestic transport. After the initial procurement of goods at the jetties or Central Fish Market in Yangon, the selection of premium quality fish and prawns is carried out at cold storage plants. Once the required quantity is achieved, value-added works, including initial processing, freezing, packing and labelling, are done to meet the export standards. Frozen fish and prawns are usually stored at the plant to wait for the best prices to be offered. This can last up to 45 days, which is quite normal for border exports. On the contrary, for overseas exports, the longest storage duration is three days. Once the

best deal is reached, they are sent to Muse in FEU reefer containers or refrigerated 12-wheeler box trucks. Two drivers are employed for each truck for safety reasons.

Figure 6.26: Product Flow of Exported Fish and Prawns into China



Source: Authors.

These trucks ought to reach Muse in two days. After going through customs procedures in Muse 105 Mile Trade Zone, they are stored in the only cold storage facility in Muse. Storage duration depends on trucking availability; normally a day. They are transported into China the next morning with Chinese refrigerated six-wheeler box trucks. Transportation is charged Kyat (K) 1,900,000 for a 12-wheeler and K 3,400,000 for a FEU for a round trip for Yangon – Muse route.

Figure 6.27: Fish and Prawn Trucks Waiting for Customs Declaration at the Muse 105 Mile Trade Zone

Source: Authors.

Figure 6.28: Reefer Trailers Found on the Mandalay – Muse Route

Source: Authors.

- Cold storage facility in Muse

There is only one cold store facility in Muse, which is operated by National Prosperity Public Company Limited. The facility has six storage chambers; one for beef and the rest for frozen fish and prawn. It has a total capacity of 1,200 tons, and the temperature can be adjusted on demand as low as -27°C. Goods can be stored for three days at K 20 per kg. After three days, additional K 3 is added to the original price of K 20 and becomes K 23/kg for each day onwards.

Figure 6.29: National Prosperity's Cold Store Facility in Muse

Source: Authors.

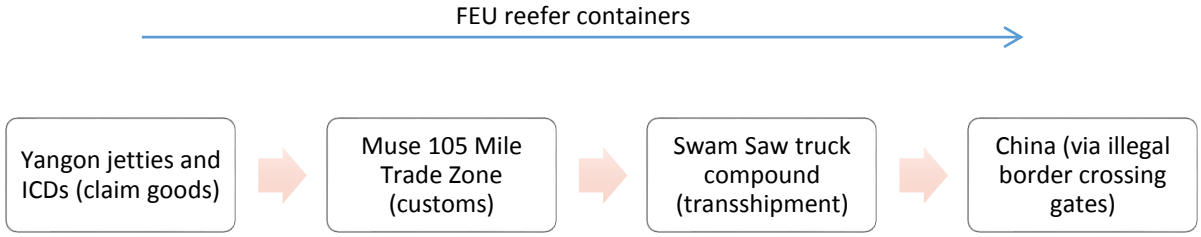
Cold chain logistics of re-exporting meat into China

There is a movement of re-exporting meat products, mainly beef and chicken by-products into China via land trade. Re-exporting is defined according to the Ministry of Commerce (MOC) as the import of goods from a first country to a second country or importing country; i.e. Myanmar for the purpose of exporting to a third country, whereas imported goods may or may not have been processed in the importing country before they are exported. Under this case study, the first countries for those products would be India, Australia, Switzerland, and the United States, especially India and Australia. The mode of transport applied by these particular meat items is a combination of sea; normal trade and land transport; and border trade.

The products come in FEU reefer containers and can be claimed at Bo Aung Kyaw Jetty, Myanmar Industrial Port (MIP), and Botahtaung Inland Container Depot (ICD) two in Yangon. The FEUs are plugged at the charging facilities powered by the port, while they are going through customs clearance. Once trucking is available, they are unplugged from charging and are transported directly to Muse, a border town connecting Yunnan Province of China, which makes storage unnecessary. The tractor trailers that carry the FEU containers are usually not equipped with gensets or portable generators. Therefore, the required electricity is vehicle-powered. It takes three days from Yangon to Muse.

The study shows that meat re-exports into China became the highest in September 2018, which was between 10 and 15 trucks (FEU reefer containers) a day with each truck carrying 29 tons of goods in general. This means the tonnage movement of cold chains for meat on the Mandalay – Muse Road is minimum 290 tons and maximum 435 tons a day in September. But under normal growth, only about two meat trucks can be found in Muse, which is 58 tons per day. There are about 10 Chinese meat importers. Unlike fish and prawns, meat imports into China are considered illegal, which is why border trade is favoured over normal trade. However, it is legal in Myanmar and therefore these trucks go through customs in the Muse 105 Mile Trade Zone and are transported into China via illegal border crossing gates.

Figure 6.30: Product Flow of Re-export Meat Products



Source: Authors.

After the customs clearance as shown in Figure 6.30, meat is transloaded into Chinese refrigerated trucks at Swam Saw (Myay Ni Kwin) Truck Compound, which is just beyond the Man Wein Gate, one of the four main legal border crossing gates in Muse. Transportation charges vary depending on the season and thus tonnage. Generally, the permitted truckload for a semi-trailer is 48 tons in monsoon and 50.5 tons in summer. In the matter of re-export meat transport, FEU reefer containers carry as much as 29 tons. Until September which is the end of the rainy season, transportation cost for a FEU from Yangon jetties and ICDs to 105 Mile Trade Zone was K3,800,000. In this cost, excess tonnage charge of K400,000 is included. This charge is dismissed in October and the total transportation charge becomes K3,400,000 throughout the year.

Figure 6.31: A SINO Reefer Trailer Found in Muse

Source: Authors.

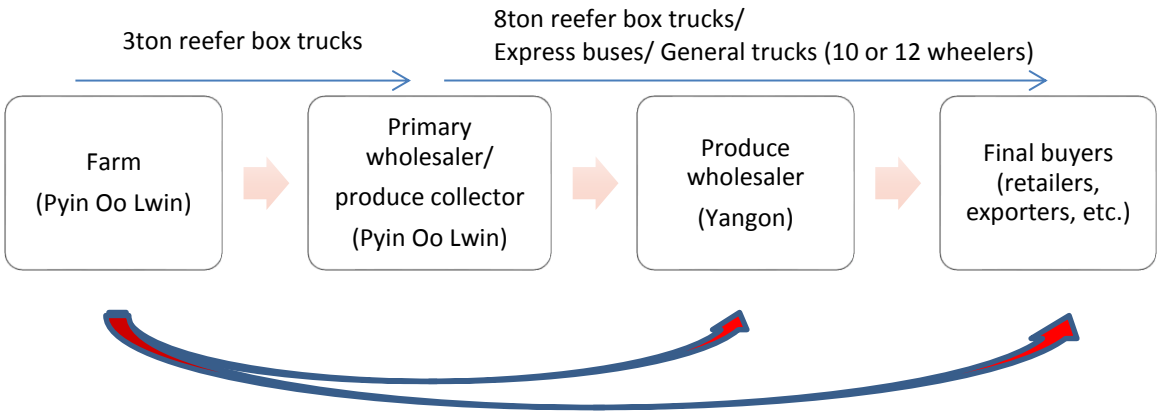
Cold chain logistics for strawberries

Strawberries are one of the fruit varieties that utilises the cold chain and is mainly cultivated in Pyin Oo Lwin, a hilly station in Mandalay Region, for its unique weather. In FY 2017/2018, the total production volume of strawberries reached 982,000 viss[45] countrywide, which is equivalent to 1,571 tons. The city's strawberry production generally starts from November at 20 kg plucked every two days. It increases to 15–20 tons a day during the peak season, which falls between November and May. Strawberries are picked every two days or four days depending on the weather. Setting aside the insignificant local consumption volume, about 90% of them are transported to Yangon, Mandalay, and Nay Pyi Taw, while some end up in other big cities, such as Mawlamyine, Magway, and Myan Aung. Of the total production, 70% goes into fresh sale, the focal point of the case study, 20% for processed such as jam, and 10% for wine making.

Brokers play a crucial role for the promotion and distribution of the city's farm produce. A broker's services resemble that of a produce wholesaler. However, it is not always about purchasing and selling in bulk. It could be an individual acting as a middleman between produce wholesalers in Yangon and farmers as buyers; for example, retailers do not purchase directly from the farm. A broker's main function is to collect the demanded amount of produce from a farmer or multiple farmers and transport them to wholesalers in Yangon. Putting aside a few prominent growers with tens of acres of farmlands, there appear to be very few farmers who sell directly to buyers. Generally, it takes at least two middlemen from the farm to retailers in Yangon. Broker service fee or commission for strawberry is between K 20 and 50 per transparent disposable plastic box. The primary collection of agricultural produce at farms which are located in remote villages is between K 15 and 20 per basket (8 viss or 12.8 kg). Generally speaking, a primary collection fee is included in the broker's commission, and sometimes the service is demanded separately by the agricultural produce wholesaler in the city.

[45] 1 viss = 1.6 kg

Figure 6.32: Product Flow of Strawberries



Source: Authors.

There are about 50 to 70 brokers in the city, while seemingly 10 of them hold the most market share of approximately 70%. Of these 10 brokers, some are a combination of produce grower, collector or broker, and wholesaler. This gives them a competitive advantage over individual brokers and farmers as they get rid of middlemen and gain direct contact or bargaining power with buyers. In-depth interviews were carried out with two out of those ten brokers and a few small farms to cover the city's agricultural supply chain while emphasizing on that of strawberry. One of the respondents was a top primary produce wholesaler while the other was a pioneer in the cold chain, and both operate tens of acres of farms.

One of the pioneers in the city's cold chain sector who we interviewed has 20 acres of farmland, seven for strawberry and the rest for other vegetables such as garlic chives, cilantro, Chinese broccoli, mustard greens, coriander leaves, etc. Though he is a cold chain user with required certificates, he still does not have direct contact with the buyer, in this case City Mart, due to some constraints in the contract, e.g. ongoing supply of produce. Therefore, he has to deliver produce to wholesalers at Thiri Mingalar Market first, from which City Mart's procurement department purchases the finest quality strawberries and produce and display them on its shelves under its brand name. According to him, the city's cold chain usage does not exceed 30% of the total production volume; which has not been published by the government and needs to be verified with ground checks.

Figure 6.33: Organic Strawberry Plantation of Cold Chain Pioneer in Pyin Oo Lwin

Source: Authors.

Express buses and rigid trucks are mainly used for freight transport. Produce wholesalers from Thiri Mingalar Wholesale Market are the main buyers of farm produce, and refrigerated transport is used only when demanded. There are other farms that sell their strawberries directly to City Mart under their own brands; however, it is only a few of them. They do not use the cold chain; instead, they pluck strawberries early in the semi-ripened stage and transport them with passenger buses. Additional packaging and labelling are done on their own in Yangon and sent to City Mart afterwards. Cold chain strawberry movement is limited to its seasonality, but many types of produce are available all year round and therefore are picked each day in the morning at 10:00am with two eight-ton reefer box trucks. The available produce includes flowers, strawberry, dragon fruit, carrot, cabbage, lattice and other vegetables. While fruits and vegetables can be loaded together, flowers demand dedicated trucks for quality control. Each type's tonnage movement depends on order placement.

Figure 6.34: Garlic Chive Plantation of Cold Chain Pioneer in Pyi Oo Lwin City

Source: Authors.

During the peak season, about 10 tons of strawberries are delivered to Yangon every day from his farm with cold chain. The adjusted temperature in the truck is about 8°C. The transportation charge is K220 per kg of strawberries. It normally takes about 12 hours from the city to Yangon. Throughout the off season, which falls between July and October, they are imported from China in order to maintain a continuous supply in the market, which is rather expensive. To take advantage of this opportunity, he tried freezing 40 tons of strawberries as a test at PSL's cold store in Yangon for later use. Freezing costs about K11 million for 10 tons or K2,000 per kg, plus storage charges for six months. They are being distributed to bakeries and fruit stands. Also, 20 tons of Japanese variety strawberries are being cultivated under contract farming as a test to export to Russia as a sample. This is done together with his companions in the city. Cold chain demand would increase if those ventures became a success.

Figure 6.35: PSL's 8-ton Truck in Pyin Oo Lwin for Produce Pickup

Source: Authors.

PSL is the only cold chain service provider for the whole city. It has two packing centres or pick up stations: Yay Ngal and Anee Sakhan in the city and another one in Htone Bo in Mandalay. Goods are collected either at Yay Ngal with a 3-ton reefer or at Anee Sakhan with an 8-ton reefer. The 3-ton trucks are better utilised for initial pickup from farms if demanded. As of now, there are two pioneers who have contracts with PSL for the long-term use of cold chain transportation services. The contract duration is one year and can be renewed as required. Contract terms require the farm to collect enough produce to get full truckloads, which is unreasonable given the product's seasonality. Therefore, other growers and brokers are also using the service without having contracts.

Figure 6.36: Isuzu 3-ton Reefer Box Truck Found at the Yay Ngal Station in Pyin Oo Lwin City

Source: Authors.

Figure 6.37: PSL's Yay Ngal Truck Station in Pyin Oo Lwin City, Mandalay Region

Source: Authors.

Cold chain demand is also driven by bakeries, namely My Apple Cake Café in Yangon, although its demand is quite small. Although the cold chain is not being used, another cafeteria chain, namely Shwe Pazun, is also buying strawberries and, therefore, could become a potential user of the cold chain. Its business nature requires a considerable volume of strawberries as a crucial supply, both raw and processed. Therefore, there is a regular pick up of strawberries at the wholesaler; one of the respondents, in the city. Every other day during the peak season, Shwe Pazun's own light truck loaded with moving baskets would come and get strawberries, whereas each basket can be filled with 8kg strawberries. From this wholesaler, between 2,500 baskets (32 tons) and 3,000 baskets (38.4 tons) of strawberries are delivered to Yangon and other big cities every day. It takes three days for strawberries to reach Yangon: one night at farms; one night at the wholesaler for primary packing; and one night for the trip to Yangon.

Apart from those, more than 70% of strawberry transport is through trucks and mostly express buses: Mandalar Min, Tat Lan, Shwe Sin Sakyar and Elite, just to name a few. They are all located at the bus terminal Myo Thit Padathar. Strawberries are first put into the transparent disposable plastic box and then into the corrugated carton that weighs about 10kg. Forty plastic boxes can be placed into the carton. The transportation charges are mostly paid by buyers and they vary depending on the destination; K2,000 per carton from Myo Thit Padathar to Aung Mingalar Bus Terminal and K2,500 to Aung San Bus Terminal. Unsurprisingly, refrigerated transport is more costly at K5,000, which is one of the major

factors hindering the growth of the cold chain. Initial dry transport from the farm to the city's bus station is K3,000 with mini-truck (Hijet), up to 15 cartons of strawberries can be loaded.

According to a spokesperson from the MOC, there is a plan for the development of value-added processing zone or industrial zone in Pyin Oo Lwin, Mandalay Region for agricultural products. In the new zone, cold storages will be constructed for fresh produce such as fruits, flowers and vegetables for export purpose. Once completed, cold chain demand of the city and its surrounding areas would tremendously go up.[46]

Cold chain logistics for processed food

Myanmar C.P. Livestock Company or MCPL was founded in 1997 by the Charoen Pokphand Group (CP), a conglomerate based in Thailand. It is a pioneer as well as a leader in livestock feed, farm, and food production and distribution in Myanmar. Its breeder farms are located in Bago, Ye' Mon, Thar Yar Gone, Inta Gaw, and Sint Kine, while hatcheries are based in Yangon and Mandalay. It is also a manufacturer of animal health products, such as vitamins, vaccines, antibiotics, disinfectant, injections, and other miscellaneous products. MCPL is marketing all its businesses in two distinct ways; one is the B2B approach, and the other is the B2C approach. Under B2B, it deals directly with restaurants, hotels, bakery food services, and conventional and modern retail markets. As for the B2C approach, it is running owned CP outlets, called CP Freshmart. CP Five Star food stations and uncooked fresh chicken and processed food stores are included in this. At present, it is operating 235 outlets across Myanmar.[47]

MCPL has one main processing plant and four slaughtering factories. Live birds are first transported with 3-ton general trucks from its farms to the four factories in Yangon for slaughtering. They are also sold to wet markets in Yangon. The production capacity of these four factories is 8.8 tons per day. Slaughtered chicken is put into cold boxes and sent to the processing plant with 3-ton box trucks. From the processing plant, meat and processed foods, such as sausages (European and Chinese style), meatballs, and soft bones, are produced. The

[46] Myanmar Alinn (2019).

[47] Wai (2016).

daily production capacity of the plant is 2.5 tons. Therefore, MCPL has a total production output of 11.3 tons per day under normal growth. The sale of chicken meat is a cash cow for MCPL and is growing about 20 tons every passing year. The sale of whole chicken bird is introduced this year and about 3,000 of them are already demanded each day or between 70,000 and 80,000 each month.

The processing plant has a cold storage room with a capacity of 5 tons for frozen and 2 tons for chilled storage. Storage utilisation is low as daily or on-demand production is applied. The adjusted temperatures are 0°C, -4°C and -25°C, respectively. 4°C is typical for daily storage, while -25°C is applied for longer periods, for example, during holiday seasons such as Thingyan and Thadingyut. In times of excess demand, dedicated space is outsourced to other 3PL service providers. As for cold chain transportation, MCPL is partnering with KOSPA Limited. KOSPA mainly handles the cold distribution or storage for KFC; the company's main client and sometimes distribute to City Mart warehouse. KOSPA also transports chicken to KFC's branches in other big cities. CP's factories are inspected by KFC's team once every three months or six months for quality control. Meat is mainly distributed to CP outlets, hotels and restaurants, City Mart, and KFC, while processed foods, such as sausage are marketed only through City Mart and CP's outlets. The cold chain is mainly used for KFC, while the rest use general box trucks loaded with cold boxes full of chicken and processed foods.

6.5. Current issues and challenges of the cold chain

The issues and challenges of the cold chain are collected from various sources, such as trade associations and service providers.

Cold chain warehousing service providers

The main challenge for operating a cold storage facility is that it tends to be less profitable in a country such as Myanmar, whose cold chain sector still needs a lot of improvement. It is a given for a cold store to be utilised between 70% and 80% in order to make profits. However, current the utilisation rate is said to be lower. It is a long way off until reaching this threshold due to insufficient demand and a lack of cold chain awareness among users and other stakeholders. Cash draining operation and maintenance costs are also challenging for operators. With that, the maintenance cost for a cold store is said to fall around the range of

K7,000,000 on average. Additionally, current warehouse designs in Myanmar are based on the design layout of countries with an already developed cold chain sector. Their warehouse capacities are usually massive. But, the fact that Myanmar's cold chain sector is still in its infancy cannot be overlooked. Therefore, in the future, warehouse designs should be developed in line with the local market size and its demand.

Cold chain transportation service providers[48]

With regard to cold chain transportation, electricity or power supply is the major hindrance, particularly for trucks that are not equipped with generators. This is more important for highway trucking as running the chilling system of a reefer container with a vehicle's power supply is not sustainable. Consequently, cold chain trucks have to charge electricity at every possible stop, such as refill or truck station along the highway. However, there is not a single station solely designated for heavy-duty trucks en route to the destination, let alone the proper charging facilities for the cold chain. On the other hand, trucks with generators are efficient and convenient, yet they demand a large sum of money compared with general trucks. There appear to be no more than ten tractor trailers with portable generators in the market.

As of now, most tractor trailers destined for border trade areas are carrying reefer containers with no plug on. To cope with this, they drive straight to the border point while keeping a countdown before goods get damaged. For example, reefer containers loaded with frozen goods are given the required temperature just before the take-off with which the freezing of goods might last possibly another eight hours before it starts wearing off. It takes three days from Yangon to Muse, a border town with China. Therefore, the reefer containers have to be charged at Mandalay and there will be no more charging en route to Muse. Regardless, this seems not a good solution yet. If the establishment of charging facilities is expensive, another way out for this issue is by having a faster route towards the destination so that shipments reach the end point in the designated time, subsequently eliminating all possible cargo damages caused by delays. A faster route means making the Yangon – Mandalay Highway Road accessible for cold chain trucks. This is one of the major factors that need more

[48] Interview to MIFFA and MCTA.

deliberate considerations from the authorities for the development of the cold chain. In addition, for infrastructure, the expansion of highway roads should go together with the expansion of bridges. Truck weight scales in all weight stations should also be uniform, as the current weight scales are found to indicate different outputs.

Cold chain users[49]

Cold chain users include all businesses from cultivators to traders. A lack of user awareness is still the main issue for cold chain development. Myanmar is also still behind its regional peers in terms of technical knowhow. Therefore, awareness raising programmes should be organised for all related users, and it is not just traders who ask the most of cold chain demand but also reach till the most basic level of the supply chain, such as growers. Even the most basic understanding of the cold chain, such as the required temperature adjustments for different products, should be fully aware by truck drivers. There appear to be very few users or more precisely traders that demand the utilisation of the cold chain for the whole supply chain till export. The undeniable fact is that they gain more profit or better prices as their products have longer shelf life, better quality, and become value-added.

Operation cost is the main reason behind its unpopularity among users. The cold chain cost incurred along the supply chain makes the final market price be less attractive for consumers. In the same sense, higher cost brings higher benefits, such as fresher and longer shelf life, and, as a result, healthier product choices. The huge price gap between products that utilise cold chain and traditional logistics can be lower by developing the whole sector. This means being able to use cold chain services more conveniently for products that need the cold chain. For example, in produce, non-hard shell fruits require the cold chain for better quality at the time they reach final consumers. Consumers should be aware of the many benefits of consuming healthier products and place quality above a few more dollars. Another surprising fact only found in Myanmar is that consumers pay the same price for produce regardless of how or what sort of logistics they had to use. This discourages users or sellers to utilise the cold chain. For this, awareness-raising campaigns for end consumers should be arranged.

[49] Interview to Myanmar Fruit, Flower and Vegetables Producer and Exporter Association (MFVP).

To clarify a more convenient use of the cold chain, a better example would be a freight consolidation service. The current cold chain sector is not yet developed, and the result is that users or pioneers have to use it at a high cost. In the agricultural industry, fresh produce has many possibilities to use the cold chain in the future, and it is found that the vast majority of cold chain utilisation for transport is only one way. But, users have to pay double for a round trip. Also, as there are not many choices among service providers, they have to make use of what is available at the doorstep even at a higher cost. Therefore, widespread use of the cold chain would be possible if many 3PL cold chain service providers were to arise and if the supporting basic infrastructure and facilities, such as electricity, were improved. For instance, growers should be able to reach the main cold storage facility more easily; the facility should even be placed at the farm. Yet, farms and the facility are too far from each other. On top of that, connecting road conditions are severe causing unnecessary delays.

Human resources and others[50]

The lack of skilled drivers and proper insurance for highly damageable goods are other challenges that should be addressed. Heavy-duty truck drivers should be properly trained for different types of vehicles. Only after that should they be granted driving certificates for each preferred truck, and with that the issuance of a driving licence. This has already been practised in other developed countries. In Myanmar, drivers holding red licences are all able to operate any type of commercial vehicles available, be they light duty or heavy duty. Therefore, what needs to be done immediately is to first provide intensive training for the operation of heavy-duty trucks. This will allow Myanmar drivers to be certified when operating in international borders. Their working hours should also be standardised to make them get used to international standards. In addition, there should be more skilled professionals for warehouse management and operation to provide services that rival the international standards demanded by the international audience. Doing so will prepare Myanmar for any upcoming cross-border agreements in terms of human resources.

[50] Interview to MIFFA and MCTA.

6.6. Government policy

In the matter of the cold chain, no news about the government policies is heard. Existing rules and regulations relevant to the logistics industry are cargo restrictions, maximum truckload limitations, and container truck curfews. Curfews are not applicable to cold chain trucks as they can operate 24 hours, but they have to propose the operating routes to the department concerned before transport. However, at the operational level for the cold chain, there are certain standards that need to be met by cold storages or processing plants. The standard is based on "the Drafted Regional Guidelines on Cold Chain Management of Fish and Fishery Products in ASEAN Region", developed by the Marine Fisheries Research Department (MFRD) Programmes[51]. The guidelines are for ASEAN and SEAFDEC member countries and are in line with Myanmar Regulation promulgated by the DOF.

According to the guidelines adopted by the MFF, fishery products have to be handled at a temperature below -4°C from post-harvest handling to receiving and processing at processing plants. This temperature is maintained by placing fish and crushed ice at the ratio of 1:1. Besides, clean water has to be used both for cleaning and ice-making. At the plant for packing and labelling, the room temperature is set at about 10°C, and after packing, the cold storage temperature is about -20°C or -2°C. A first-in-first-out system has to be used for product movement. As for transport and distribution, the controlled temperature is -18°C in reefer containers that are destined for the Yangon International Port for normal trade. But for border trade, frozen products are carried by reefer container at -18°C, chilled products by carrier boat with crushed ice, and some products with insulated box trucks. For local consumption, cold boxes and crushed ice are mainly used in a ratio of 1:1. They are transported by truck and passenger buses to other regions from Yangon.[52] Regardless of the guidelines, there is weak compliance from local businesses for many reasons, such as a lack of facilities, electricity and containers with no power supply from factory to port, quality and safety awareness, and training.

[51] SEAFDEC (2018).

[52] Interview to Myanmar Fisheries Federation.

6.7. The mid-term prospect of the cold chain

In the private sector, local logistics-related businesses have voiced themselves regarding the mid-term prospect of Myanmar's cold chain sector. According to them, some positive changes to the cold chain sector will be visible in the next five years if the following factors are improved:

1. If transportation infrastructure is improved and long-haul cold chain transport becomes more in demand compared with urban distribution;
2. If much FDI comes to the sector;
3. If the government lifts some export/import restrictions on products that require cold chain and subsequently increased foreign trade; at present, products such as chicken and other foodstuffs and vegetables are restricted for import;
4. If the demand of refrigerated storage increases in line with trade growth;
5. If the consumption of foodstuffs from supermarkets becomes widespread;
6. If the number of hotels, restaurants, modern supermarkets, and minimarts increases; and last but not least
7. If knowledge-sharing workshops, training, and awareness-raising campaigns about cold chain usage and benefits are delivered to drivers and other stakeholders from the government level.

On closer inspection, the cold chain sector can potentially be developed in three distinct ways: boosting foreign trade, especially exports; re-exporting; and transit trade. These would just be pure optimism unless prerequisite actions are taken. Of the three approaches, re-exporting and transit trade have some contradicting effects on the sector. While re-exporting would potentially demand cold chain warehousing services, transit trade might require more transportation services. Besides, re-exporting shows more promise in the short term than transit and brings along more competition together with the opportunities arising from regional transport agreements.

Foreign trade

Cold chain demand will most likely be driven in the future by the trade of fresh perishables, such as fruit and vegetables, fishery products, pharmaceuticals, and seeds. The government has also taken the necessary steps in terms of rules, regulations, and policies to invite local and foreign investments for trade development, i.e. the National Export Strategy (NES) launched in 2015. With the current implementation of the NES, the development of foreign trade, specifically exports, is reassuring. In the strategy are seven priority sectors and four cross-sector focuses for development. The seven sectors include fisheries, textiles and garments, forestry products, beans and pulses and oilseeds, rice, rubber, and tourism. The four cross-sectors include access to finance, quality management, trade facilitation and logistics, and trade information and promotion.

Five more sectors were proposed in September 2018 and are still in the negotiation stage. Among them are two potential sectors; fruits and vegetables, and value-added agricultural food products that are likely to demand the cold chain.[53] Following the NES, the Myanmar Investment Commission also announced the 10 prioritised areas in June 2017 for investments as an additional enforcement, and in that list are export promotion sector and logistics industries. Furthermore, the import substitution sector; agriculture and its related services, and the value-added production of agricultural products; livestock production, breeding, and production of fishery products; and the healthcare industry are also included.[54] Half of the lists are the sectors that are contributing to the growth of the cold chain.

Re-exporting

To recap, re-exporting is defined according to the MOC as the import of goods from a first country to a second country or importing country, i.e. Myanmar for the purpose of exporting to a third country, whereas imported goods may or may not have been processed in the importing country before they are re-exported. Re-exporting was first initiated in 2015 with the approval from the MOC. There are 17 items to date and they are sugar, betel nuts, and oil, which were permitted in 2015 and the rest such as tyres, sesame (white and black), dried

[53] Global New Light of Myanmar (2018).

[54] Interview to Myanmar Investment Commission.

chilli, groundnut, cotton, soy beans, textiles, fresh fruit, electronic materials, cosmetics, juices and other groceries, clothes, edible oil and garlic, which were later approved in late June 2016. Sugar re-exporting reached a record high in 2016, comprising more than 3 million tons. When China, the major buyer, stopped importing sugar from Myanmar in 2017 in order to protect its local industries, re-exports of sugar and diesel were also suspended temporarily.[55]

According to the specification published by the MOC, there must be a warehouse in place to store re-export products in order to get the re-export license. Re-exporting has been practised substantially with China: sugar buyer, Thailand: sugar exporter, and Indonesia: betel nut exporter, India: betel nut buyer. However, these items only require general warehouses. Meanwhile, in the newly added items are some perishables that will likely demand cold chain warehouses in the future, such as dried chilli and fresh fruit. Products such as dried chilli, fresh fruit, electronics, computer and laptop placed in a dirt-free air-conditioned chamber, and cosmetics have been found to use the cold chain, although not for re-exports. If the demand for these items were to increase, demand for cold chain warehouses would likely increase as well.

Transit trade

When it comes to transit trade, Singapore has been a very good example, benefiting from its position as a focal point of contact for the East and West. Myanmar also has the potential to be just as beneficial as Singapore, not entirely through the sea but also focusing on land transport. This conclusion is reached due to the fact that Myanmar is a major part of many renowned connectivity projects in Asia, such as the Greater Mekong Sub-region Cross Border Transport Agreement (GMS CBTA), GMS Economic Corridors, the ASEAN Free Trade Area (AFTA), India's Kaladan Multi-Modal Transit Transport Project (KMTT) and India–Myanmar–Thailand Trilateral Highway Project, and China's One Belt One Road Initiative (OBOR). Despite the delays, Myanmar still has a part to play as a transit destination if they are accomplished.

In 2017, the total regional trade value reached US$165,828 million as described in Table 6.23. The contribution of land transport is thought to be about 20% of the total value compared

[55] Wai (2018).

with sea transport. In this, Myanmar currently has some involvement as a land transit point for its neighbours' trade. **Thailand–China** trade is done through the Myanmar Tachilek border point. As for **India–China trade**, there appear to be both land and multimodal transports. Land transport is via the Muse (China border) – Mandalay – Tamu (India border) route, which is part of the GMS Eastern Corridor. A sea route from India to Myanmar i.e. part of KMTT project would add to this land route to make it multimodal. There is also the India – Myanmar – Thailand Trilateral Highway Project, which is expected to be accomplished in the next two years. If this happens, **India–Thailand trade** has the most possibility with Myanmar acting as the main transit point.[56]

Table 6.23: Total Regional Trade in 2017 (Potential of Transit Trade Via Myanmar)

Sr.	Description	Trade Value (US$ Million)
1	Thailand Export to China	21,426.20
2	China Export to Thailand	32,547.08
3	Thailand Export to India	4,700.59
4	India Export to Thailand	3,653.83
5	Thailand Export to Bangladesh	909.48
6	Bangladesh Export to Thailand	44.83
7	India Export to China	13,333.53
8	China Export to India	76,380.70
9	Viet Nam Export to India	5,018.55
10	India Export to Viet Nam	7,813.08
	Total Trade	**165,827.86**

Sources: MOC (2017), Central Board of Indirect Taxes and Customs (2019), and the Customs Department (2015).

Apart from these, the vast majority of regional trade is being conducted via sea. However, when the Trilateral Highway is completed, it would connect with the GMS's East–West Economic Corridor (EWEC) that starts from Da Nang, Viet Nam, passes by the Lao PDR and Thailand, and finally ends in Mawlamyine, Myanmar, in the Myanmar section. However, the new Myanmar section of the EWEC will be from Myawaddy to Yangon and applied under the CBTA Agreement in the Myawaddy border. But if it becomes active just like its counterparts, it would form an easier trade link between **Viet Nam and India**. In the same way, **Bangladesh**

[56] The Hindu Business Line (2018).

– Thailand trade can be conducted through Myanmar via land transit or even port to port. The only issue is whether Myanmar can improve the required infrastructure in time for the activation of those agreements. Depending on that, most of the transit fees and other appealing benefits from the 20% of regional trade will become Myanmar's.

Goods in transit normally do not require the transhipment of goods or containers; this is more so if the agreements such as CBTA and AFTA become up and running. The use of the cold chain is more widespread for regional market leaders, such as Thailand and Viet Nam, and other prominent trade partners, such as India and China. The agreement allows the free flow of goods by removing national borders. This includes all tradable goods, so it will include the items that require the cold chain as well. However, making use of the CBTA pass is likely to leave warehousing along the border vacant, and the use of cold chain trucks that meet regional standards set and adhere by all traded partners will become more in demand.

When the agreement becomes active, Thailand's trucks will pass the borders and come down to Yangon Thilawa, while Myanmar's trucks will be able to go until Bangkok. This brings many benefits, such as trade growth and the resulting cold chain demand. The utilisation of assets, such as trucks and warehouses, will become higher. However, considering the current capacity of Myanmar, it is not nearly enough in terms of both soft assets; skilled drivers and hard assets; and trucks, warehouses, and other tangible assets. According to a spokesperson from MCTA, Thailand has about 15 times the required assets, including reefer containers. There will be a downfall for the logistics industry if the same product quality cannot be guaranteed stemming from insufficient assets and human resources.

If this continues, the potential logistics market share will be seized by a more powerful counterpart. Myanmar also has an issue with trade deficits, and it is nearly certain that more imports and therefore the utilisation of foreign assets is more likely rather that of local assets. This is a loss for the local industry and may cost many potential users. If the local industry cannot bring forth the demanded quality, there will be a demand shortage for local logistics services. If there is a demand shortage, local service providers will not be able to fund themselves in enhancing their capacities to provide better quality. If they cannot provide the same regional quality standard, the market share will slip away to other regional peers. This

forms an endless loop, and to stop it during many uncertainties and possibilities, infrastructure must come first.[57]

But if Myanmar can compete with regard to skills and assets, the table will turn, and Myanmar will benefit the most from transit just as Singapore. The bet is on how fast Myanmar can develop the current logistics capacities. It is the fresh perishables that have the most potential to use the cold chain if they acquire access to the vast regional market or consumer base more easily. To accommodate the demand, more technical training to cold chain suppliers, most needed from drivers, should be provided. There is also another way to solve this issue, i.e. the construction of transhipping, material handling and cross-docking facilities for transit trucks at border points along the corridor. This would reduce the negative impact on the industry given that no changes were made to the current logistics capacities. The former solution seems more viable, and if implemented, the development of Myanmar's cold chain sector would be unquestionable when the time came.

6.8. Conclusion

In conclusion, there are resources in Myanmar to fulfil current cold chain needs with 88,148 tons of storage capacity, which only represents the fishery sector and a couple of top third-party service businesses, and more than 7,000 refrigerated trucks to date. But, they are all underutilised even though the total volume of current demand and potential demand is about 15 million tons a year. So far, we have seen the market situation in the study. An example is the use of refrigerated trucks without running chilling systems, not using generators for continuous chilling, or warehouses with less than 80% of utilisation. When tracing back to the source of this issue, it is found that what is lacking still are intermediaries to make the market realise the true usefulness of the cold chain. Intermediaries mean the emergence of commodity markets in business hubs, such as Yangon, Mandalay, and Nay Pyi Taw. The government should support the development of commodity markets, such as the ongoing Danyingone Wholesale Market, the conceptual plan of Mandalay and Pyin Oo Lwin wholesale market and value-added processing zone. If these facilities enforce the use of the authentic cold chain, then the market would follow its lead. Other necessities, such as the

[57] Interview to Myanmar Food Processors & Exporters Association.

enhancement of human capacities and cargo insurance service businesses would come along as well as the cold chain becomes a norm. However, implementation work is at a slow pace. To reach the point of success of the cold chain industry in Myanmar would require faster development of infrastructure, awareness of users, and supportive and enforced government policies to go along with it.

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Appendix

Cold chain profiles of top service providers

(1) Ryobi Myanmar Distribution

Ryobi Myanmar Distribution is a wholly Japanese-owned logistics company and is operating the largest warehouse in Myanmar.

Table A.1. Cold Chain Profile of Ryobi Myanmar Distribution

Name	Ryobi Myanmar Distribution Service Co., Ltd
Address	Lot No. B-9, Zone A, Thilawa Special Economic Zone, Yangon
Storage Capacity (Bonded warehouse TBC included)	Total floor area is 36,695 sqm (2 storeys): ▪ Frozen : -25°C to -20°C 1,901 sqm (3 rooms) 2,400 pallets ▪ Chilled : +1°C to +10°C 1,523 sqm (3 rooms) 1,400 pallets ▪ Aircon : +25°C to +28°C 1,160 sqm (2 rooms) 850 pallets ▪ Dry : 4,032 sqm 12,100 pallets ▪ Document: 542 sqm 14,500/carton
Transportation Capacity	Operate ten refrigerated box trucks ▪ 2 tons truck: -25°C to +20°C ▪ 3 tons truck: -25°C to +20°C
Product	▪ Frozen: frozen foods (seafood, meat), prepreg, etc. ▪ Chilled: processed foods, health care materials, vegetables, fruits ▪ Aircon: grains (rice/bean), chocolate, chemicals ▪ Dry: general cargo
Additional information	▪ All-weather durability (dustproof, dock shelter etc.) ▪ Full-canopy truck yard ▪ 24-hour security and monitoring system ▪ 48-hour back-up battery for emergency shut down ▪ Risk protection of flooding by 6.5m above sea level location

Source: Interview to Ryobi Myanmar Distribution (https://ryobitransport.com/transport-kokusai-myanmar.html)

(2) KOSPA Limited

KOSPA Limited is one of the leading 3PL cold chain logistics service providers in Myanmar providing end-to-end logistics solutions for agricultural, pharmaceutical, FMCG, and others. It is a joint venture between Yoma Strategic Holdings Limited (Myanmar) and Kokubu & Co. (Japan).

Table A.2. Cold Chain Profile of KOSPA Limited

Name	KOSPA Limited
Address	Mingaladon Township, Yangon
Storage Capacity	Total cold storage capacity is about 4,500 sqm: ▪ Frozen zone: -25°C to -18°C 1,100 sqm (2 units * 550 sqm) ▪ Chilled zone: -5°C to +15°C 2,200 sqm (4 units * 550 sqm) ▪ Aircon zone: +15°C to +25°C 660 sqm ▪ Ambient: +25°C and above 540 sqm
Transportation Capacity	Total cold chain fleet is ten trucks, ▪ 6 x 2 tons frozen/refrigerated trucks ▪ 1 x 28 tons refrigerated truck ▪ 3 prime movers with portable generators ▪ 3 chassis for FEUs
Product	Food and beverages; wine; cheese; ice-cream
Client	Retail, restaurant, hotel, exporter/importers

Source: Interview to KOSPA Limited (https://www.kospalogistics.com/)

(3) Premium Sojitz Logistics (PSL)

PSL, a 3PL cold chain logistics company, is a joint venture between Premium Distribution Company (PDC), a foodstuff and consumer good wholesaler and Japanese Sojitz Corporation. PDC handles food wholesale mainly for City Mart Group, a market leader in the retail sector. It has head offices in Yangon, Mandalay, Pyin Oo Lwin, and Heho.

Table A.3. Cold Chain Profile of PSL

Name	Premium Sojitz Logistics (PSL)
Address	No.39/B, Shu Khin Thar Street, Shwe Pin Lone Housig, 27 Ward, North Dagon Township, Yangon
Storage Capacity	Total cold storage capacity is about 5,733 sqm (in Yangon and Mandalay): ▪ Frozen zone : -20°C 895 sqm ▪ Chilled zone : +5°C 298 sqm ▪ Aircon : +18°C 508 sqm ▪ Ambient : +25°C and above 4,032 sqm
Transportation Capacity	Total 30 trucks ▪ 27 x 6 wheeled refrigerated box trucks ▪ 3 x 12 wheeled insulated box trucks
Product	Various retail products including foodstuffs, flowers, fruits and vegetables
Client	Hotels, restaurants, supermarkets, vegetable markets, flower markets, exporters and distributors

Source: Interview to PSL (https://www.facebook.com/myanmarpsl/)

(4) Premium Worldwide

Premium Worldwide Co., Ltd is majority owned and operated by a Singapore Private Limited Company with Diversified Holdings in Logistics, Information Technology, Trading, Real Estate, Lifestyle and the Food & Beverage Sectors. Sales Direct is its associate company providing foodstuffs and general trading services for businesses in Myanmar.

Table A.4. Cold Chain Profile of Premium Worldwide

Name	Premium Worldwide Co., Ltd
Address	HQ & Central Distribution Hub, 209 & 238 Hlaing Tha Yar Industrial Zone 2, Ka Naung Min Thar Gyi Road, Yangon
Storage Capacity	Total cold storage capacity is 3,400 tons ▪ Cold/Chilled zone : 1,600 tons (8 units x 200 tons) ▪ Ambient : 1,800 tons (2 units x 900 tons)
Transportation Capacity	Has six refrigerated trucks; ▪ 3 x 2 tons trucks ▪ 3 x 3.5 tons trucks
Product	Over 300 items: Mainly store foodstuffs; cheese, butter, juice, various sauce dressings, tomato paste, ketchup, etc.
Client	Hotels, retail, and restaurant chains; KFC, for example.

Source: Interview to Premium Worldwide (http://www.premiumgroup.com.mm/)

(5) Nature Logistics

Nature logistics is a 3PL logistics service provider focusing on cold chain logistics and refrigeration services. It provides a full range of logistics services, refrigerated and dry container sales, and rental and refrigeration engineering services for reefers and cold storage factories.

Table A.5. Cold Chain Profile of Nature Logistics

Name	Nature Cold Chain Logistics and Refrigeration Services Co., Ltd
Address	No. 74, Ground Floor, 30th Street, Lower Block, Yangon
Fleet size	Operating five tractor trailers; prime-movers and chassis equipped with generators
Product	Chemicals, pharmaceuticals, beef, seeds, flowers, fruits, vegetables, ice-cream, cheese, etc.
Client	Mainly exporters/importers

Source: Interview to Nature Logistics Company (https://www.natureclr.com/)

(6) Myan Express

Table A.6. Cold Chain Profile of Myan Express

Name	Myan Express Logistics Co., Ltd
Address	No.7(B), Cherry Condo(2), Cherry Garden City,14/3 Ward, South Oakkalapa Tsp., Yangon
Fleet size	Total fleet of 12 box trucks with temperature range between +15°C and -25°C, ▪ 3 x 2 tons (10ft truck) ▪ 3 x 2.5 tons (12ft truck) ▪ 2 x 3 tons (14ft truck) ▪ 2 x 4 tons (16ft truck) ▪ 1 x 4.5 tons (19ft truck) ▪ 1 x 6 tons (21ft truck)
Brand	Hino, Nissan, Mitsubishi, Toyota, Man
Purchase price	Average purchase prices of box trucks, ▪ 10ft: K18 million (new) K15 million (second-hand) ▪ 14ft: K24 million (new) K20 million (second-hand) ▪ 16ft: K27 million (new) K23 million (second-hand) ▪ 19ft: K30 million (new) K25 million (second-hand) ▪ 21ft: K30 million (new) K25 million (second-hand)
Product	Mainly pharmaceuticals
Client	Ministry of Health, hospitals, pharmacies

Source: Interview to Myan Express (https://www.facebook.com/pages/category/Local-Business/Mayan-Express-Courier)

(7) SENKOSMI

SENKOSMI is a joint venture company between Senko Co., Ltd, one of the leading logistics companies in Japan and Singapore Myanmar Investco, an investment and management company focused on Myanmar, listed on the Singapore Stock Exchange. SENKOSMI provides comprehensive 3PL logistics services. SENKOSMI is registered as US FDA Food Facility and it has a workforce of 30.

Table A.7. Cold Chain Profile of SENKOSMI

Name	SENKOSMI
Address	Insein Township, Yangon
Capacity	Has 16 refrigerated box trucks with capacity ranging from 2 to 4.5 tons
Product	Mainly imports such as seafood and meat
Client	Wholesalers/retailers, restaurants, hotels, importers

Source: Interview to SENKOSMI (http://senkosmi.com/