



**Asia-Pacific
Economic Cooperation**

**Final Project Completion Report:
High Level Public-Private Forum on Cold
Chain to Strengthen Agriculture & Food's
Global Value Chain**

Agricultural Technical Cooperation Working Group

JAPAN

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1. Background

Establishing and upgrading cold chain contributes to food security by reducing food losses, and to empowering of agriculture by involving agriculture and food producers into global value chain. Cold chain also serves the fundamentals to improve people's life. In many developing economies, food is lost mostly during the early and middle stage of the food supply chain. This has been caused, among others, by the lack of sufficient cold chain. Some APEC developing economies have been developing their plans to improve their cold chain to achieve food security.

The sufficient cold chain empowers agriculture. It enables small farmers and fishers to increase their income by delivering value-added food products to consumers, in additions to by reducing their product's losses. The combination of the providing sufficient cold chain and entering global value chain is a key of the success of agriculture.

In addition, developing economies among APEC have reached more developed status now. According to the development, the food consumption pattern would change and it results in more demand of diversified diet. Cold chain is necessary to provide such kinds of foods. This project would improve their quality of lives.

Therefore, the development of the cold chain, which connects production, storage, processing, distribution in cold, leads to achieving food security and promoting global value chain, which results in the empowering agriculture in APEC region.

The objectives of this report are as follows;

- Understand the current situations and the benefits of cold chain systems;
- Identify best practices on establishment of cold chains;
- Share experiences and knowledge regarding cold chain system among APEC economies

2. History of the Development of Cold Chains in Developed Economies

In this section, we focused on the history of the development of Cold Chains in developed economies including Japan. Using examples from the technologies and system on cold chains which are utilized in developed economies, we summarized lessons and applicabilities to the least developed economies.

2.1 Brief Background of Development on Cold Chain¹

Cold chain is a low-temperature physical distribution system in seamless manners between upstream and downstream. It contributes stable food supply, food price stability and to ensure food safety. Therefore it has become an essential distribution system for modern trade.

The first time of using the term, “cold chain” was in the report; *The cold chain in the U. S. A.*, published in 1951. This report aimed to clarify the situation of cold chain in the United States by study expert team consisted of the OEEC (the predecessor of the OECD) and ECA (the predecessor of the USAID).

The methods in refrigerating and freezing for food products had been partly conducted in the nineteenth century. For example, the frozen beefs were transported by cargo ships between France and Argentina in 1876 and preserved oranges in refrigerated storages were traded at foreign settlements in Osaka and Yokohama of Japan in 1887. However it is said that such efforts had been quite partial in the whole food chain prior to the latter half of the twentieth century, the time that cold chain was widely penetrated in developed economies.

Looking back on the history of cold chain, sufficient economic power is indispensable for the maintenance of full-fledged cold chain in one’s economy. Because it needs not only to purchase cold chain facilities cost much higher than normal warehouse and trucks, but also to maintain stable electric power and roads for transportation. In fact, the period that Japan achieved to establish domestic cold chain network had been paralleled by the period of rapid economic growth from 1955 to 1973, which recorded consecutively economic growth rate around 10% in every year. Also, it is pointed out that if GDP per capita in one economy becomes over 1,000 US dollars, the demand of electrical applicants including a refrigerator

¹ Kunio TAKAMATSU (2015) “Cold Chain and Refrigeration Technology” *ELECTRO-HEAT*(202).
Hiroyuki MORIMOTO (2014) “Construction of Cold Chain for Offering High Quality Food Products” *Gekiryu* (39), *KOKUSAI SHOGYO publishing corp.*,
Takayuki MORI and others (2013) “Cold Chain” *Koyoshobo*,
Hirofumi TANGE (2013) “A Study on the Social Context of Logistics” *Kiyou* (20), *Aichi Gakuin University Keieikanrikenkyujo*,

would rapidly increase. Since the beginning of the twenty first century, emerging regions like Asian economies have continuously achieved economic growth so that their interests for cold chain have been basically rising with growth of household incomes and diversification in food consumption.

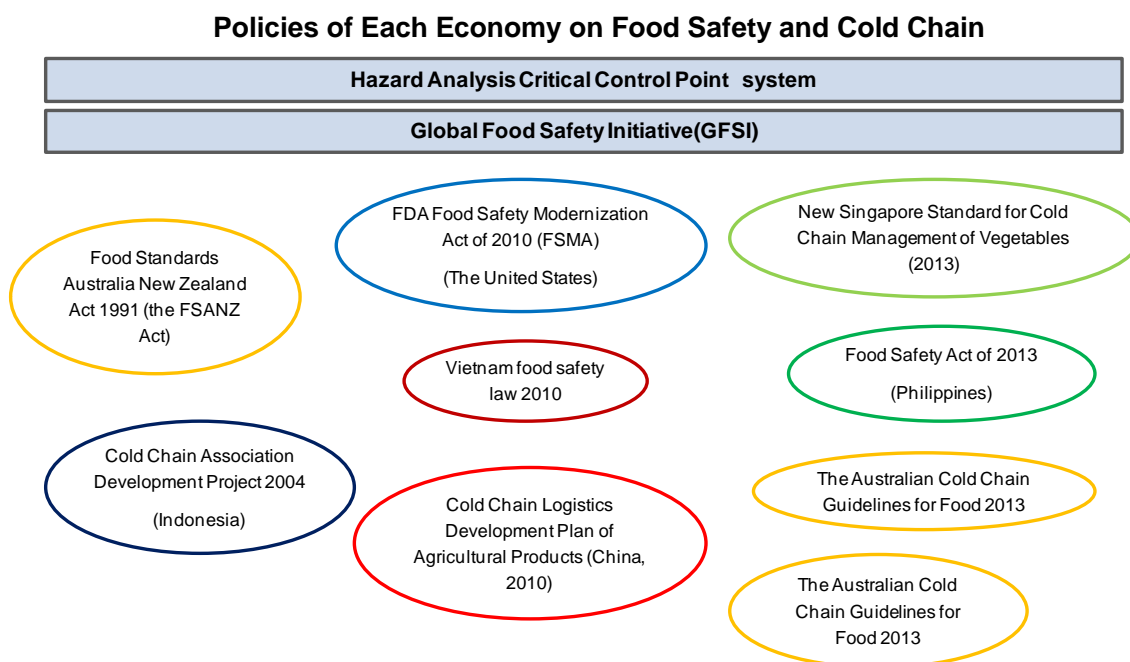
In addition, other important factor to develop cold chain is firstly, “distance” between production area and consumers. Namely, the more distance between both places is, the more cold chain have to be maintained. For example, in the United States, it takes over several days to transport food products from remote agricultural area to the city by reefer trucks because it have to traverse vast land area.

Furthermore, the above can be argued from another standpoint; “urbanization rate” that is also largely influential to the introduction of cold chain. For example, Australia, where 90% population concentrates in urban areas, maintains cold chain as an indispensable function because the foods are transported from out of the city through only on this chain. In contrast, Viet Nam where only 30% population concentrates in urban area, has not developed cold chain well compared with other emerging economies. The reason is that Viet Nam has “local production for local consumption” economies that most Vietnamese buy food products from traditional markets. In addition, people live in Hanoi and Ho Chi Minh also prefers to buy products produced/transported from near agricultural provinces like Bac Giang Province and Tien Giang Province.

Thirdly, as for “distance”, “food import” is also significant factor to develop cold chain. Generally, import food products from foreign economies needs several days even by air transportation because there is not only the transportation but also bond procedure. Also, if you use shipping transportation, it would take several weeks. Therefore, the maintenance of cold chain is indispensable to keep food products fresh for the importing economies (relevant industries in the exporting economies also should be developed as well). Those economies such as Japan and Singapore, depend their own food supply on imported food, have increased their food import along with the trend of free trade expansion under the GATT/WTO regime. That is why the cold chains of those economies have been sophisticated in terms of technologies, intuitions and policies.

, As the partnership between economies will be more strengthened by the increase of multilateral trade and business transaction, the developing economies will develop cold chain and eventually achieve higher level of advancement.

The following figure shows major laws and policy programs regarding food safety and cold chain in some economies. In recent years, developing economies follow the policies of developed economies and global standards in these fields. These laws and policy programs serve as guidelines for cold chain development.



Source: Published report in each economy

2.2. Case of Japan

2.2.1. Brief Background of Cold Chain in Japan

Back to the beginning of 19th century, one of the Japanese private companies, *Kuzuhara Comapany (Nichirei Co., Ltd.)* had introduced the frozen techniques from The United States and set up the first industrial fridge. The company had started the refrigerated vessel services at that time. Surrounded by the seas, the first demand for the refrigerated transport was for the frozen fish².

During the Great Kanto earthquake in 1923 to the World War II, the development of the cold chain had been very limited because of the social and economic confusion.

Full-scale development of the cold chain had been restarted after the war. Nichirei had started the frozen food business such as seafood, meat, ice and so forth in 1943. Home refrigerators had been spread in almost every household in the late 1950s.

² Japan Frozen Food Association website, <http://www.reishokukyo.or.jp/frozen-foods/ff-histry>

At the same time, Japanese government promoted the cold chain development and Ministry of Science and Technology (present Ministry of Education, Culture, Sports, Science and Technology) showed the recommendation on the Cold Chain which contribute to improvement of dietary life in 1965. After this recommendation, Ministry of Agriculture and Forestry (present Ministry of Agriculture, Forestry and Fisheries) played the important role to set up the cold chain infrastructure and network for vegetables, fruits, meats, seafood all over the economy. Cold chain technologies including precooling, refrigerated transport and preservations had been also developed.

National Railway Service had launched the second five year plan to modernize the railways with cold chain during 1957-1961. Until 1968, additional to the usual containers, circulation, refrigerated and tanked containers run through 144 stations and 1,257 zones and these railway cold chain service responded the demand for the cold chain³.

During the period of rapid economic growth of 1950s to 1970s, home electricity applicants, like refrigerators⁴ and microwaves has become popular while frozen foods/meats industry had gradually spread to the household.

Frozen food industry had rapidly developed since 1970s, followed the development of restaurant or fast food shops such as franchised family restaurants, KFC, McDonalds under the high economic growth.

In 1970, public-private Committee for Frozen Food Industry had been established and it introduced independent (not mandatory) Standard for Frozen Food in 1971. Every frozen foods have to be kept under -18 degree based on this standard⁵. Ministry of Agriculture and Forestry (present Ministry of Agriculture, Forestry and Fisheries) defined the “Chilled foods” as foods treated in the under -5 degree to 5 degree⁶.

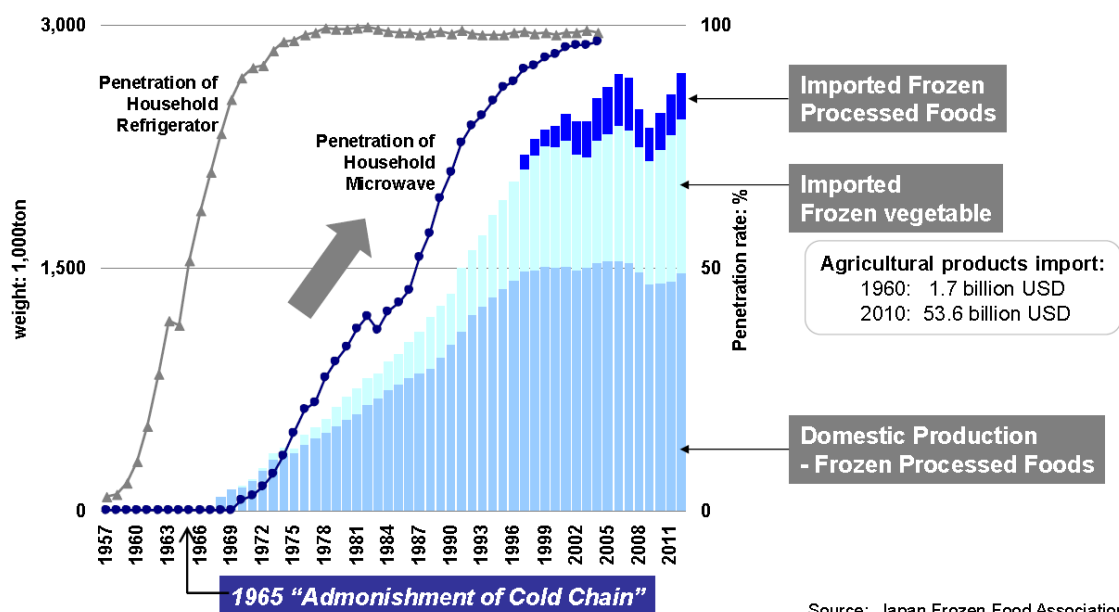
³ Railway Club of Hitotsubashi University website, http://www.ikkyo-tekken.org/studies/2009/2009_21.pdf

⁴ Refrigerator penetration rate reached 50% in 1965 and reached 100% in 1975.

⁵ Japan Frozen Food Association website, <http://www.reishokukyo.or.jp/hinkan/20140213>

⁶ Japan Frozen Food Association website, http://www.reishokukyo.or.jp/frozen-foods/new-ff-qanda/qa_01

Trends in domestic frozen food consumption and penetration of home appliances



Source: Kato (2013) Cold Chain Infrastructure and related Industries -Contribution to food losses / waste reduction-, presented at Symposium on Human Resource Development in Food-related Area through Partnership with ASEAN Universities Jakarta, Indonesia, January 21, 2013

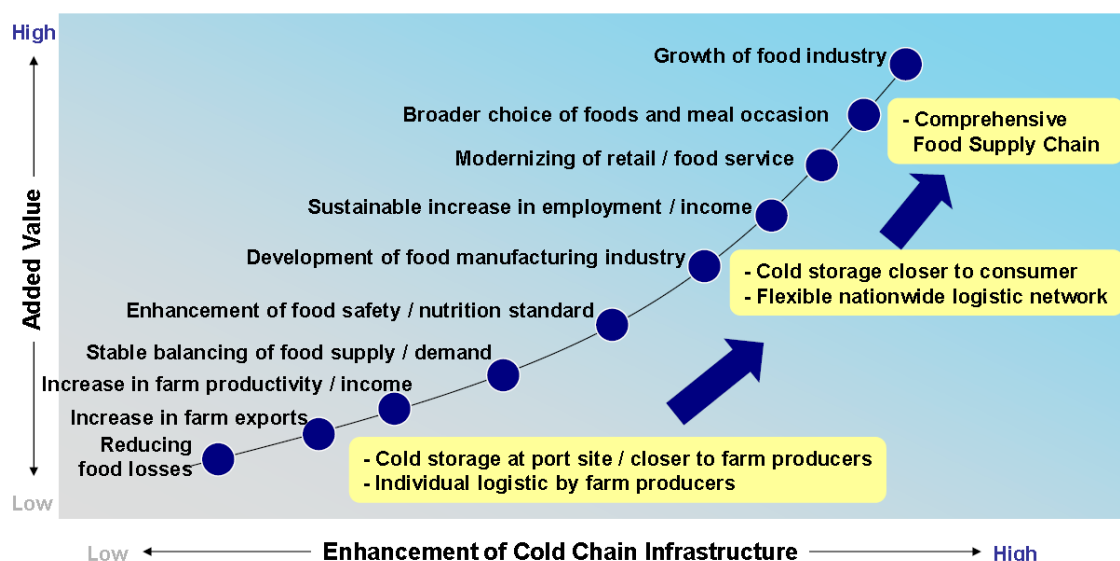
Around the late 1970s, the amount of the frozen processed foods reached 0.5million ton, and it reached more than 1million ton in 1990, 1.5million ton in 2000. With an increase in the total amount of frozen or chilled foods, private logistic companies provided the cold chain home delivery services after the late 1980s⁷.

2.2.2. Cold Chain Technologies Development in Japan

Cold chain technologies that we need have been changed as economy and agricultural and food industry develops. Under the poor cold storage infrastructure, it is quite difficult to add the value of agricultural products and food and the main challenges in the cold chain will be food losses, inefficient process for food or others. However as cold chain infrastructure matures, the added values for agricultural products and foods will be much higher. Consumers also can enjoy the opportunities to select more variety of agricultural products and foods.

⁷ Kuronekoyamoto Co. Ltd. website, <http://www.kuronekoyamoto.co.jp/company/30th/>

Historical Development: Creating added value of food industry / Enhancement of cold chain infrastructure

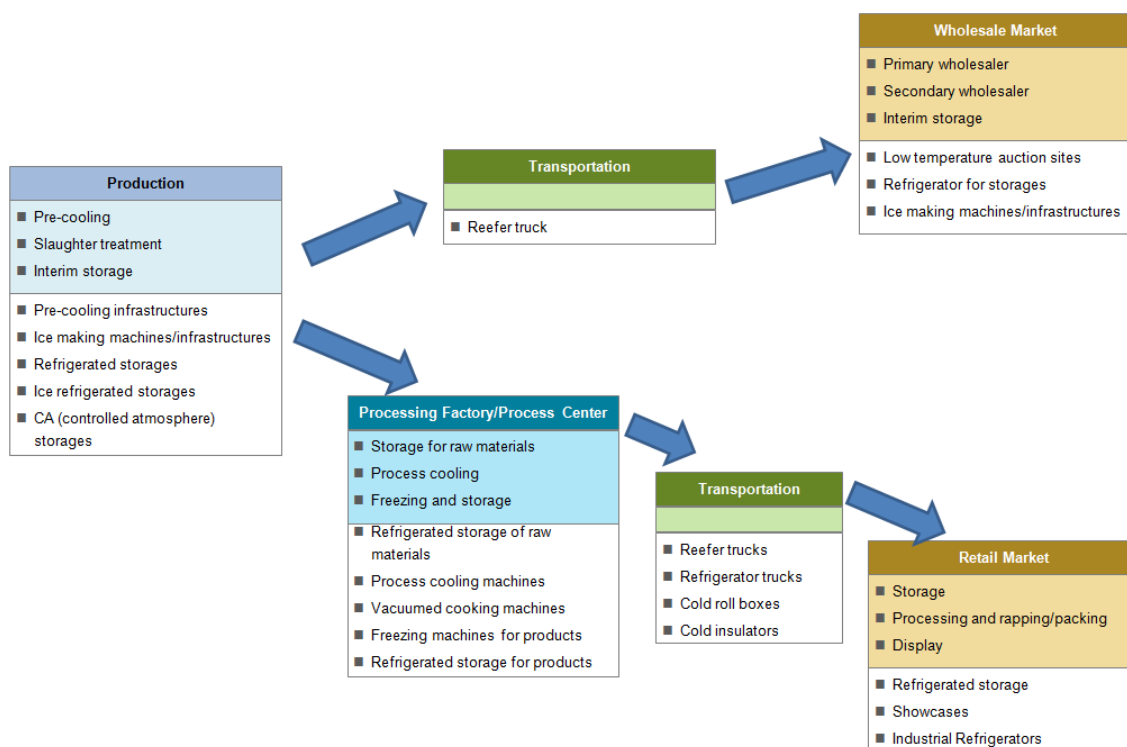


Source: Kato (2013) Cold Chain Infrastructure and related Industries -Contribution to food losses / waste reduction-, presented at Symposium on Human Resource Development in Food-related Area through Partnership with ASEAN Universities Jakarta, Indonesia, January 21, 2013

When we look at cold chain logistics, there are several important factors such as stable supply throughout a year, stable price, securing the food safety and so on. To achieve these factors, we have to consider both technologies and machines/infrastructures. Required technologies and machines/infrastructures in the cold value chain for food will be divided into three parts indicated below; 1) production and processing, 2) logistics, 3) consuming/market.

We also have to consider what kind of food we deal with (e.g. agricultural products, meats, fishes, processing foods) but the basic and common technologies and machines/infrastructures are summarized into the figure below.

Relationships between Cold Chain and Cold /Freezing Infrastructures



Source: Takamatsu (2015) Cold Chain and Cold/Freezing Technologies (*Teion Ryutsu to Reito Gizyutsu* in Japanese), *Electroheat*, Vol 202, p.43.

The three steps of the cold chain are cooling (10°C to -5°C), chilling (5°C to -5°C) and freezing (under -18°C). Main cold chain technologies in each product are summarized as follows.

1) Agricultural products and processed products

(1) Pre-cooling

Main technology for vegetable pre-cooling for is “vacuumed pre-cooling” and for fruit pre-cooling is “forced draft cooling” and “pressure cooling”.

(2) Refrigerated storage

Forced draft cooling system is the most popular system for refrigerated storage. It has some functions to prevent;

- drying with cloth cooling duct
- maturing with ethylene removal system
- temperature fluctuation and drying with broken ice supply machines
- cleanness with electrolyzed and ozone water supply systems

Low temperature and high humidity storages and controlled atmosphere (CA) storages are also effective for vegetable and fruits.

For several vegetables such as broccolis, ice making machines are needed to transport.

2) Meats and the related products

(1) Drying and pre-cooling

In order to keep away bacteria from developing since meats which have just slaughtered are around 40°C with waters, we have to dry them and make them cool until 0°C as soon as possible.

(2) Refrigerated storage

After drying meats, they are kept in the refrigerated storages.

3) Fisheries and the related products

(1) Ice making machines

Most of fish and shellfish are transport with ice. Fishes are frozen on the deep-sea fishing boats/ships. Auto ice making machines and ice cube making machines are the main ice making machines.

(2) Freezing machines

Forced draft cooling system is the most popular for freezing infrastructure. Contact freezer is also used for rapid freezing.

Refrigerated trucks and freezer trucks are the main vehicle to carry agricultural products in cold chain. Each truck is used for most vulnerable phase of end-to-end cold chain safety and security monitoring. Traditional data loggers record temperature and/or humidity and report upon arrival. While “postmortem” data is useful for attributing responsibility in case of failure, it does not prevent potential productivity lapses or loss of food-goods and/or spoilage of vaccines and pharmaceutical supplies.

Currently Japanese companies focus on the energy saved cold chain technologies. For instance, most of the companies have been launched non-fluorocarbon (CFC) refrigerator systems with balanced energy-saving and environmental friendly characters. It utilized CO₂ instead of CFC and LED light for the further eco-applicant⁸.

Some of the Japanese cold chain technologies contribute other economy's cold chain;

⁸ Ministry of Environment website, <http://www.env.go.jp/earth/ozone/hojokin.html> and Panasonic co., Ltd. website, <http://www2.panasonic.biz/es/cold-chain/super/ev/>

■ Malaysia⁹

Yamato Holdings has offered chilled parcel delivery service in Malaysia since 2011, and it increased handling volume by 30% in 2013.

The Malaysian government expects Yamato's cold-chain parcel delivery to stimulate the economy's online consumption. Win Far Trading, a seafood wholesaler in the southern city of Johor Bahru, is using Yamato's services to expand its customer base in Kuala Lumpur and the northern city of Penang. "Yamato delivers even one parcel, which has led to more online orders for Japanese frozen oysters," said the company's president.

■ Thailand¹⁰

In Thailand, cold-storage distributors are growing in number, but the tropical climate has made it challenging for many of them to control in-truck temperatures. Yokohama Reito, a cold-storage warehouse operator headquartered in Yokohama, entered the Thai cold-chain market two years ago. Yokohama Reito offers delivery services to 50 companies, of which 60% are local clients. Charoen Pokphand Group, Thailand's largest conglomerate, is among them. Yokohama Reito focuses on personnel development. It examines the skills of truck drivers and assigns experienced drivers to give on-the-job training to those who need to improve. It also gives skilled drivers incentives.

■ The Philippines¹¹

Sumifru Corporation a subsidiary of Sumitomo Corporation, currently supplies about 30% of the bananas sold in Japan. To ensure that Japanese consumers can get the best-tasting bananas, Sumifru was the first in the industry to establish a fully temperature-controlled supply chain, starting from the place of production. The banana is so sensitive to temperature changes that it can suffer chilling damage even when the temperature drops only slightly below its preferred temperature of around 13.5 degrees Celsius.

Bananas are sent to temperature-controlled consolidation points or dedicated refrigerated facilities for temporary storage within 4 hours after harvest. They are then shipped from the Sumifru Group's own port facilities on banana carriers, arriving at their destination Japanese port around five days later. During this entire process, the temperature is controlled at an optimum level.

⁹ *NIKKEI ASIAN REVIEW*, April 24, 2014 <http://asia.nikkei.com/magazine/20140424-A-future-in-drought/Business/Japanese-logistics-give-Southeast-Asia-the-chills?page=2>

¹⁰ *NIKKEI ASIAN REVIEW*, April 24, 2014 <http://asia.nikkei.com/magazine/20140424-A-future-in-drought/Business/Japanese-logistics-give-Southeast-Asia-the-chills>

¹¹ Sumitomo Corp. website <http://www.sumitomocorp.co.jp/business/article/id=26869>

Because of provisions of the Plant Protection Act, bananas are imported into Japan while they are still green. They are then placed in ripening facilities for about five days, where they are artificially ripened with ethylene gas. With their arrival timed to coincide with their ripening schedule, the bananas are then shipped to supermarkets and other stores. These processes, from harvest to delivery, take about two weeks in all. The strict temperature control makes it possible for fresh and tasty bananas to be delivered to consumers. The cold chain is the key to enabling consumers to enjoy fresh, high-quality bananas during all four seasons. The Sumifru Group's own port facilities work untiringly, shipping bananas 24 hours a day, 365 days a year.

■ People's Republic of China¹²

Shandong i-Logistics Co., Ltd, a joint venture of Itochu Logistics, has a large scale frozen and fridge storage at the Qingdao port, which is strictly managed by the latest cold chain system and Japanese managers, and provides high quality logistics services to many Japanese costumers in the food and food related industry.

The company also has both the bond warehouse license and the first forwarder license. In regards, it can provide one stop cold chain bond warehouse logistics.

2.3. Lessons and Applicability to Least Developed and Developing Economies

One of the general and common issues on cold chain in developing economies is the fiscal burden for the cold chain infrastructure. Unit cost of the food and processed food is so lower than the manufacturing goods that companies in this field cannot invest the infrastructures much. In addition, the cold chain management requires local staffs to have the high level know-how of operation compared to the dry logistics. This shortage of know-hows and knowledge on cold chain management leads to the lack of quality of food and processed foods¹³.

Looking at some Japanese experience, they utilized the rapid economic growth and global events such as Olympics (1964) or World Exposition (1970) to develop the basic cold chain infrastructure as well as the basic frozen/chilled food and processed food industry since the governmental budgets were more distributed at the world events and private companies tried to respond the demand for the high valued frozen/chilled foods.

¹² Itochu website [http://www.itclogi.com/service/People's Republic of China/service/chn_cold.html](http://www.itclogi.com/service/People's%20Republic%20of%20China/service/chn_cold.html)

¹³ Ministry of Economy, Trade and Industries website, http://www.meti.go.jp/committee/sankoushin/ryutsu/pdf/003_04_00.pdf

Regarding the cold chain management, Japanese companies traditionally put strong emphasis on the human resource development at every field and levels. The food and processed food companies provided intensive trainings and education and developed guidelines, manuals, handbooks and so forth to disseminate the same level of standard or skills.

3. Current situation and challenges of cold chains in each sector in least developed and developing economies

3.1 Literature Review of Current situation and challenges on cold chain in APEC economies

Most developing APEC economies belong to the tropical zone so that food products would be easily damaged unless its temperature is carefully controlled. Therefore, it is recognized that the demand for cold chain in the agricultural and food industry there is much higher than other regions.

The following points are current situations and challenges to establish or improve cold chain in some economies.

Current Situation and Challenges on Cold Chain in some APEC economies

Economy	Current Situation and Challenges
Malaysia	<p>The percentage of cold chain is only about 2% out of all services provided by Yamato Transport Co., Ltd, that is a Japanese commercial carrier in Malaysia.</p> <p>Products which should be transported under cold circumstance are sometimes kept in the normal temperature due to poor logistic management in the warehouse in Kuala Lumpur International Airport.</p>
The Philippines	<p>Average temperature of the Philippines is higher throughout the year so that low temperature control for fresh food is always necessary.</p> <p>CCAP (Cold Chain Association of the Philippines Inc.) is established in 2002 and over 100 companies such as logistics and retail have become a member company.</p> <p>Maintenance of cold chain is expensive.</p> <p>Cold chain systems in rural area are not developed well.</p> <p>There is significant influence for temperature control during the delivery due to a delay of transportation infrastructure maintenance.</p>
Thailand	<p>There are many cases that warehouse workers handle food products at normal temperature before loading it onto refrigerator car.</p> <p>Maintenance of cold chain is expensive.</p> <p>Delivery system of cold chain in Thailand is not efficient.</p>
Viet Nam	<p>Demand for cold chain retailers is not so high. They value cost more than quality at food delivery.</p> <p>There is significant influence for temperature control during the delivery due to a delay of transportation infrastructure maintenance.</p> <p>Temperature control at warehouse in rural areas is not carried out properly.</p>

Source: Compiled from JETRO and various sources.

There are several common challenges to improve cold chain in developing APEC economies from each perspective as follows;

- Human Resource Development

The workers involved in cold chain are not educated or trained to manage products carefully. They sometimes leave food products at room temperature for hours before loading it onto refrigerator car.

- High Transportation Cost

Using cold chain is expensive by several causes, such as unreliable electricity and inefficient delivery system.

- Insufficient Infrastructure

Due to a delay of transportation infrastructure maintenance, there is significant influence for temperature control during the delivery. In addition, the number of refrigerated warehouses is small in local areas.

- Inappropriate and lack of institutional systems

Due to the inconvenience of customs clearances at the international airport such as limited its working hours, imported fresh foods are exposed to normal temperature for a long time in warehouse of the airport. In addition, there are many cases that it is no clear guidelines regarding temperature control for food products.

- Lack of Investment

Introducing cold warehouse and reefer trucks costs small farmers much. Although they are eager to introduce those facilities in order to keep their products fresher and longer, they cannot invest the facilities because of the shortage of money.

- Cultural Differences

The foods on cold chains are not necessarily accepted as fresher foods in all APEC economies. For example, the typical Vietnamese consider that the fresh foods should be kept at room temperature immediately after harvesting, not be on cold chains. Therefore, the cold chain technologies have not widespread well into the Viet Nam households.

Based on these challenges for the development of cold chain in APEC region, actions

for solving them are sometimes raised as stated below;

- Assistance to small-scale farmers (support for traceability system, capacity building for participation in global value chain)
- Improvement of infrastructure and development of a distribution services system
- Training for staffs in the logistic field to obtain handling skills and knowledge for cold products and cold chain system
- Creating an enabling environment for private sector, especially small and medium sized enterprises (SMEs), to lead a business and create an environment connecting the farmers, industry and market

3.2. Questionnaire Survey on Current situation and challenges on cold chain in APEC economies based on the questioners by APEC economies

Following to the literature review above, we have conducted two kinds of questionnaires survey to APEC economies to understand the situation of the development of cold chains in each economy and to identify the areas being interested in by economies.

The draft of the questionnaires was consulted with Ministry of Agriculture, Forestry and Fisheries (MAFF), and we circulated the questionnaire to APEC members after the approval of MAFF utilizing Agricultural Technical Cooperation (ATCGW) mailing list. Names on the list are the participants who attended Asia-Pacific Information Platform on Food Security (APIP on Food Security) since 2011, nominated experts by attachés of Japanese embassy in charge of agricultural policies in each APEC economies and so on (Survey1).

Also we utilized our original network of the persons who are engaged in the cold chain related business (Survey2).

3.2.1. Basic information

Survey 1

The questionnaire survey was conducted from 25 May 2015 to 12 June 2015, distributed questionnaires to 249 contact E-mail address in total registered by the officials among 21 APEC economies. There were 14 responses as below. The collection rate was approximately 5.6 %.

Economy

Chile	Indonesia	Rep. of Korea	Mexico	New Zealand	Papua New Guinea	The Philippines	Singapore	Chinese Taipei	Thailand	Total
1	1	1	1	1	1	3	1	1	3	14

Survey 2

The web questionnaire survey was conducted during 25 May 2015 to 12 June 2015. It consisted of 170 answers from the people in the cold chain-related industries in APEC economies listed below.

Economy

Australia	Canada	Chile	Hong Kong, China	Malaysia	Mexico	New Zealand	Peru	The Philippines	Singapore
12	15	7	6	10	17	14	6	16	9

Chinese Taipei	The United States	Total
5	53	170

Industrial Sector

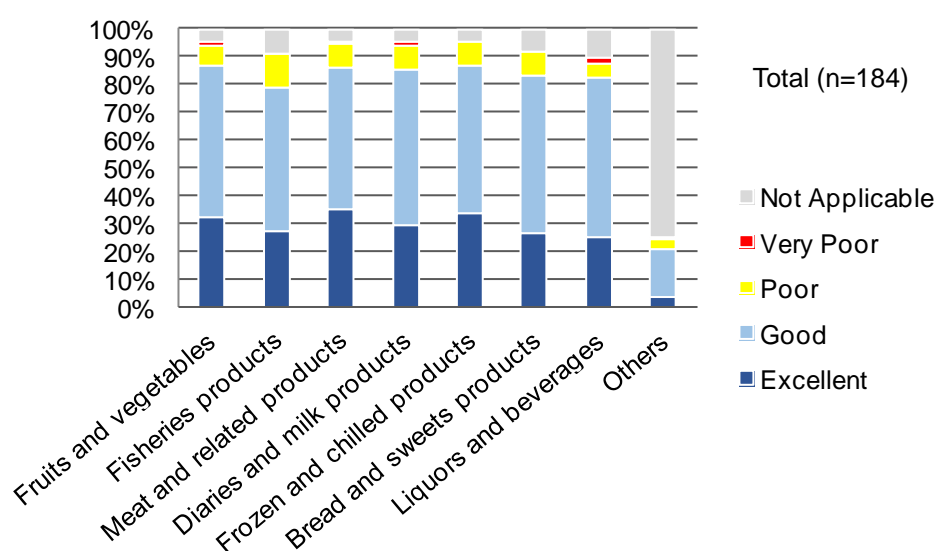
Agriculture	Manufacturing	Food	Marketing	Wholesale	Distribution	Foodservice	Others*	Total
31	18	26	6	13	45	26	5	170

*Others with related to the cold chain: Public Sector (1), Consultancy (1), Health (1), Business Services (1), and Transport Services (1)

For the following each analysis, we expediently separated economies into: the developed economies (The United States, Australia, New Zealand, Singapore, Canada, Hong Kong, Chinese Taipei, and Republic of Korea) and the developing economies (Malaysia, The Philippines, Mexico, Chile, Peru, Indonesia, Thailand, Papua New Guinea).

3.2.2. Current situation of cold chain development

Entire current cold chain situation in each product is as follow.

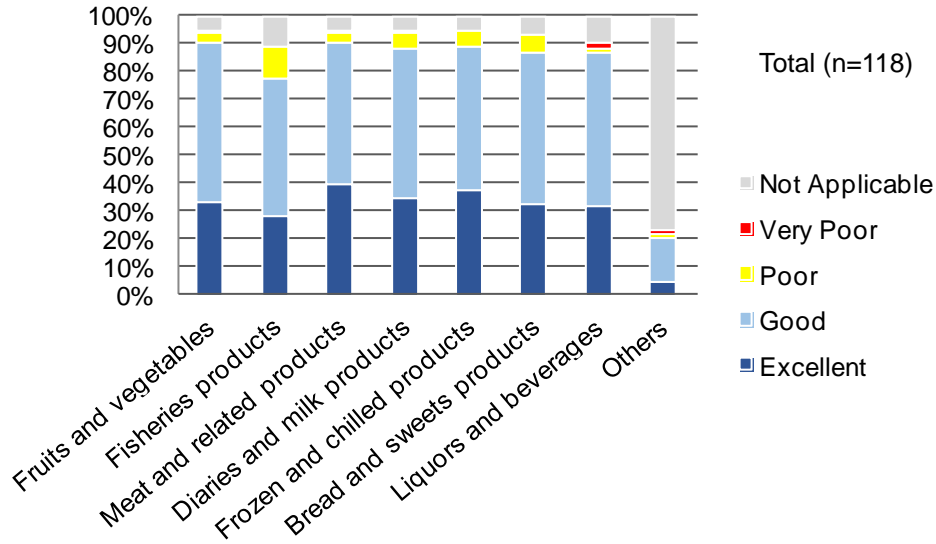


Answers of “Excellent” and “Good” in each product are reached around 80% because the share of the United States which accounts for nearly 30% of all responses is largely influential to whole aggregate data. However, the share of “Excellent” and “Good” answers

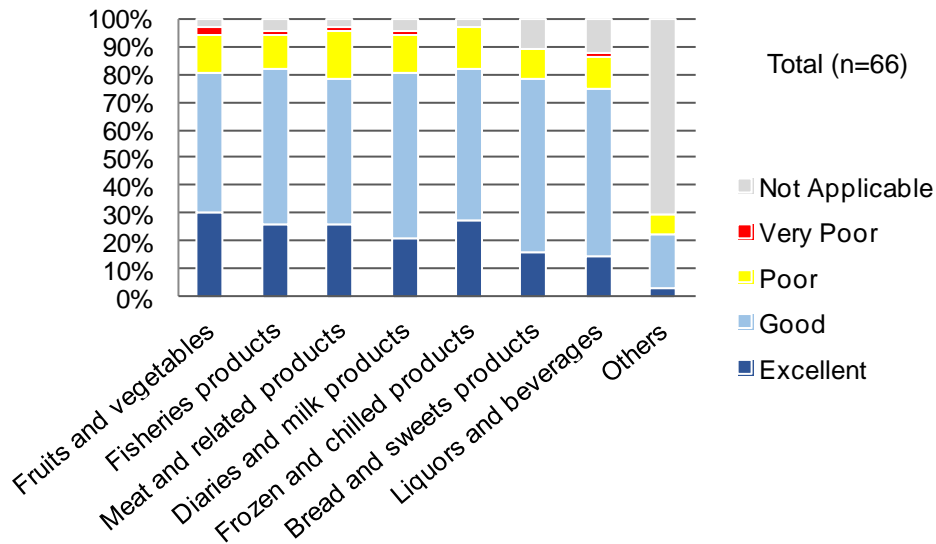
in fishery products is comparatively lower.

Next, the following bar graphs show the separated answers into developed and developing economies.

Developed Economies



Developing Economies



According to the graphs above, the share of “Excellent” in each product in developed economies is higher than developing economies and the sum of “Excellent” and “Good” answers in fruit and vegetables, meat and related products and frozen and chilled products are reached around 90%. On the other hand, the shares of “Poor” in each product in developing economies are relatively higher than in developed economies.

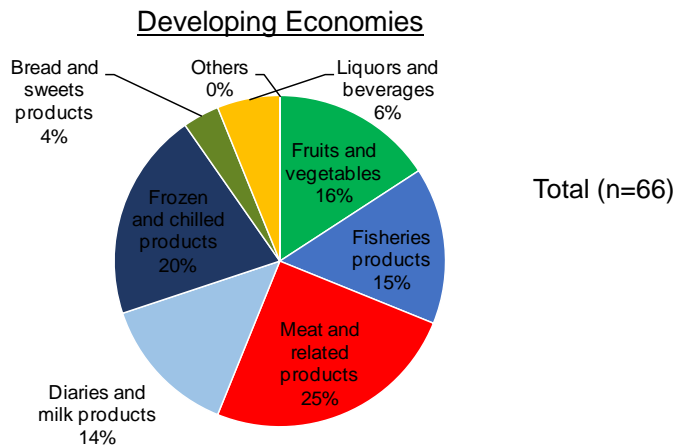
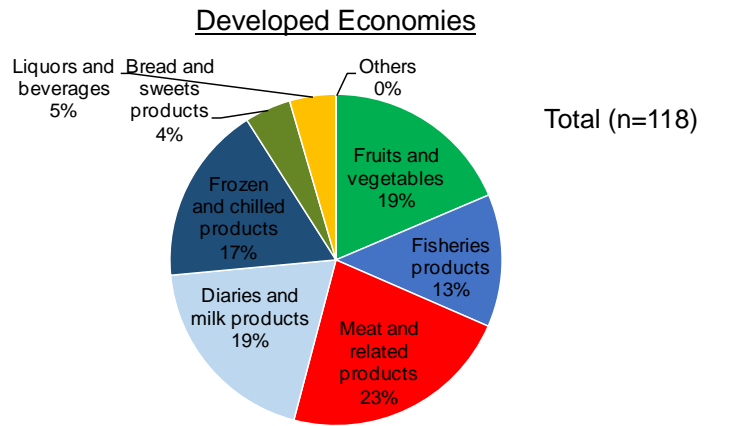
Characteristics in each economy

(*graphs in each economy are on annex)

Economy	Answers on situation of cold chain development
Australia	“Good” or “Excellence” in most products, but “poor” portion is relatively high in fisheries products. A very small portion of “Very poor” in meat, diaries/milk and liquor/beverages.
Canada	“Good” or “Excellent” in all products, but also a small portion of “poor” in all products.
Chile	“Good” or “Excellent” in most products except for bread/sweets products and liquor/beverages.
Hong Kong	“Good” or “Excellent” in most products, but “poor” portion is relatively high in fisheries products.
Indonesia	“Good” in diaries/milk products and frozen/chilled products, “poor” in all other products
Republic of Korea	“Excellent” in most products.
Malaysia	“Good” or “Excellent” in frozen/chilled and bread/sweets products. “Poor” portion is relatively high in fruits/vegetables, fisheries, meat, and bread/sweets products.
Mexico	“Good” or “Excellent” in all products, but also a small portion of “poor” in fruits/vegetables, fisheries, meat, diaries/milk and frozen/chilled products.
New Zealand	“Good” or “Excellent” in all products.
Papua New Guinea	“Poor” in most products, except for fisheries products. “Very poor” in fruits/vegetables.
Peru	“Good” or “Excellent” in fruits/vegetables, frozen/chilled products and liquor/beverages. “Poor” portion is relatively high in diaries/milk products. Meat and bread/sweets products have the lowest portion of “good”. A small portion of “very poor” in fisheries and meat products.
The Philippines	“Good” or “Excellent” in fruits/vegetables, fisheries, meat, frozen/chilled, and bread/sweets products. “Poor” portion is relatively high in diaries/milk products.
Singapore	Good” or “Excellent” in all products.
Chinese Taipei	“Good” or “Excellent” in all products,
Thailand	“Good” in fisheries and diaries/milk products. “Poor” in fruits/vegetables. Evaluation of frozen/chilled products is divided.
The United States	“Good” or “Excellent” in all products, but some “poor” in fisheries, diaries/milk and bread/beverages. A very small portion of “Very poor” in liquor/beverages

3.2.3 Most advanced products in terms of cold chain

The following graphs show three most advanced products in terms of cold chain.



*Circle graphs in each economy are on appendix.

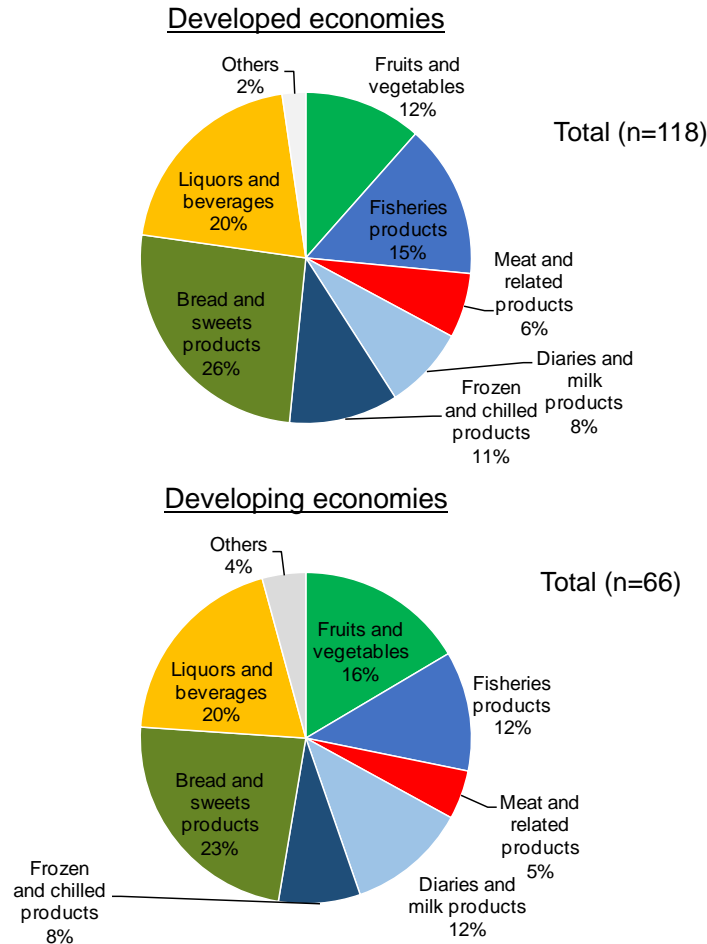
The proportions in each product of developed and developing economies are similar in this survey and both circle graphs indicate that most people regard fruits and vegetables, fisheries products and meat and related products as most advanced products.

It may be supposed that export and import of the above food products between economies are growing in recent decades, therefore cold chains in the relevant industries have been well developed. For example, the fish industry in Chile is advanced well because Chile is one of the world's largest exporters of fish product. In the other hand, Singapore, the large food importing economy, also maintain their cold chain facilities and policies as well.

However, it is still popular that people in some southeastern economies such as the Philippines, Viet Nam and Indonesia prefer to buy fruit and vegetables at traditional market, namely wet market that does not use cold chain facilities.

3.2.4 Less advanced products in terms of cold chain

The following graphs show three less advanced products in terms of cold chain.



*Circle graphs and free answers in each economy are on annex.

According to circle graphs, the shares of bread and sweets products and liquors and beverages are relatively higher in both developed and developing economies. It seems that many respondents regard those products as conservable product which does not need cold chain facilities. For example, many respondents in both developed and developing economies answered that bread and sweets products can be reserved at room temperature therefore refrigeration is not required. Also Thai respondent answered that he doesn't refrigerate liquors and beverages, otherwise he use ices when he drinks.

3.2.5 Needs for assistance or cooperation

Quite a number of needs were expressed by each economy, however those can be categorized as follows.

Facilities and financial assistance

- Cargo (Canada).
- Good cold storage system (Malaysia).
- Government should provide properly fund (Malaysia). More delivery trucks (New Zealand). Financial assistance through loan or grant for construction of cold chain facilities in small and medium enterprises (The Philippines).
- Reefer Trucks, air conditionally storage warehouses (Singapore).
- Refrigerated trucks and cold storage (The United States).
- A big cold freezer (The United States).

Training and knowledge sharing

- Knowledge and information exchanges(Republic of Korea)
- Training and guidance to food production and processing workers (New Zealand).
- Competency training of FBO's on the cold chain regarding control and management (The Philippines).
- Sharing of knowledge on cold chain technology and management (Singapore).

Energy conservation technology

- New technologies applicable to cold chains in order to optimize resources and product lifetime (Chile).
- Energy efficient cold storage equipment (Malaysia).
- Technologies that can help reducing energy consumption (Thailand).

Improvement in partnerships between stakeholders in supply chain network

- Between manufactures and distribution centers they must come up with viable solutions to keep the temps for all foods at a level that will not abuse people to get sick (The United States).
- Need to shorten places where products have to travel to before they are on the shelves at stores (The United States).
- Better communication between planes, trucks, drivers, and facilities to which the products are being delivered (The United States).

Efforts to reduce food loss among consumers and producers

- Reducing food losses (Thailand)
- The consumer either needs to become reeducated about the continual amounts of waste in the supply chain. Growers and manufactures should have a way to sell less than picture perfect food items at local (The United States).

3.2.6 Policies, strategies, laws and frameworks (This question is for Survey 1 only)

The following answers are by officials in each economy.

Answers

Economy	Main policies, strategies, laws and frameworks
Chile	<ul style="list-style-type: none"> The Ministry of Health, what should be done is: 1) Update on national regulation requirements for products in which cold is a requirement to maintain safety, 2) Promote their implementation through building plans and 3) Supervise its application throughout the food chain. In the area of fishery exports, products must maintain their storage according to the process conditions. Refer to HPB / NT1¹⁴.
Indonesia	<ul style="list-style-type: none"> Ministry of Agriculture has assisted farmer's organization on cold chain facilities, particularly those producing vegetables.
Republic of Korea	<ul style="list-style-type: none"> Law: act on distribution and price stabilization of agricultural and fishery products.
Mexico	<ul style="list-style-type: none"> National plan of Development (Plan nacional de Desarrollo): considers the national strategies to improve the national agricultural activities; < Internal Rules of Secretary of Agriculture (Reglamento Interior de la SAGARPA)>: to establish and coordinate the national committees to improve the agriculture production, storage, processing and distribution of agricultural products <Law of Sustainable Rural Development (Ley de desarrollo Rural Sustentable)>: Points out the legal frame to do actions to improve the strategic agriculture and fishery products.
New Zealand	<ul style="list-style-type: none"> Registration of premises, transporters, stores and operators under the Food Act or the Animal Products Act. The risk based approach in this legislation requires identification of cold temperature when this is necessary for food safety and appropriate measures must be in place to ensure the food is at appropriate temperatures¹⁵.
Papua New Guinea	<ul style="list-style-type: none"> A number of policies, strategies, laws and frameworks exist in to promote or improve cold chain of my economy¹⁶. <ol style="list-style-type: none"> PNG National Agriculture Development Plan National Action Plan for the Fresh Produce Sub-sector Promotion PNG Government National Strategic Development Plan 2010-2030 PNG National Fisheries Policy PNG Rural Transport Policy PNG Rural Electrification Policy PNG SME Policy Strategic Program Implementation Plan 2012-2020 of PNG National Agricultural Research Institute (NARI)
The Philippines	<ul style="list-style-type: none"> Department of Agriculture institutes accreditations for cold storage and warehouse on agricultural and fisheries products as well as quality of meat. The regulatory framework, policies & strategies are crafted in accordance with the internationally accepted req's of Codex.
Singapore	<ul style="list-style-type: none"> Chilled and frozen meat products are under the Wholesome Meat and Fish Transportation of Meat Products) Rules¹⁷. Cold chain standards for food have been established by Singapore Standard Committee for voluntary adoption by food industry.
Chinese Taipei	<ul style="list-style-type: none"> The Certified Agricultural Standards (CAS) Chinese Taipei (Taiwan) Premium Agricultural Products based on the Agricultural Production and Certification Act¹⁸.
Thailand	<ul style="list-style-type: none"> Agricultural zoning policy. Government's policy to make Thailand to be "Kitchen of the world". Government's policy on Food Security and Safety.

¹⁴http://www.sernapesca.cl/index.php?option=com_remository&Itemid=246&func=fileinfo&id=2731 Regarding storage conditions, establishments carrying out this operation must meet the requirements set out in the document HPB /NT2: and http://www.sernapesca.cl/index.php?option=com_remository&Itemid=246&func=fileinfo&id=262 and <http://pnd.gob.mx/>

¹⁵<http://www.foodsafety.govt.nz/> and <http://foodsafety.govt.nz/policy-law/food-regulation/nz-food-legislation/> and <http://foodsafety.govt.nz/policy-law/food-act-2014/>

¹⁶<http://www.nari.org.pg/>

¹⁷http://www.ava.gov.sg/docs/default-source/legislation/wholesome-meat-and-fish-act/62web_wmf_transportationofmeatproductsrules.pdf

¹⁸<http://www.cas.org.tw/>

3.2.7 Interesting area in cold chain (This question is for Survey 1 only)

The following answers were raised by officials in each economy.

Technologies and infrastructure

- Areas of interest about cold chain are mainly related to products maintenance during their transfer to commercialization; market destinations. Technologies in these areas have not evolved much. Progress has been seen in the area of maintaining refrigerated cooled products by applying a modified atmosphere. This is an area that is not extended, and would provide benefits in terms of marketing cooled refrigerated products (Chile).
- Technologies to increase the shelf lives of perishable agriculture products (Indonesia).
- Better technologies, infrastructure and financial support (Mexico).
- Building and promoting of Designated refrigerated transport and cold chain; trucks and depots for fruits and vegetable is the critical need in my economy because in the rural area where 85% of the economy's population live, they produce good fruits and vegetables, but these produce do not get to consumers (market) in cities because absence of refrigerated trucks and depots (Papua New Guinea).
- Technologies that relates to upgrading of cold chain infrastructure to be more globally competitive in terms of operational efficiency and reliability (The Philippines).
- Innovative technologies (Chinese Taipei).
- Appropriate technologies and equipment for SMEs (Thailand).

Policies

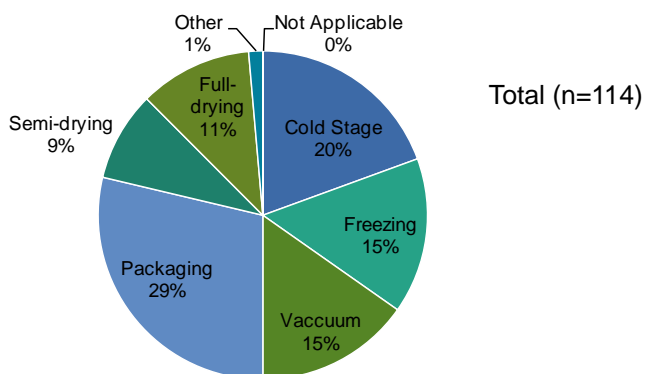
- Cold chain policies (Republic of Korea).
- Cold chain policies and infrastructure (Thailand).

Knowledge

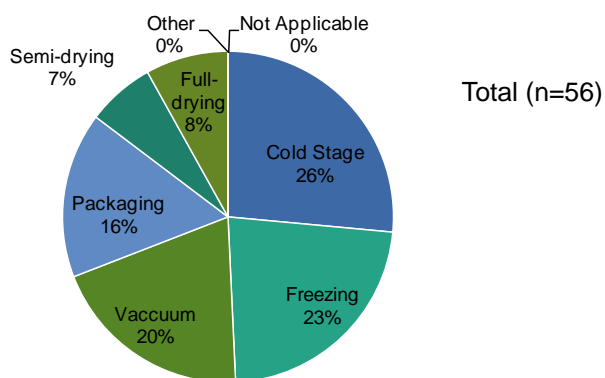
- Knowledge on cold chain technologies and Infrastructures (Singapore).

3.2.8 Cold chain technologies to be improved/updated (This question is for Survey 2 only)

Developed Economies



Technology	No. of Answer	Percentage	Rank
Cold Stage	42	19%	2
Freezing	33	15%	3
Vacuum	33	15%	3
Packaging	62	29%	1
Semi-drying	19	9%	5
Full-drying	24	11%	6
Other	3	1%	7
Not Applicable	0	0%	8

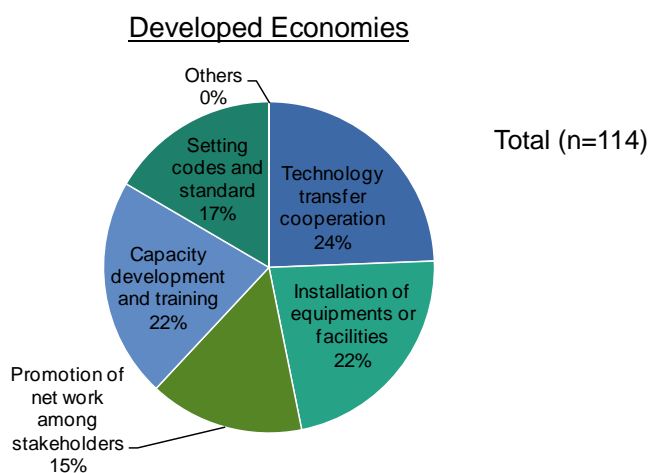


Developing Economies

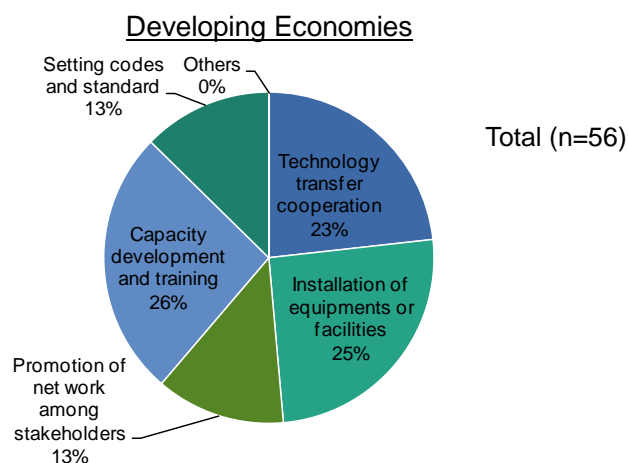
Technology	No. of Answer	Percentage	Rank
Cold Stage	36	26%	1
Freezing	31	23%	2
Vacuum	27	20%	3
Packaging	22	16%	4
Semi-drying	9	7%	6
Full-drying	11	8%	5
Other	0	0%	7
Not Applicable	0	0%	7

According to above data, on the one hand “package” has the largest share in developed economies, on the other hand “cold storage” has the largest share in developing economies as well as “freezing” which is the second largest. From these results, it is considered that technology level of refrigerating facilities namely “cold storage” and “freezing” are not adequate in developing economies. In contrast, it seems that people live in developed economies regards “packaging” as more important to be improved than “cold stage” and “freezing”.

3.2.9 Needs for assistance or cooperation to improve/update cold chain technologies (This question is for Survey 2 only)



Assistance/Cooperation	No. of Answer	Percentage	Rank
Technology transfer cooperation	50	24%	1
Installation of equipments or facilities	46	22%	2
Promotion of net work among stakeholders	31	15%	5
Capacity development and training	44	21%	3
Setting codes and standard	34	17%	4
Others	0	0%	6



Assistance/Cooperation	No. of Answer	Percentage	Rank
Technology transfer cooperation	33	23%	3
Installation of equipments or facilities	36	25%	2
Promotion of net work among stakeholders	18	13%	4
Capacity development and training	37	26%	1
Setting codes and standard	18	13%	4
Others	0	0%	6

The proportions in each circle graph of developed and developing economies are similar in this survey but the type of assistance or cooperation with the largest share in each circle graph is different. "Technology transfer cooperation" has the largest share in developed economies, on the other hand, "Capacity development and training" has the largest in developing economies. It indicates that need to develop human resource in developing economies, which is more fundamental element in cold chain, is larger than in developed economies.

3.2.10 Interested Japanese cold chain technology

Facilities

- Rapid cooling facilities (Australia)
- Freezing cargos (Canada).
- Advance shipping cold storage (Malaysia).
- Deep sea freezing capacities and vacuum packaging (New Zealand).
- One packaging for exporting grapes in northern Peru (Peru).
- Brand-new cold storage vehicle specifically designed for shipping frozen goods (The Philippines).
- Cold storage and robotic technologies to achieve less defect of the product manufactured (The Philippines).
- Freezing, canning (The Philippines).
- Chiller and freezer made in Japan (The Philippines).

Information technology

- Smart sensor for intelligent temperature measurement (Chile).
- The interest would be about computers, reducing shrinkage and minimizing the cost of conservation and production (Chile).
- RFID (The United States).

Transportation

- Transport and distribution, cold chain field (Chile).

- Yamato was using a brand-new cold storage vehicle specifically designed for shipping frozen goods. The company aims to expand its market in economies across Asia, where the demand for cold-storage is high (The Philippines).
- Cold Chain Parcel Delivery Services (Singapore).
- Home delivery (Chinese Taipei).
- Units to ship items (The United States).
- DHL (The United States).

Human resource

- In general, Chile has good technology but needs specialists therefore be better people than technology training as such (Chile).
- Freezing techniques and equipment (Mexico).
- I have little knowledge about existing technologies in Japan, but in reality depend not only on technology but also of the research conducted in the field (Mexico).

3.3. Field Survey on current situation and challenges on cold chain in Least Developed and Developing Economies: case of the Philippines and Viet Nam

3.3.1. The Philippines

Most of the cold chain system in the Philippines are developed and operated by retailers (superstores and convenience stores) that sell imported agri-products and foods, and major local logistics companies.

The Cold Chain Association of the Philippines (CCAP), established in 2002, has about 100 member companies and organizations, consisting of seven business categories (food importation, food processing, cold storage operations, refrigerated transport (trucking, shipping and air freight) , retail, food distribution, and food service) and other associate members involving equipment suppliers, constructors, government agencies, universities, etc. About half of them are cold storage operating companies, and some of them are providing wider range of logistics services as 3/4PL.

Cold Chain Facilities of Major Logistics Companies in the Philippines

Company Name	Capital	Location	Cold Chain Facilities
Royal Cargo Inc.	Philippines	Manila	Freezing & refrigeration storage: 37,000 m ³ Cold trucks: 185
Koldstor Centre Philippines Inc.	Philippines	Imus	Freezing & refrigeration storage: 4,660 MT Blast freezer: 14 MT
Igloo Supply Chain Philippines	JV (Singapore-Philippines)	Manila	Freezing & refrigeration storage: 9,400 m ³ Cold trucks:25
		Davao	3 Freezing storages 37 meter long temperature controlled receiving & loading bay
Polar Bear Freezing and Storage Corp.	Philippines	Pasig, Davao, Cagayan de Oro, Bicutan	Freezing & refrigeration storage: 36,600 m ³ Blast freezers
Glacier Refrigerated Services Corp.	Philippines	Manila, Quezon City	Freezing & refrigeration storage: 14,400 m ³ Blast freezers
Icebox Logistics Services Inc.	JV (Philippines-US)	Manila	Reefer containers: 140 Reefer vans

Source: JETRO (2014) "Study on Cold Chain in Major Countries and Regions: the Philippines" and website of each company.

The share of the modern retailers (modern trade) in grocery retail sales in 2014 is about 28% and the remaining 72% is occupied by traditional retailers (traditional trade), which is so-called "wet market" involving public markets and micro stores called "sari-sari stores". While the sales of traditional trade has increased 18 % from 2009 to 2014, modern trade has increased 65% in the same period, thus the share of traditional trade has declined from 78% to 72%. However, traditional trade still keeps prevalent position over

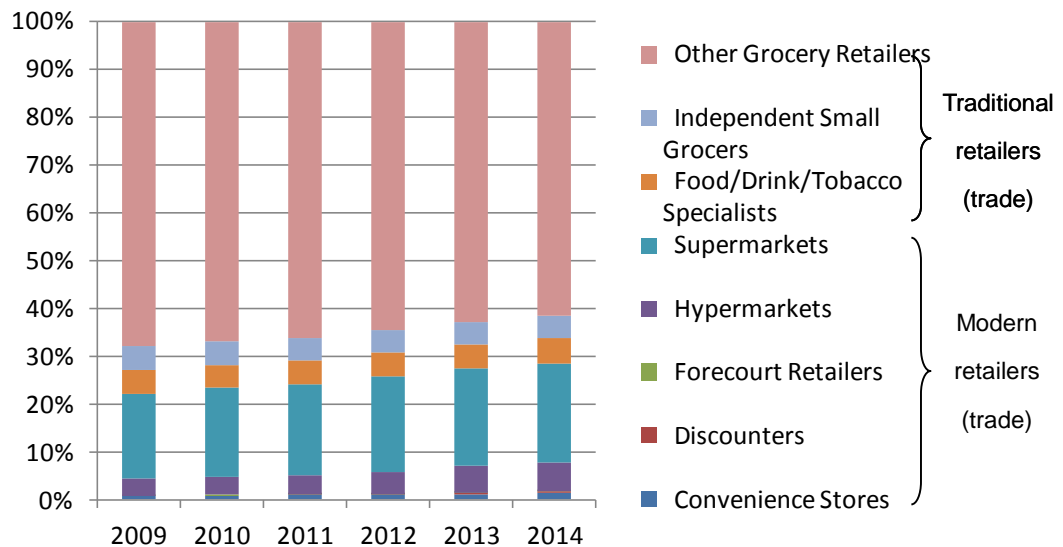
modern trade, and sari-sari stores, as the major contributor to overall figures for traditional grocery retailers, continue to influence through its presence and reach in neighborhoods across the economy ¹⁹.

Sales in Grocery Retailers by Channel: Value (2009-2014)
(billion PHP)



Source: Euromonitor

Sales in Grocery Retailers by Channel: Value Share (2009-2014)

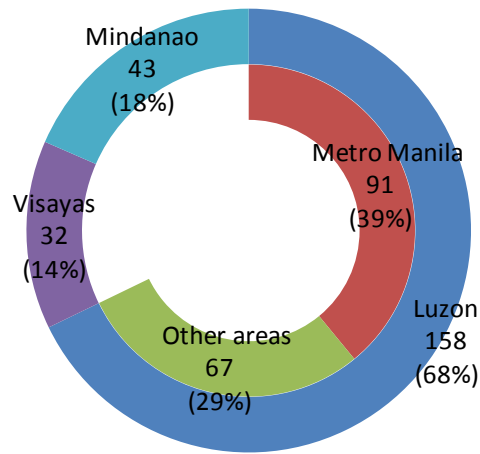


Source: Euromonitor

¹⁹ Euromonitor, "Grocery Retailers in the Philippines", June 2015.

Cold chain system concentrates in the modern trade system and is not observed in the traditional trade system (wet market). Rural areas have much less developed cold chain system, but the awareness of cold chain system is said to be increasing along the penetration of the companies involved in the modern trade.

**Number of Accredited Cold Storage Warehouse by Location
(as of May, 2015)**



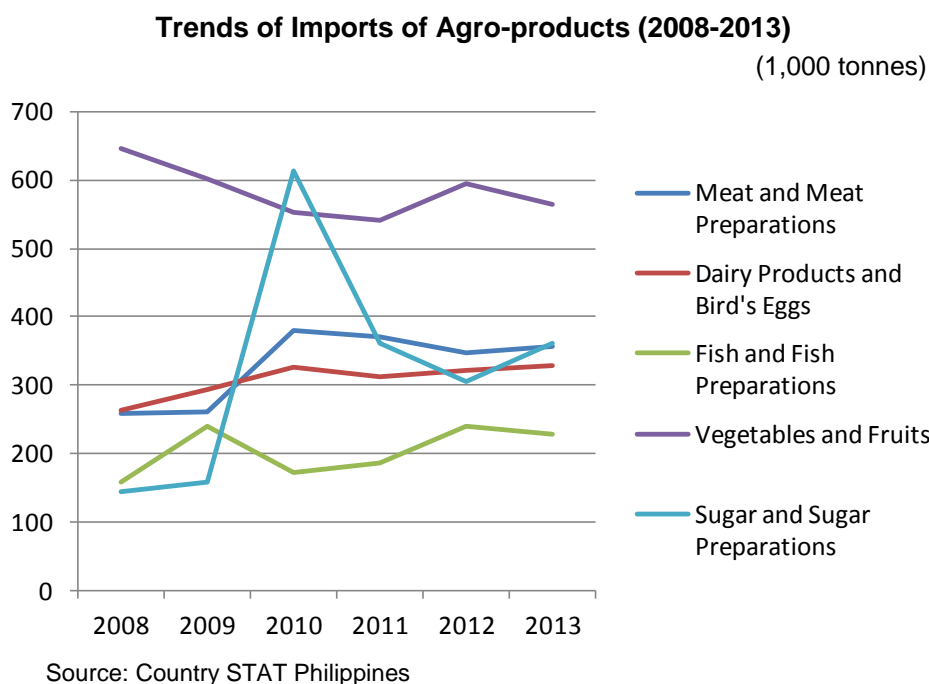
Source: Port Calls Asia,

“Wet market” in the Metro Manila



Source: MURC study team

Considering the lack of capacities of cold storages to respond to current increase of import under robust economic conditions, the Philippine government has been requesting the cold storage companies to expand their capacities. The Department of Agriculture has exchanged MOU with CCAP to improve the quality and standards of cold chain system, as well as introduced the mandatory accreditation of cold storage warehouses²⁰. National Meat Inspection Service (NMIS) enforces meat inspection for all the fresh, frozen and chilled meat at all meat establishments including cold storages.



On the other hand, cold chain system has not been developed for indigenous agri-products nor by local farmers. However, the Philippines government and foreign governments are conducting pilot projects in some regions, including followings:

Benguet Cold Chain Project: Department of Agriculture and Benguet province government support farmers and traders around the city of Trinidad in Benguet province, where various highland vegetables are produced, to introduce cold storages and reefer trucks for their usage. They are promoted to sell the products to hotels, restaurants and

²⁰ The number of cold storage warehouses nationwide accredited by the Department of Agriculture has risen to 233 as of May 22, 2015, 31% increased from the 178 cold storage warehouses listed as of May 1 last year. "Cold stores increase as domestic demand strengthens", Port Calls Asia, June 19, 2015.

²¹ Evaluation criteria for accreditation is as follows: physical structure, including establishment construction and layout and spaces for special purposes (30%); equipment and facilities, including cold storage and equipment (30%); sanitary facilities and control (35%); quality safety and assurance program, including GMP certified and HACCP certified (5%).

super stores in Manila at higher prices. The other pilot project is conducted by the Department of Agriculture to develop Benguet Agri-Pinoy Trading Complex (BAPTC) near the cold chain project site. Establishment of pre-cooling, packing stations and cold chain center in Benguet is also a part of the nationwide cold chain project of Department of Agriculture, which aimed to promote investment in cold chain facilities under Public-Private-Partnership (PPP)²².

Cold storage and reefer trucks in the Benguet Cold Chain Project



Source: MURC study team

Philippine Cold Chain Project: with the support of USDA, value chains for vegetable, meat and fish are being developed in Caraga region in Mindanao. The project works on creating and strengthening producers' groups to increase agricultural production that meets international food safety requirements through provision of improved technologies, developing cold chain related markets, and improving productivity of selected high value commodities. CCAP supports the project in providing cold chain facilities and technologies. More detailed information of the project is provided in Chapter four.

Constraints and challenges for cold chain development include: high electricity price and insufficient supply of electricity, underdevelopment of transportation infrastructure (lack of electricity plug for reefer containers at seaports and vessels, dirt roads, etc.), unorganized farmers, lack of consumers' awareness of cold chain, heavy traffic congestion and restriction in Metro Manila.

²² Project sites include following four cold chain routes: 1) Benguet-Manila Route; 2) Cagayan-Manila Route; 3) Visayas Inter-Island Connections; 4) Mindanao-Cebu- Manila. Department of Agriculture, "Terms of Reference for Engaging of the Transaction Advisors for the Establishment of Cold Chain Systems Covering Strategic Areas in the Philippines Project", February 2012.

3.3.2. Viet Nam

Most of the cold chain system in Viet Nam are developed and operated by food processing companies for export (seafood processing in particular), retailers (superstores and convenience stores) and logistics companies mainly from Japan, the United States and Republic of Korea, as well as Viet Nam.. These logistics companies concentrate in the Ho Chi Minh City and its surrounding area.

Cold Chain Facilities of Major Logistics Companies in Viet Nam

Company Name	Capital	Location	Cold Chain Facilities
Konoike Vinatrans Logistics	JV(Japan-Viet Nam)	HCMC	Freezing & refrigeration storage: 2,000 m ² Cold trucks: 26
Akuruhi Logistics	Viet Nam	HCMC	Freezing & refrigeration storage: 2,000 m ² Cold trucks: n.a.
Nippon Express (Viet Nam)	Japan	HCMC	Freezing & refrigeration storage: 949 m ² Cold trucks:7 Reefer containers : 3 (AMATA Logistics Center) Refrigeration storage: 59 m ² (Vietnam Singapore Industrial Park)
Swire Cold Storage	Australia	HCMC	Freezing & refrigeration storage: 37,000 pallets
Preferred Freezer Services	United States	HCMC	Freezing & refrigeration storage: 24,000 pallets
Lotte-Sea Logistics	Rep. of Korea	HCMC	Freezing & refrigeration storage: 23,000 pallets
Hoang Lai	Viet Nam	HCMC	Freezing & refrigeration storages: 58,000t (four storages total)
Saigon Trading Group (SATRA)	Viet Nam	HCMC	Freezing & refrigeration storage: 20,000 pallets
ALFA-AG Joint Stock Company	Viet Nam	HCMC	Freezing & refrigeration storage: 20,000 pallets Cold trucks: n.a.

Source: JETRO (2014) "Study on Cold Chain in Major Countries and Regions: Viet Nam, Hanoi, Ho Chi Minh" and interview survey by MURC

Viet Nam Logistics Business Association (VLA) has about 300 members, mainly consisting of the former state-owned and privatized companies. Most of them are small and medium sized companies that only provide trucking service, except for few Japanese logistics companies. Major logistics companies with cold chain facilities do not belong to VLA.

According to the persons involved in logistics industry, the share of the modern trade in retail sales in Viet Nam is about 10 to 20% and the remaining 80% or more is shared by public markets and micro stores. In spite of increase of the opening of Japanese convenience stores in urban areas, the above structure has not changed for years. Northern area has much less developed cold chain system than Southern area.

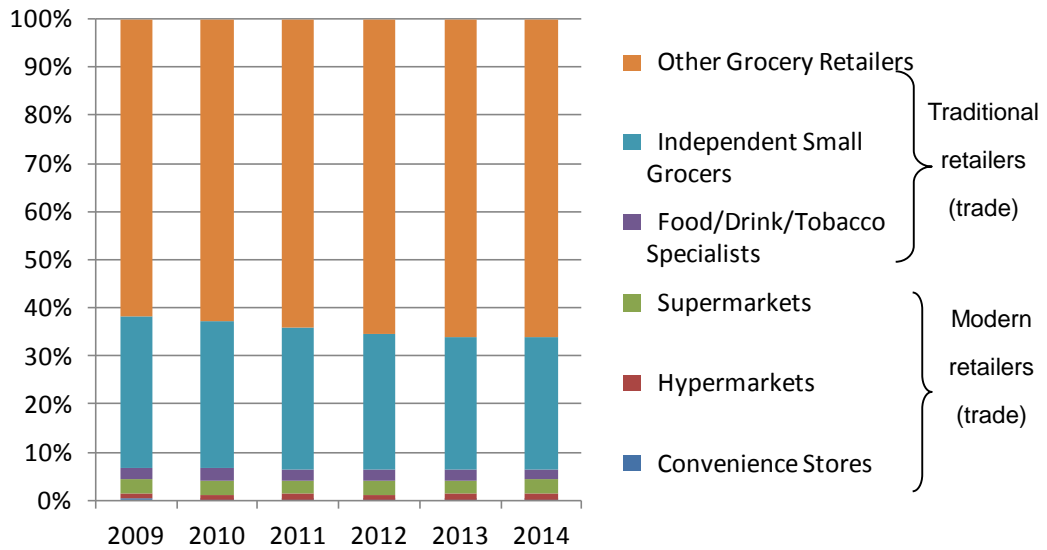
Looking at the trend of value sales of grocery retailers from 2009 to 2014, sales of the traditional grocery retailers (food/drink/tobacco specialists, independent small grocers and other grocery retailers consist of mostly kiosks, street stall and markets) increased 167% and maintained overwhelming position against the modern grocery retailers (convenience stores, hypermarkets and supermarkets), which had almost same rate of growth. As the result, traditional retailers has kept 96% share of the total value sales of grocery retailers during the period.

Sales in Grocery Retailers by Channel: Value (2009-2014)
(trillion VND)



Source: Euromonitor

Sales in Grocery Retailers by Channel: Value Share (2009-2014)



Source; Euromonitor

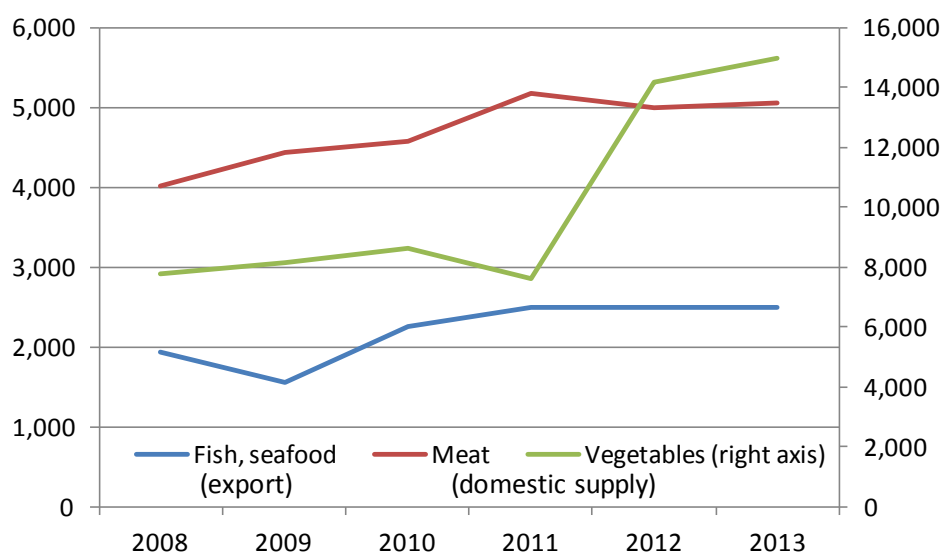
The main reasons are higher pricing strategy of the modern retailers and the consumer habit of buying from local traditional independent small grocers and other grocery retailers. It is considered that majority of Vietnamese consumers are especially price conscious on daily products such as groceries, and, most still tend to prefer traditional grocery retailers that offer cheaper prices and are often located nearer to home²³. It is also pointed out that traditional retailers are more convenient for the customers mostly visit by motorbikes.

Cold chain system has been developed year after year mainly for sea food for export, meat and horticulture for domestic consumption. However, local logistics companies are reluctant to introduce cold chain facilities mainly due to one-way and short-range conveyance and low freight charge. On the other hand, Japanese logistics companies have started cold chain business with expecting increase of import and domestic demand of/for chilled and frozen foodstuff.

Trends of Export (fish, seafood) and Domestic Supply (meat, vegetables) (2008-2013)

(1,000 tonnes)

²³ Euromonitor, "Grocery Retailers in Vietnam", June 2015.



Source: FAOSTAT

For example, Japan Logistic System, that provides extensive logistics service in Viet Nam through its subsidiary Logitem Vietnam Corp., has established a joint venture company with K Line and the Cool Japan Fund to handle chilled and frozen foodstuff. The company is building 9,300 m² storage with freezing and refrigeration facilities in Binh Duong Province, northern area of Ho Chi Minh City. Nippon Express (Vietnam) opened a multifunctional warehouse in Amata Logistics Park on the outskirts of Ho Chi Minh City. It has 949 m² freezing and refrigeration storage, as well as cold trucks and reefer containers.

Although Vietnamese government promulgated “Food Safety Law” and issued “Project against post-harvest losses until 2020” in 2010, there are no particular policies for cold chain development. In relation to the latter project, the government issued the Prime Minister’s Decision 68/2013/QĐ-TTg on support policies to reduce post-harvest losses in agriculture, which support farmers to purchase machines and equipment serving production, processing and storing of agro-forestry and fishery products. However, it is pointed out that the number of farmer’s access to policies is low due to limitation in preferential policies for types or machines and equipment designed for post-harvest loss reduction. The policies also do not support enterprises and research institutes in manufacturing and purchasing machines from other countries²⁴.

²⁴ VietnamPlus, July 29, 2015. (<http://en.vietnamplus.vn/postharvest-loss-reduction-policies-remain-inefficient/75371.vnp>)

Vietnam Farmers' Union (VNFU) emphasizes the economic loss, amounting about 50 trillion VND per year, caused by price decline of agri-products which are oversupplied during limited harvest seasons. They recommended the Prime Minister to establish cold storages in rural areas so that farmers can provide products throughout the year at constant price. They also expect investment in cold chain facilities by private and/or foreign companies.

There are some cases of investment in cold storages by farmers groups with financial support by provincial governments, but it is difficult to find opportunities for such cases to be extensively spread due to their financial constraint. Farmers also have constraint in technology and knowledge to operate and maintain cold storages²⁵. It is noteworthy to mention that one major local superstore is making effort to link local farmers to its own cold chain utilizing VietGap (Vietnam Good Agricultural Practice), the accreditation mechanism for improving standard on agricultural practice promoted by the Ministry of Agriculture.

PPP in Potato Production in Thai Binh Province²⁶

Currently, potato production plays an important role in cropping systems of farmers in Viet Nam. Potato is considered the major winter crops in some provinces in the Red River Delta, where they have policies to support for potato development (variety, cold storage).

Among others, Thai Binh Province has many support policies for potato seed subsidies and support to build cold storage for preservation. For example, Decision No. 575 of Thai Binh PPC on supporting to build cold storage for agricultural production regulates to support over 114 million VND for Kien Xuong District to build Cold Storage. The Province has a plan to increase the number of cold storage up to 280 which have equivalent storage capacity of about 8,000 to 9,000 tons of potato, meeting the demand of preservation for the whole province. This project also includes input supply and machinery to potato consumption, and the total budget is about 1,015 billion VND, of which the people (cooperatives) and enterprises are expected to contribute 943 billion VND.

Saigon Co-op and the VietGap²⁷

²⁵ It is often pointed that farmers need appropriate freezing technology to keep texture of vegetables and fruits when thawed.

²⁶ Centre for Agrarian Systems Research and Development (CASARD), "A Study on Potato Value Chain in Viet Nam (draft)", 2013.

²⁷ FAPQDCP website (<http://www.thucphamantoanviet.vn/a-aconsumers/worldwide-news/saigon-co-op-is-the-first-distributor-in-vietnam-to-join-fapqdc-activities/>), Saigon Co-op website (<http://www.saigonco->

Saigon Co-op, the largest supermarket network in Viet Nam, has signed official cooperation agreement with the Food and Agriculture Products Quality Development and Control Project (FAPQDCP) supported by Canadian International Development Agency (CIDA) in January 2011 to distribute fruits and vegetables comply with production standards such as Good Production Practices (GPPs) and VietGap. According to the agreement, FAPQDCP provides Saigon Coop with technical service/advice for fruits and vegetables handling and packing and equipment/storage facilities using those standards. Saigon Co-op also provides technical consultancy support and periodic monitoring to many cooperatives and farmers on the basis of raw materials and consumption products conform with VietGap. The products are collected and distributed through the fresh food distribution center of Sigon Co-op with freezing and refrigerating storage located in Song Tang Industrial Zone.

Constraints and challenges for cold chain development include: behavior and habits of Vietnamese people in purchasing and cooking (they buy necessary foodstuff every day, many of them do not cook at home, therefore they do not use refrigerators) , lack of retailers' awareness and knowledge of cold chain, foreign investment regulation, traffic regulation, underdevelopment of transport infrastructure (road and bridges), one-way and short-range conveyance, and corruption (facilitation payments to customs and police officers).

op.com.vn/tintucsukien/san-pham-vietgap-lien-ket-cung-co-loi_1496.html), and interview with Saigon Co-op in August 2015.

4. Good Practices and Pilot Projects of Cold Chains in APEC Economies

4.1. Literature Review

When we look at good practices of global value chain including cold chain in the agriculture and food-related industries conducted by APEC economies, it seems there are several key factors to achieve positive results. The common key factors are as follows;

- To establish value chain platform which is consisted of wide range of stakeholders from governments, private sectors, international organizations, civil societies, academics and so on. The discussion points which were talked at the platform are to be reflected into policies related to global value chain
- To collaborate with private companies, network building between farmers and value chain stakeholders as to promote connectivity between each value chain
- To cope with NGOs ,which has strengths in agricultural value chain field, in order to have opportunities for small farmers to be involved in value chain, while supporting accesses to market and credit, storage and logistics (However some results shows that small farmer's participation in value chain does not necessarily bring benefits to them)
- To provide training courses for farmers to gather information of market and plan to make an market-oriented production cycle by themselves

In terms of supporting farmers as upstream promotion in the value chain, we sometimes find out examples of multinational companies, which sale products made by agricultural materials. Most of these companies have been conducting corporate social responsibility (CSR) projects related to supporting farmers in terms of securing their supply chain. Some of these activities aim to build value chain with farmers under the contract to provide their productions to companies in exchange for seeds, fertilizers and chemicals. When conducting projects/programs, companies sometimes collaborate with international or local NGOs. Such a project structure might be a good example to establish cold chain involving farmers while utilizing public-private partnership.

In addition, FAO (2014) reports that large retailers and large processors prefer to work together with large farms, which also applies to larger exporters. It means that the future development of small-scale farmers depends on the economic performance and development of small and medium-sized processors. Therefore, building and supporting a sustainable and successful business environment for cold chain related stakeholders including SMEs should be one of the top priorities to establish value chain to benefit upstream

producers²⁸.

Economy	Good practices of Cold Chain
<p>The Philippines and USDA (The United States)</p>	<p><u>The Philippines Cold Chain Project (PCCP)</u> PCCP is a four year project funded by The United States Department of Agriculture (USDA) Food for the progress program and implemented by Winrock International along with its partners in CARAGA Region. PCCP project is to increase agricultural productivity of the horticultural, meat, and fish value chains and expand trade of agricultural products. PCCP targets meat, fish, and horticultural producers in Eastern Mindanao in Caraga Province and will strengthen producer, middlemen and input suppliers to move farm production from farm to more profitable markets while maintaining freshness and quality. PCCP will work with value chain businesses, producers, government, and nongovernmental entities for participation for project related assistance, training, and intervention. PCCP's major activities involves: 1) creating new agricultural producer groups and strengthening existing ones; 2) creating new and strengthening existing trade associations; 3) developing agrodealers and other input suppliers; 4) training sanitary and phytosanitary issues; 5) providing financial services to producer association members; 6) providing grants for equipment and inputs; 7) developing new and strengthening existing buyer-seller relationships; 8) facilitating PPP; 9) developing and promoting a media and technology use plan; 10) training improved agricultural techniques; 11) training post-harvest handling and storage; 12) training post-harvest processing.</p> <p>Source: http://winrockpccp.org/html/about.php, http://winrockpccp.org/pdf/2014AnnualReport.pdf</p>
<p>Singapore</p>	<p><u>New Singapore Standard for Cold Chain Management of Vegetables</u> Public-private partnership develops new standard to further ensure safety, freshness, quality, and availability of vegetables for Singapore. The food industry, together with Agri-Food & Veterinary Authority of Singapore (AVA) and SPRING Singapore (enterprise development agency), has jointly developed a new Singapore Standard (SS) for the cold chain management of vegetables. The introduction of this SS follows industry feedback as well as updates from new references and procedures adopted as best practices regionally.</p> <p>The new standard, named SS 585: 2013, is a revision of the previous technical reference (TR) for cold chain management of vegetables (TR 24: 2007). It covers major supply links starting from the farm to the packing house, transportation, distribution, wholesale centre and retail. Guidelines on the processes of harvesting, pre-cooling, processing, storing, distribution, and retailing are also included. Growers, importers, logistics providers, retailers, and seaport/airport ground handling parties are recommended to adopt this standard, which has been approved by the Singapore Standards Council.</p> <p>Source: http://www.ava.gov.sg/files/avavision/issues3-4_2013/food-security-vegetables-management.html</p>

²⁸ FAO (2014) Processor driven integration of small-scale farmers into value chains in Eastern Europe and Central Asia (http://www.fao.org/fileadmin/user_upload/Europe/documents/Publications/PDI/EECA_en.pdf)

4.2. Questionnaire Survey

The following are the answers to the question on the good practices of respondents' own economies. Although most of the good practices mentioned are concerned with the efforts mainly made by the governments, private sectors led practices are introduced by Indonesia, Mexico and the United States..

Survey 1

Economy	Good practices (projects or programs)
Chile	1) Clean Production Agreements ²⁹ 2) Replacement from conventional energy to renewable energy. 3) Governmental instruments that encourage the use of sustainable energy (FIA, CORFO). 4) In the fishery sector, sanitary management conditions and associated infrastructure are described in the documents of the previous links.
Indonesia	Initiative of dairy farming cooperatives to coordinate collection of milk from smallholder farmers for further processing and marketing to consumers.
Mexico	There is not an official "good practices data base" in Mexico, despite there could be registers into the activities related to each official and private program.
New Zealand	<p>Cold chain is not identified as an area particularly needing improvement. It is covered by the NZ food legislative system, and compliance is required for food operators to register with authorities and conduct business.</p> <p>NZ is an exporter, often by a reasonably long sea journey, of agricultural and fish products requiring cold chain including dairy, meat, fish, frozen and chilled vegetables and fruits which has in part driven appropriate investment in cold chain technologies and infra-structure. It is a necessary part of getting many of these products to export markets in suitable condition both for food safety and quality.</p> <p>When chilling and freezing technologies were initially invented, this enabled NZ to export by sea to off shore markets, and we have kept up to date with changes in these technologies since that time.</p>
Papua New Guinea	<p>There is strong recognition and promotion of public-private partnership (PPP) open dialogue in my economy.</p> <p>Organization like NARI and FPDA (Fresh Produce Development Agency) follow good practice culture for promoting or improving cold chain³⁰</p>
The Philippines 1	Monitoring of meat establishments for compliance to D.A. Admin Order No. 9, and 21 thru regular audit of the CS facilities
The Philippines 2	Product standardization for fresh and preserved products
The Philippines 3	Continuing program on the provision/installation of ABF in community fish landing centers & stainless fish stalls in identified strategic location, the cold storages in fish port/fish landings including the rehabilitation of the existing operational cold chain infrastructure.

²⁹<http://www.cpl.cl/Acuerdos%28APL%29/>

³⁰<http://www.nari.org.pg/>

Economy	Good practices (projects or programs)
	Continuing consultation dialogue with the stakeholders involved in the cold chain from farm to fork. ³¹
Singapore	1) Public agencies are proactively co-developing guidelines with private/industry stakeholders for cold chain management of food. 2) Real time temperature sensing and monitoring systems are in place in some major warehouses and retails stores.
Chinese Taipei	Chinese Taipei has been implementing and promoting the Certified Agricultural Standards (CAS) Chinese Taipei (Taiwan) Premium Agricultural Products based on the Agricultural Production and Certification Act.
Thailand 1	Raw material has to keep below 5°C. During processing, temperature has to keep below 10°C. After freezing, the core temperature of product reach -18°C.
Thailand 2	Mango Cooperative
Thailand 3	Public and private sectors cooperation in promoting farmers and producers to use GAP (Good Agricultural Practices) in Thai farms and to use GMP(Good Manufacturing Practices) in their plants/factories. Establishment of various standards to be in time with international standards for agricultural products for exportations.

Survey 2

Economy	Good practices (projects or programs)
Canada	Delivers cost-effective insulated thermal packaging solutions to protect the integrity of temperature sensitive products.
Mexico	Semarnat ³² Ongoing training seminars, fairs or exhibitions with the newest technologies
New Zealand	Crop and food scientists work well under funding restraints Inland ports i.e. the product is packed into final containers near the point of production then transported by rail to the sea port. The cold storage of food is managed by the central governments, and headed by the Consumers Act from the economy's government. Hygiene standards
Peru	GMP (Good Manufacturing Practice) are followed as is.
The Philippines	The Department of Agriculture with the modernization of agriculture had implemented the Cold chain program. Local government conducts training and seminars in all levels especially in the rural areas in order to educate the public about cold chain technologies. Mostly, products are preserved in a cold storage especially in manufacturing companies like canning corporations.
Chinese Taipei	Electric power development project
The United States	Try to give a better service change from time to time refrigerators products The FDA is always coming up with new standards and better quality control. This helps to insure safe foods. Walmart

³¹SEAFDEC, ASEAN, National Legislations, UN-FAO, CAC, USFDA, EC, AQIS, Canadian rules and regulations

³² Semarnat <http://www.semarnat.gob.mx/>

Economy	Good practices (projects or programs)
	<p>There is a high level of cooperation between companies working with the same cold chain necessary products</p> <p>Stouffer could put out more new products.</p> <p>Monitor the perishables</p> <p>FIFO, first in first out, is something that is practiced and should be mandatory for all foods. Refrigerated trucks and storage in warehouses.</p> <p>The FDA does research and inspections to make sure the chain is up to design and finds way for improvement</p> <p>OSHA (Occupational Safety and Health Administration)</p> <p>PUBLIX³³</p> <p>FSMA³⁴ of 2011</p>

Followings are the answers to the question on the good practices of other economies. Some respondents mentioned about good practices in the regional level (AANZFTA and EU).

Survey 1

Economy	Good practices (projects or programs)
Indonesia	Vegetable export company in Thailand utilizes modern facilities and very tight sanitation practices.
New Zealand	Post-harvest management of milk under the ASEAN, Australia, New Zealand Free Trade Area (AANZFTA) Dairy Regulatory Study Programme.
The Philippines 1	Initiative of Department of Agriculture to guide other agencies on the requirements on operation of Cold Storage facilities and auditing their compliance
The Philippines 2	Exchange of information and technology concerning cold chain management and upgrading of infrastructure Food Safety program implementation from farm to fork. ³⁵
Singapore	<p>1) Develop regional guidelines on cold chain management for implementation</p> <p>2) Sharing of experience in implementing cold chain management system</p>

Survey 2

Economy	Good practices (projects or programs)
Malaysia	Joint venture and cooperation
Mexico	<p>Have good pre-cooling systems and maintenance as well as transport units that move the product</p> <p>Constant training in each project and program that each product is implemented</p> <p>Availability of transportation and storage to move more product from origin to destination</p>

³³ Publix Super Markets, Inc., www.publix.com/

³⁴ Food Safety Modernization Act

³⁵ EU Food and Feed Hygiene Rule and Codex

Economy	Good practices (projects or programs)
	Work in cooperatives, but especially in mutual agreement with the economy people to make better use of resources and better economic conditions for communities in general.
New Zealand	<p>Technical information used by better cold chain control countries (i.e. Japan) to be passed on to other countries that require such technology.</p> <p>While processing and packaging, keep in mind the length of time before the product will reach consumers.</p>
Peru	<p>Implementation of ISO 9001, HACCP 14001, pm, 5s</p> <p>Sanctions in Chile food. Transporters do not have a cold chain system for transporting food.</p> <p>Promote proper conservation of frozen products mediates using equipment that does not harm the ozone layer.</p>
The Philippines	<p>Other countries like Japan have more advance technology than The Philippines</p> <p>Training and development, innovation</p> <p>Advanced programs for those who have minimal resources to help them learn and improve income and at the same time improve the economic cycle</p>
Singapore	<p>Government help in costs and maintenance</p> <p>Maintaining of room temperature</p> <p>Apply KPI</p>
The United States	<p>Cold dry storage</p> <p>Shipment flash freeze</p> <p>Better Logistics between Cold Storage and Refrigerated Trucks & Truck Routs</p> <p>I believe the best practices to promote cold chain improvements would be to encourage high standards on a federal level in other countries.</p> <p>New packaging and a few new products.</p> <p>Federal guidelines being stricter</p> <p>European Union sharing of best practices</p> <p>Not bruise fruit, maintain the food fresh</p> <p>Better codes and bylaws</p> <p>Walmart</p>

5. Conclusion and Policy Implication for Empowering Cold Chain in APEC Region

This study shows the major and common challenges to empower cold chain in APEC as well as good practices to promote the cold chain industry in collaboration with the wide range of stakeholders.

One of the general and common obstacles on cold chain in developing economies is the financial shortage or fiscal burden for the investment for cold chain infrastructure. When we look back to the Japanese cold chain development, they developed the basic cold chain infrastructure being alienated to the economic growth and global events such as Olympics and World Exposition during 1960s and 1970s. At present, it might be a different situation in the developed economies, but they are also able to utilize the global events and opportunities to cope with international donors and NGOs. Private-Public Partnerships (PPP) is another option to develop the basic cold chain infrastructure although there were no examples raised in this study.

Another issue is lack of the human development on cold chain to enhance the cold chain management system which requires relatively high level of knowledge compared to the dry logistics. Most of the reason of low quality of food and processed foods comes from this shortage of know-hows and knowledge on cold chain and cold chain management.

Japanese companies traditionally put strong emphasis on the human resource development not only in the cold chain-field but also in another fields and levels. Most of the food and processed food companies in the developed economy provides intensive trainings, guidelines, manuals, handbooks and so forth to empower the safety and high quality products. Technical transfer in this regard to developing economies is desirable and beneficial to the both economies.

In developing economies, basic cold chain systems are developed in the supply chain of agricultural export/import by the investments of foreign affiliated companies. This private-led cold chain would be developed with the economic growth although government de-regulations for foreign investments, basic infrastructures are needed.

On the other hand, the introduction of cold chain in the domestic supply chain is quite limited and strong commitments and initiative from government is essential. In this situation, there might be two options to solve this issue. One is to connect private companies (retail

chains or supermarkets) with agricultural production to join the cold chain in the companies supply chain. The other is to prepare for the basic and simple cold storage and enhance bargaining power to the market as supplier.

One of the good practices might be found in Singapore. The Singapore food industry, together with AVA and SPRING Singapore, has jointly developed a new Singapore Standard (SS) for the cold chain management of vegetables. This public-private partnership develops new standard to further ensure safety, freshness, quality, and availability of vegetables for Singapore. The introduction of this SS follows industry feedback as well as updates from new references and procedures adopted as best practices regionally.

Although there are some challenges and constrains in the Philippines, the example of the Philippine Cold Chain Project with the support of USDA, to establish value chains for vegetable, meat and fish is worthy to refer. This project in Mindanao works on creating and strengthening producers' groups to increase agricultural production that meets international food safety requirements through provision of improved technologies, developing cold chain related markets, and improving productivity of selected high value commodities. CCAP supports the project in providing CC facilities.

To establish cold value chain platform which is consisted of wide range of stakeholders from governments, private sectors, international organizations, civil societies, academics and so on is also quite important. The discussion points which were talked at the platform are to be reflected into policies related to global value chain.

In order to enhance the small farmers' awareness in the cold chain, it might be a good option to cooperate with NGOs, which has strengths and networks in rural area while supporting accesses to market and credit, storage and logistics. To provide training courses for farmers to gather information of market and plan to make a market-oriented production cycle by themselves would be useful.

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ANNEX

SURVEY1

Questionnaires Survey on Cold Chain in APEC economies

Establishing and upgrading cold chain contributes to food security by reducing food losses, and to empowering of agriculture by involving agriculture and food producers into global value chain. The sufficient cold chain enables small farmers and fishers to increase their income by delivering value-added food products to consumers, in additions to by reducing their product's losses. The combination of the providing sufficient cold chain and entering global value chain is a key of the success of agriculture. Therefore, the development of the cold chain, which connects production, storage, processing, distribution in cold, leads to achieving food security and promoting global value chain, which results in the empowering agriculture in APEC region

Ministry of Agriculture, Forestry and Fisheries (hereafter MAFF), Japan has assigned Mitsubishi UFJ Research and Consulting Co., Ltd,(hereafter MURC) by MAFF to conduct this study. The objective is to identify best practices on establishment of cold chains and share the experience; understand the current situations and the benefits of cold chain systems; share experiences and knowledge regarding cold chain system and develop a network, "Cold Chain Infrastructure Consortium" among the stakeholders

The result from both the questionnaires and field study at 2 APEC economies will be summarize into the Focused Report and MURC will make a presentation on this report at High Level Public-Private Forum held in Japan, in October-December 2015.

We would appreciate receiving your answer of this questionnaire through our questionnaire answer system or via e-mail (apip@murc.jp) no later than **Thursday 4 June 2015**.

If you have any questions, please do not hesitate to contact us.

Sincerely yours,

Secretariat for High Level Public-Private Forum on Cold Chain
to Strengthen Agriculture & Food's Global Value Chain,
Department of International Studies, Mitsubishi UFJ Research & Consulting (MUR
C)
5-11-2 Toranomom, Minato-ku, Tokyo, 105-8501, Japan
E-mail: apip@murc.jp

Questionnaire Survey

Note: Please kindly fill out and submit this form to MURC by 4 June 2015.

Mandatory fields are indicated by a red asterisk *.

Basic Information

Q1. First of all, please provide us your basic information.

- | | | |
|---|----------------|---------------|
| 1 | Name | Ms./Mr. _____ |
| 2 | Economy * | _____ |
| 3 | Nationality | _____ |
| 4 | Organization * | _____ |
| 5 | Title * | _____ |
| 6 | E-mail * | _____@_____ |
| 7 | TEL | _____ |

Questionnaires on Cold Chain

Q2. Please describe current cold chain situation in your economy.

- 1 *What is the best description of your cold chain situation in each product;
- | | | |
|---|-----------------------------|------------------------------------|
| ✓ | fruits and vegetables | <input type="checkbox"/> Excellent |
| | | <input type="checkbox"/> Good |
| | | <input type="checkbox"/> Poor |
| | | <input type="checkbox"/> Very Poor |
| ✓ | fisheries products | <input type="checkbox"/> Excellent |
| | | <input type="checkbox"/> Good |
| | | <input type="checkbox"/> Poor |
| | | <input type="checkbox"/> Very Poor |
| ✓ | meat and related products | <input type="checkbox"/> Excellent |
| | | <input type="checkbox"/> Good |
| | | <input type="checkbox"/> Poor |
| | | <input type="checkbox"/> Very Poor |
| ✓ | diaries and milk products | <input type="checkbox"/> Excellent |
| | | <input type="checkbox"/> Good |
| | | <input type="checkbox"/> Poor |
| | | <input type="checkbox"/> Very Poor |
| ✓ | frozen and chilled products | <input type="checkbox"/> Excellent |

- Good
 Poor
 Very Poor
 Excellent
 Good
 Poor
 Very Poor
 Excellent
 Good
 Poor
 Very Poor
 Excellent
 Good
 Poor
 Very Poor
- ✓ bread and sweets products
- ✓ liquors and beverages
- ✓ Others
 please specify (_____)
- 2 *Which products do you think the three most advanced in terms of cold chain? Please check (multiple answers allowed)
- fruits and vegetables
 fisheries products
 meat and related products
 diaries and milk products
 frozen and chilled products
 bread and sweets products
 liquors and beverages
 Others, please specify (_____)
- 2-1 *Please describe the reason why you chose them.
- product (_____)
 reason (_____)
- product (_____)
 reason (_____)
- product (_____)
 reason (_____)
- 3 *Which products do you think the three less advanced products in terms of cold chain? Please check (multiple answers allowed)
- fruits and vegetables
 fisheries products
 meat and related products
 diaries and milk products
 frozen and chilled products

- 3-1 *Please describe the reason why you chose them.
- bread and sweets products
- liquors and beverages
- Others, please specify (_____)
- product (_____)
- reason (_____)
- product (_____)
- reason (_____)
- product (_____)
- reason (_____)
- 3-2 *What kinds of assistances or cooperation are needed in these areas in the field of cold chain in your economy?
- _____
- _____
- _____
- _____

Q3. Policies, strategies, laws and frameworks etc.

- 1 *Please describe the main policies, strategies, laws and frameworks to promote or improve cold chain of your economy.
- reference URL (if any)
- 2 *Please describe interested area (e.g. technologies, infrastructure, policies etc.) in the cold chain.
- reference URL (if any)
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Q4. Good practice on cold chain

- 1 *Please describe the good practices (projects or programs including under the public and private (e.g. companies, academics, NGOs, etc.) cooperation) to promote or improve cold chain of your economy.
- reference URL (if any)
- _____
- _____
- _____
- _____
- _____

2 *Please describe the good practices _____
(projects or programs) to promote or _____
improve cold chain in other economies. _____

reference URL (if any) _____

Thank you very much for your kind cooperation!

SURVEY2

Questionnaires Survey on Cold Chain in APEC economies

Establishing and upgrading cold chain contributes to food security by reducing food losses, and to empowering of agriculture by involving agriculture and food producers into global value chain. The sufficient cold chain enables small farmers and fishers to increase their income by delivering value-added food products to consumers, in additions to by reducing their product's losses. The combination of the providing sufficient cold chain and entering global value chain is a key of the success of agriculture. Therefore, the development of the cold chain, which connects production, storage, processing, distribution in cold, leads to achieving food security and promoting global value chain, which results in the empowering agriculture in APEC region

Ministry of Agriculture, Forestry and Fisheries (hereafter MAFF), Japan has assigned Mitsubishi UFJ Research and Consulting Co., Ltd,(hereafter MURC) by MAFF to conduct this study. The objective is to identify best practices on establishment of cold chains and share the experience; understand the current situations and the benefits of cold chain systems; share experiences and knowledge regarding cold chain system and develop a network, "Cold Chain Infrastructure Consortium" among the stakeholders

The result from both the questionnaires and field study at 2 APEC economies will be summarize into the Focused Report and MURC will make a presentation on this report at High Level Public-Private Forum held in Japan, in October-December 2015.

We would appreciate receiving your answer of this questionnaire through our questionnaire answer system in **ENGLISH**. (If you are not involved in the agriculture, food and cold chain related industry, you can stop answering here, thank you)

Questionnaire Answer System:

<https://reg26.smp.ne.jp/regist/is?SMPFORM=ojt-miqep-69eb05fa887ab249842eb60015539433>

If you have any questions, please do not hesitate to contact us.

Sincerely yours,

Secretariat for High Level Public-Private Forum on Cold Chain
to Strengthen Agriculture & Food's Global Value Chain,
Department of International Studies, Mitsubishi UFJ Research & Consulting (MUR
C)

5-11-2 Toranomom, Minato-ku, Tokyo, 105-8501, Japan

E-mail: apip@murc.jp

Questionnaire Survey

Mandatory fields are indicated by a red asterisk *.

Basic Information

Q1. First of all, please provide us your basic information.

- 1 Residence *
 - USA
 - Australia
 - New Zealand
 - Singapore
 - Canada
 - Hong Kong
 - Malaysia
 - Chinese Taipei
 - Philippines
 - Mexico
 - Chile
 - Peru
- 2 Employment Status*
 - Full time
 - Part time
 - Others
- 3 Industrial Sector
 - Agriculture (raising of crops, livestock, and fishery products)
 - Manufacturing (agricultural construction, farm machinery and supplies, seed, etc)
 - Food processing (preparation of fresh products for market, and manufacture of prepared food products)
 - Marketing (promotion of agricultural products or food etc)
 - Wholesale (supermarkets and shops)
 - Distribution (logistics, transportation, warehousing)
 - Foodservice (catering)
 - Others

Questionnaires on Cold Chain

Q2. Please describe current cold chain situation in your economy.

- 1 What is the best description of your cold chain situation in each product;
- ✓ fruits and vegetables
 - Excellent
 - Good
 - Poor
 - Very Poor
 - N/A
 - ✓ fisheries products
 - Excellent
 - Good
 - Poor
 - Very Poor
 - N/A
 - ✓ meat and related products
 - Excellent
 - Good
 - Poor
 - Very Poor
 - N/A
 - ✓ diaries and milk products
 - Excellent
 - Good
 - Poor
 - Very Poor
 - N/A
 - ✓ frozen and chilled products
 - Excellent
 - Good
 - Poor
 - Very Poor
 - N/A
 - ✓ bread and sweets products
 - Excellent
 - Good
 - Poor
 - Very Poor
 - N/A

✓ liquors and beverages

- Excellent
- Good
- Poor
- Very Poor
- N/A

✓ Others

please specify (_____)

- Excellent
- Good
- Poor
- Very Poor

2 Which products do you think the **three** most advanced in terms of cold chain? Please check (multiple answers allowed)

- fruits and vegetables
- fisheries products
- meat and related products
- diaries and milk products
- frozen and chilled products
- bread and sweets products
- liquors and beverages
- Others, please specify (_____)

2-1 Please describe the reason why you chose them.

Please write down the product name you chose above and the reason;

product (_____)
reason (_____)

product (_____)
reason (_____)

product (_____)
reason (_____)

3 Which products do you think the **three** less advanced products in terms of cold chain? Please check (multiple answers allowed)

- fruits and vegetables
- fisheries products
- meat and related products
- diaries and milk products
- frozen and chilled products
- bread and sweets products
- liquors and beverages
- Others, please specify (_____)

3-1 Please describe the reason why you chose

Please write down the product name you chose

them.

above and the reason;

product (_____)
reason (_____)

product (_____)
reason (_____)

product (_____)
reason (_____)

3-2 What kinds of assistances or cooperation are needed in these areas in the field of cold chain in your economy?

Q3. Cold chain technologies

1 Which cold chain technologies are needed to be improved or updated? Please check (multiple answers allowed)

- cold stage
- freezing
- vacuum
- packaging
- semi-drying
- full-drying
- Other (_____)

2 What kinds of assistances or cooperation are needed to improve or update cold chain technologies checked in the above question? Please check (multiple answers allowed)

- Technology transfer cooperation
- Installation of equipments or facilities
- Promotion of network among stakeholders
- Capacity development and training
- Setting codes and standards
- Other (_____)

3 Please describe particular cold chain technologies of Japan you are interested in, if any.

reference URL (if any)

Q4. Good practice on cold chain

1 Please describe the good practices _____
(projects or programs including under the _____
public and private (e.g. companies, _____
academics, NGOs, etc.) cooperation) to _____
promote or improve cold chain of **your** _____
economy.

reference URL (if any) _____

2 Please describe the good practices _____
(projects or programs) to promote or _____
improve cold chain in **other countries**. _____

reference URL (if any) _____

Thank you very much for your kind cooperation!

Cuestionario de encuesta sobre la cadena de frío en las economías del APEC

El establecimiento y la mejora de la cadena de frío contribuye a la seguridad alimentaria, reduciendo las pérdidas de productos alimenticios y fortaleciendo la agricultura al incluir a los productores agrícolas y de alimentos en la cadena de valor global. Una cadena de frío adecuada reduce las pérdidas de los productos de agricultores y pescadores, y les permite además incrementar las ganancias, al ofrecer productos con valor agregado a sus clientes. La combinación de una cadena de frío adecuada y el ingreso a la cadena de valor global es clave para el éxito de la agricultura.

En consecuencia, el desarrollo de la cadena de frío, que conecta la producción, el almacenamiento, el procesamiento y la distribución de productos refrigerados, ayuda a alcanzar la seguridad alimentaria y fomenta la cadena de valor global, lo que da como resultado un fortalecimiento de la agricultura en la región del APEC.

El Ministerio de Agricultura, Silvicultura y Pesca de Japón (en adelante denominado MAFF por sus siglas en inglés) contrató a la empresa Mitsubishi UFJ Research and Consulting Co., Ltd. (en adelante denominada MURC) para que realice esta investigación. Los objetivos son identificar las buenas prácticas para el establecimiento de cadenas de frío y compartir dichas experiencias; comprender las condiciones y los beneficios actuales de los sistemas de cadena de frío; compartir conocimientos y experiencias sobre sistemas de cadenas de frío y desarrollar una red de trabajo llamada Consorcio de Infraestructura de Cadenas de Frío entre los participantes.

Los resultados de los cuestionarios y de la investigación de campo de las economías 2 APEC serán integrados en el Informe Centrado que MURC presentará en el Foro de Alto Nivel de los Sectores Público y Privado que se realizará en Japón entre octubre y diciembre de 2015.

Agradecemos que utilice nuestro sistema de respuesta para completar este cuestionario. (Si no se encuentra vinculado/a con la agricultura, el sector alimenticio o con industrias relacionadas con la cadena de frío, no es necesario que responda esta encuesta. Gracias.)

Sistema de respuesta del cuestionario:

<https://reg26.smp.ne.jp/regist/is?SMPFORM=ojt-miqep-69eb05fa887ab249842eb60015539433>

Si tiene alguna consulta, no dude en contactarnos.

Atentamente,

Secretaría del Foro de Alto Nivel de los Sectores Público y Privado para la Cadena de Frío
para el Fortalecimiento de la Cadena de Valor de la Agricultura y los Alimentos,
Dirección de Estudios Internacionales, Mitsubishi UFJ Research & Consulting (MURC)
5-11-2 Toranomon, Minato-ku, Tokyo, 105-8501, Japón
Correo electrónico: apip@murc.jp

Cuestionario de encuesta

Los campos obligatorios están marcados con un asterisco rojo *.

Información básica

Q1. Antes que nada, indique sus datos generales.

- 1 Lugar de residencia *
 - México
 - Chile
 - Perú
- 2 Situación laboral*
 - Empleado a tiempo completo
 - Empleado a tiempo parcial
 - Otra
- 3 Sector de la industria
 - Agricultura (cultivos, ganado y productos de la pesca)
 - Manufactura (agroquímicos, construcción agrícola, maquinaria y suministros agrícolas, semillas, etc.)
 - Procesamiento de alimentos (preparación de productos frescos para el mercado y elaboración de comidas preparadas)
 - Comercialización (promoción de productos agrícolas o comidas, etc.)
 - Venta mayorista (supermercados y negocios)
 - Distribución (logística, transporte, almacenamiento)
 - Servicios de comidas (catering)
 - Otra

Cuestionario sobre cadena de frío

Q2. Describa el estado actual de la cadena de frío en su economía o país.

- 1 ¿Cuál es la mejor descripción de las condiciones de su cadena de frío para cada producto?
 - frutas y hortalizas
 - Excelente

- | | |
|---|--------------------------------------|
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ productos de la pesca | <input type="checkbox"/> Excelente |
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ carne y derivados de la carne | <input type="checkbox"/> Excelente |
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ leche y lácteos | <input type="checkbox"/> Excelente |
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ productos congelados y refrigerados | <input type="checkbox"/> Excelente |
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ pan y dulces | <input type="checkbox"/> Excelente |
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ bebidas alcohólicas y bebidas sin alcohol | <input type="checkbox"/> Excelente |
| | <input type="checkbox"/> Buena |
| | <input type="checkbox"/> Mala |
| | <input type="checkbox"/> Muy mala |
| | <input type="checkbox"/> No contesta |
| ✓ Otros | <input type="checkbox"/> Excelente |
| Especifique () | <input type="checkbox"/> Buena |

- 2 ¿Qué productos son en su opinión los **tres** más avanzados en cuanto a cadena de frío? Verifique (se permiten respuestas múltiples)
- Mala
 - Muy mala
 - frutas y hortalizas
 - productos de la pesca
 - carne y derivados de la carne
 - leche y lácteos
 - productos congelados y refrigerados
 - pan y dulces
 - bebidas alcohólicas y bebidas sin alcohol
 - Otros, especifique ()
- 2-1 Describa la razón por la que los eligió. Escriba el nombre del producto que eligió y la razón por la que lo hizo.
- producto ()
razón ()
- producto ()
razón ()
- producto ()
razón ()
- 3 ¿Qué productos son en su opinión los **tres** menos avanzados en cuanto a cadena de frío? Verifique (se permiten respuestas múltiples)
- frutas y hortalizas
 - productos de la pesca
 - carne y derivados de la carne
 - leche y lácteos
 - productos congelados y refrigerados
 - pan y dulces
 - bebidas alcohólicas y bebidas sin alcohol
 - Otros, especifique ()
- 3-1 Describa la razón por la que los eligió. Escriba el nombre del producto que eligió y la razón por la que lo hizo.
- producto ()
razón ()
- producto ()
razón ()

producto ()

razón ()

3-2 ¿Qué tipos de asistencias o cooperación son necesarias para estas áreas en el campo de la cadena de frío en su economía?

Q3. Tecnologías de cadena de frío

1 ¿Cuáles son las tecnologías de cadena de frío que precisan mejoras o actualización? Verifique (se permiten respuestas múltiples)

Almacenamiento en frío

Congelamiento

envasado al vacío

envasado

secado parcial

secado completo

Otro ()

2 ¿Qué tipos de asistencia o cooperación se necesitan para mejorar o actualizar las tecnologías de la cadena de frío seleccionadas en la pregunta anterior? Verifique (se permiten respuestas múltiples)

Cooperación para la transferencia de la tecnología

Instalación de equipamiento o infraestructura

Promoción de redes de trabajo entre participantes

Desarrollo de capacidades y capacitación

Establecimiento de códigos y normas

Otro ()

3 Describa las tecnologías de la cadena de frío de Japón que le interesan, en caso de que alguna le interese.

URL de consulta (si existe)

Q4. Buenas prácticas en cadena de frío

1 Describa las buenas prácticas, es decir los proyectos o programas de cooperación del sector público o privado (por ej. corporativos, académico o de ONG, etc.) para promover o mejorar la cadena de frío en su país.

- URL de consulta (si existe) _____
- 2 Describa las buenas prácticas (proyectos o programas) para fomentar o mejorar la cadena de frío implementadas en **otros países**. _____
- URL de consulta (si existe) _____

Muchas gracias por su amable contribución.

Results of two questionnaires in detail

Questionnaires on Cold Chain

Q2. Please describe current cold chain situation in your economy.

**Q2-1 What is the best description of your cold chain situation in each product?
(Choices: Excellent, Good, Poor, Very Poor)**

Survey 1

Answers

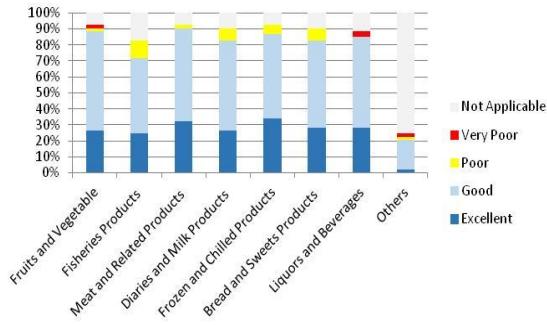
Economy	fruits and vegetables	fisheries products	meat and related products	diaries and milk products	frozen and chilled products	bread and sweets products	liquors and beverages	Others please specify ()
Chinese Taipei	Good	Good	Good	Good	Good	Poor	Good	-
Indonesia	Poor	Poor	Poor	Good	Good	Poor	Poor	-
The Philippines 1	Good	Good	Good	Good	Good	Good	Good	-
The Philippines 2	Good	Good	Good	Good	Good	Good	Good	-
The Philippines 3	-	Good	-	-	Good	-	-	-
Singapore	Good	Good (Adequate)	Excellent	Excellent	Good	Good	Good	-
Republic of Korea	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Excellent
Thailand 1	Good	Good	Good	Good	Good	Good	Good	Good (field crops)
Thailand 2	Poor	Good	Good	Good	Poor	Good	Good	-
Thailand 3	Poor	Good	Poor	Good	Excellent	Poor	Poor	-
Chile	Excellent*1 Poor *2	Excellent	Excellent	Excellent*3 Good*4	Excellent*5	-	-	-
Mexico	Good	Good	Good	Excellent	Good	Excellent	Excellent	-
New Zealand	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	-
Papua New Guinea	Very Poor	Good	Poor	Poor	Poor	Poor	Poor	-

	Excellent
	Good
	Poor
	Very Poor

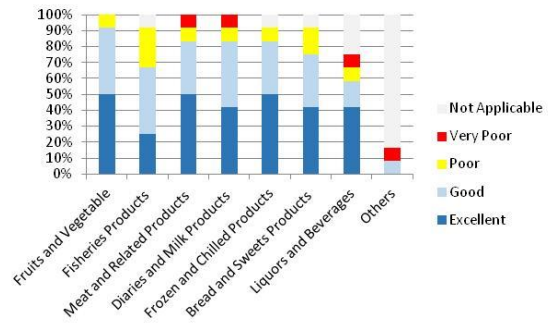
- *1 fruit export
- *2 domestic market of fruit and vegetables
- *3 processing
- *4 primary production
- *5 mainly fruits and vegetables

Survey 2 Answers

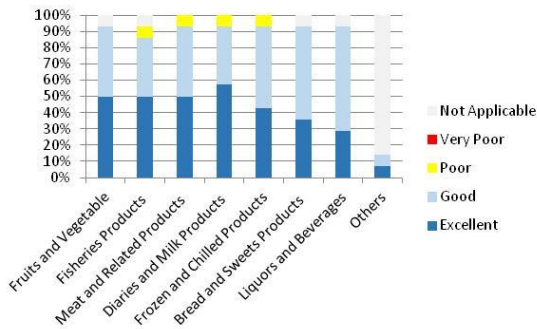
The United States (n=53)



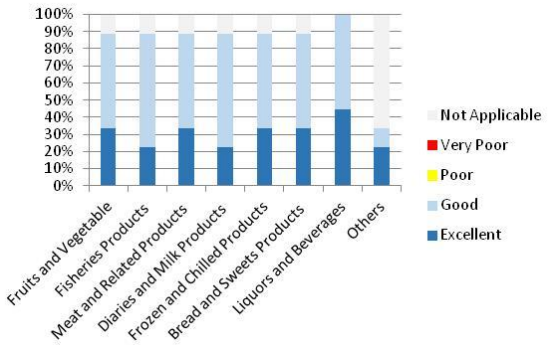
Australia (n=12)



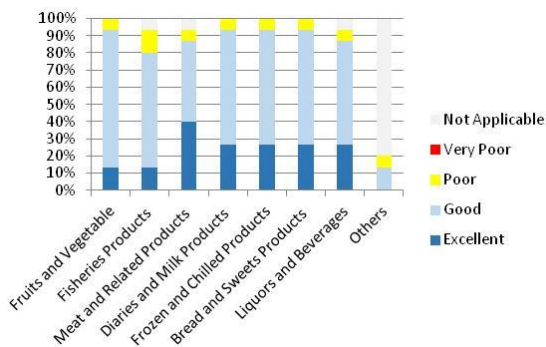
New Zealand (n=14)



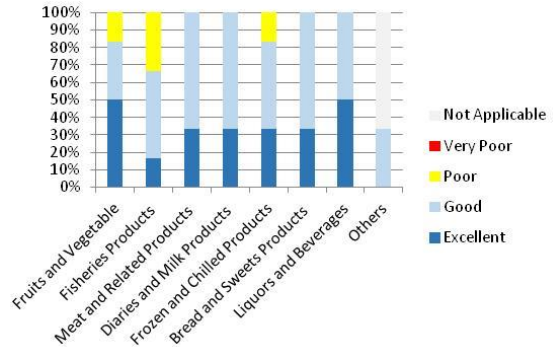
Singapore (n=9)

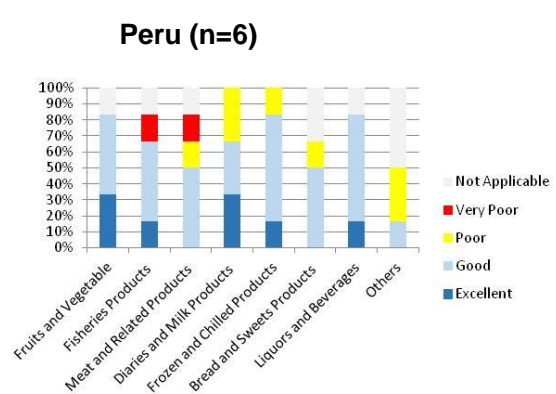
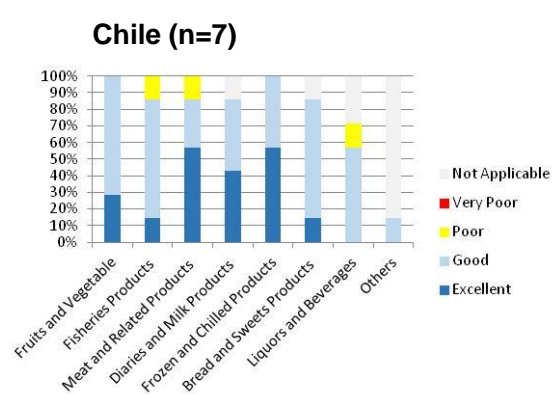
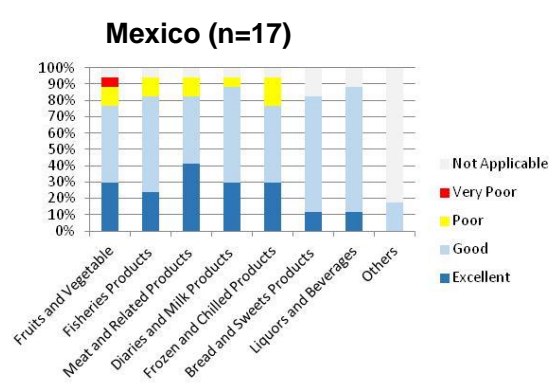
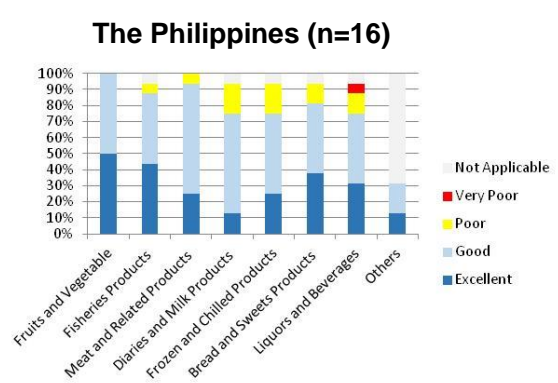
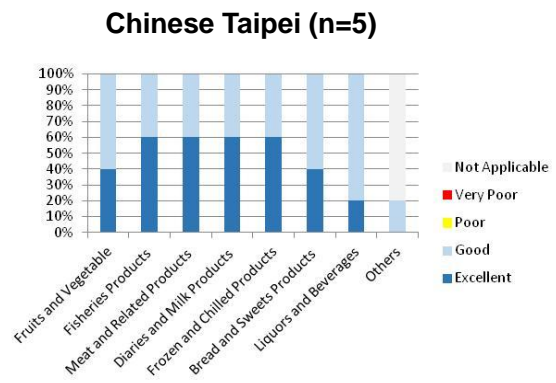
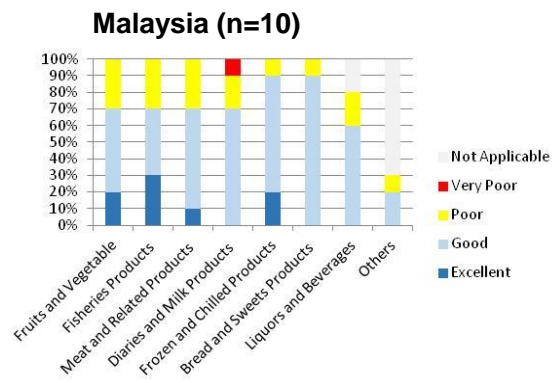


Canada (n=15)



Hong Kong (n=6)





Q2-2 Which products do you think the three most advanced in terms of cold chain? (Multiple answers allowed)

Q2-2-1 Please describe the reason why you chose them.

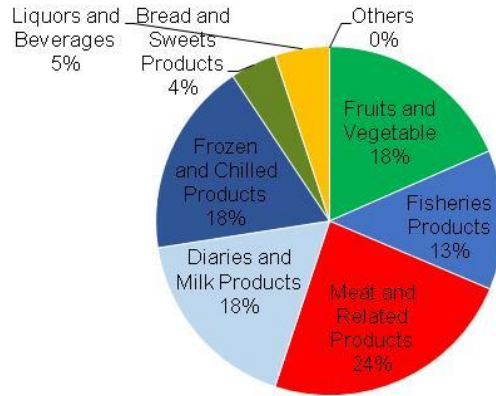
Answers

Economy	Products	Reason
Chinese Taipei	fisheries products	<ul style="list-style-type: none"> The cold chain system for the above three products has been well established from production to distribution and consumption.
	dairies and milk products	
	frozen and chilled products	
Indonesia	fisheries products	<ul style="list-style-type: none"> Particularly for export markets there has been significant private sector investment on cold chain infrastructures.
	dairies and milk products	<ul style="list-style-type: none"> Milk product handling, marketing, and processing are organized by cooperatives which are equipped by cold chain facilities.
	frozen and chilled products	<ul style="list-style-type: none"> This kind of products are mostly sold by modern retailers (hypermarkets and super markets) having modern cold chain equipments.
The Philippines 1	fruits and vegetables	<ul style="list-style-type: none"> Product (Department of Agriculture, Admin Order No. 21 s. 2011 particularly NMIS has an in-place accreditation and auditing system) reason (We monitor compliance of vendors, dealers in supermarkets and wet markets thru Admin. Order No. 05-06 s. 2012)
	meat and related products	
	frozen and chilled products	
The Philippines 2	meat and related products	<ul style="list-style-type: none"> There are many private industries in this sector.
	frozen and chilled products	<ul style="list-style-type: none"> There are many private industries in this sector.
The Philippines 3	fisheries products	<ul style="list-style-type: none"> The established system on the management and control of the cold chain in the fisheries sector is in place and strictly implemented to ensure quality and safety of fishery products.
	meat and related products	<ul style="list-style-type: none"> No comment
	frozen and chilled products	<ul style="list-style-type: none"> The established system on the management and control of the cold chain in the fisheries sector is in place and strictly implemented to ensure quality and safety of fishery products.
Singapore	meat and related products	<ul style="list-style-type: none"> These are mostly imported products and the industry have ensured proper storage and handling; There is regulatory requirement on the temperature of transport container for chilled and frozen meat products
	dairies and milk products	<ul style="list-style-type: none"> These are mostly imported products and the industry have ensured proper storage and handling; There is regulatory requirement on the temperature of transport container for chilled and frozen meat products
	frozen and chilled products	<ul style="list-style-type: none"> -
Republic of Korea	fruits and vegetables	<ul style="list-style-type: none"> They need to be moved in well-regulated circumstances in order to reduce the food loss
	fisheries products	<ul style="list-style-type: none"> They need to be moved in well-regulated circumstances in order to keep freshness
	dairies and milk products	<ul style="list-style-type: none"> They need to be moved in well-regulated circumstances in order to keep freshness
Thailand 1	fisheries products	<ul style="list-style-type: none"> It can be control from farm to product

Economy	Products	Reason
	meat and related products	• These products can be destroyed by microorganism at high temperature or temperature change from low to high.
	frozen and chilled products	• To meet Customer requirement.
Thailand 2	fisheries products	• The products are in good condition when I usually find in the market. They have good system to keep the food not so bad condition
	liquors and beverages	• There are so many beverages in the market and they have good system (packaging, transporting and storage)
	-	• -
Thailand 3	fisheries products	• Thailand is an exporter in the world market.
	diaries and milk products	• These products should be kept under cold conditions.
	frozen and chilled products	• These products must be kept under cold conditions.
Chile	fruits(only)	• Long distance from main buyer markets; to comply with legal requirements in target markets
	fisheries products	• The industry is highly specialized and integrated into export process, reason why the management of product temperatures is quite sensitive. This industry is the most restrictive in terms of regulations, laws and sanitary issues
	meat and related products	• Because of internal and foreign market laws and policies; and because of the characteristics of the product (perishable)
Mexico	diaries and milk products	• Almost the total chain is controlled by big enterprises.
	bread and sweets products	• The storage of grain, mainly wheat, is done by big depots, while processing and distribution is done by some big companies. Farmers would need great investments to compete against this kind of big enterprises
	liquors and beverages	• All chain is controlled by big enterprises
New Zealand	fisheries products	• Note: these products have been selected because cold chain is more important from a food safety perspective than for bread, sweets, liquors and many fruits and vegetables in New Zealand's climate. The cold chain for non-fermented beverages, and fruit and vegetables that require refrigeration temperatures is as advanced as for the selected products.
	meat and related products	
	diaries and milk products	Reason: all of the products come under the legislative framework in NZ for food safety under the Food Act and the Animal Products Act and when cold temperature is identified as necessary for food safety the whole chain from production, through transport, cold storage and retail must adhere to the appropriate cold temperature.
	frozen and chilled products	
Papua New Guinea	fisheries products	• Because large fishing companies use cold chain to bring fish in fresh state to retail outlets in the main city shops.
	meat and related products	• Major piggery and poultry enterprises have cold chain that enables them to transport their meat to retail outlets in good and fresh states.
	frozen and chilled products	• Most middlemen and supermarkets have good cold chain especially in major cities where the customers are quite happy about.

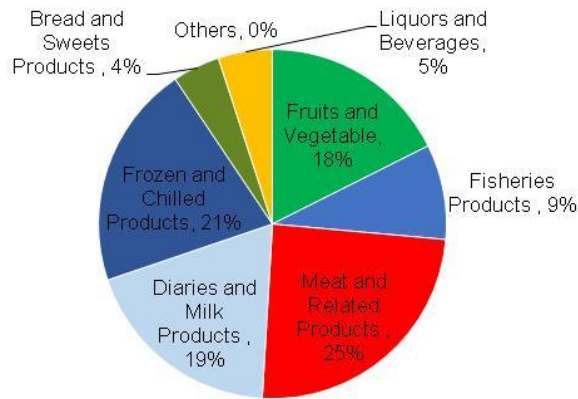
**Survey 2
Answers**

ALL



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
94	66	121	89	92	22	26	0	510

The United States



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
28	14	39	30	33	7	8	0	159

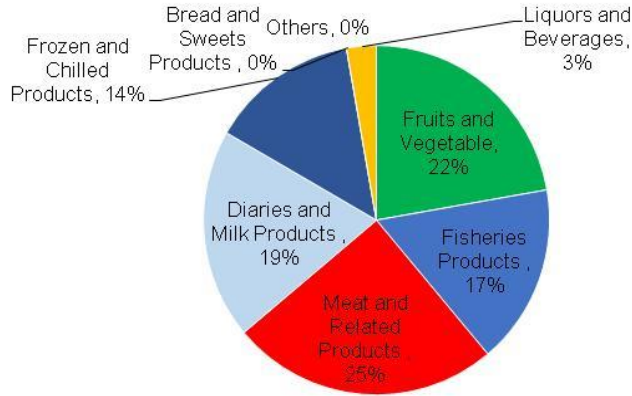
< Fisheries products >

- Because of the awareness of food-illnesses these products are carefully managed.
- My state is by the ocean so are seafood products are usually really fresh.

< Diaries and milk products >

- There are a lot of FDA³⁶ requirements about how dairy products are stored.

Australia

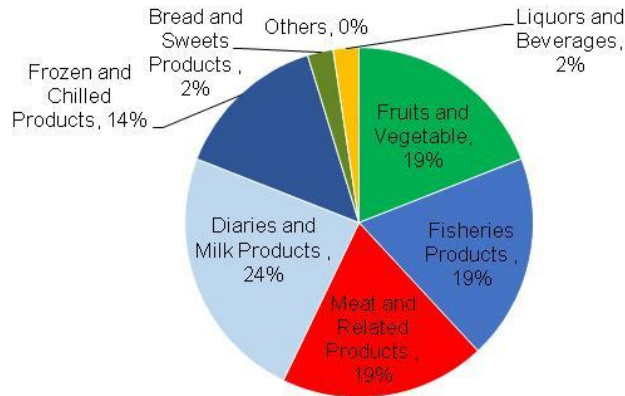


Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
8	6	9	7	5	0	1	0	36

<Fisheries products>

- Because our commercial fishing is being more regulated now.

New Zealand



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
8	8	8	10	6	1	1	0	42

<Fruits and vegetables>

- We export fruit and vegetables to a high standard.

³⁶ Food and Drug Administration

<Fisheries products>

- Heard that our seafood exporters are no 1 in the world.
- Coastal economy
- Deep sea freezer capacity to on shore controlled temperature

<Meat and related products>

- Closely monitored cold chain production

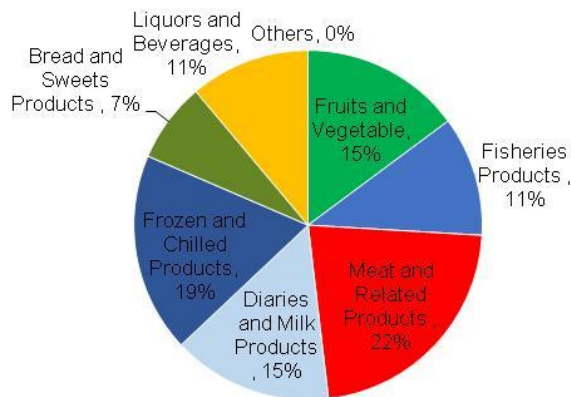
<Diaries and milk products>

- Fonterra³⁷ has the best export procedures in place
- The main industry in new Zealand

<Frozen and chilled products>

- Regular monitoring of cold chain distribution

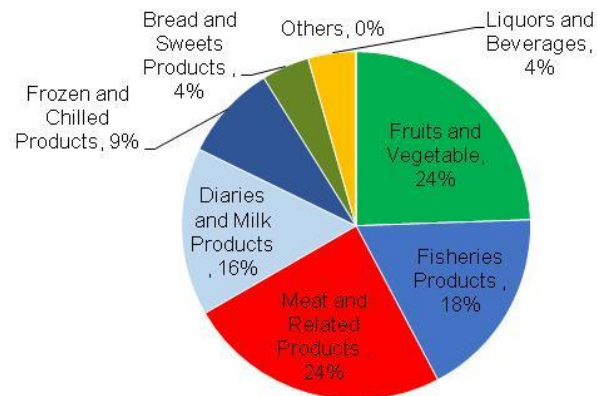
Singapore



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
4	3	6	4	5	2	3	0	27

³⁷ Leading diary company in New Zealand. <http://www.fonterra.com/global/en>

Canada



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
11	8	11	7	4	2	2	0	45

<Fruits and vegetables>

- Sunkist³⁸

<Fisheries products>

- Have 3 oceans on our border
- Hungry Man³⁹, Swanson⁴⁰

<Meat and related products>

- Have large cattle farms across economy
- Bobs Bacon

<Diaries and milk products>

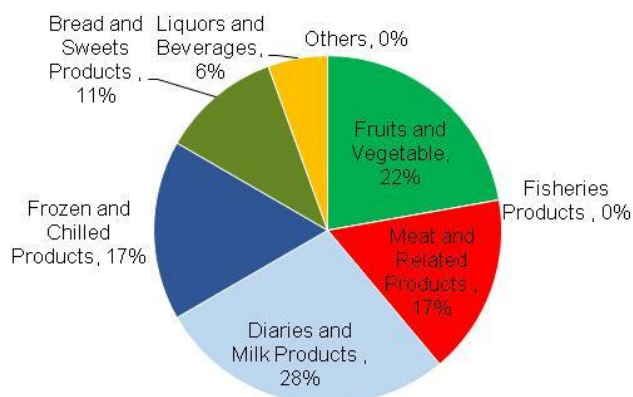
- Large dairy farms across economy

³⁸ <http://www.sunkist.com/>

³⁹ <http://hungryman.com/>

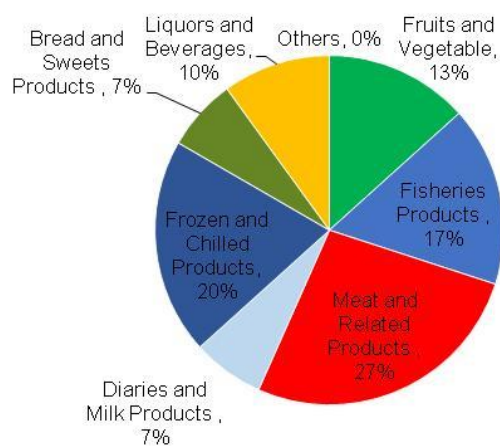
⁴⁰ <http://www.swansonvitamins.com/>

Hong Kong



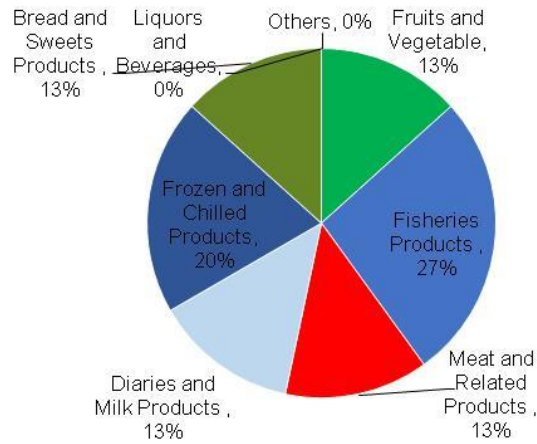
Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
4	0	3	5	3	2	1	0	18

Malaysia



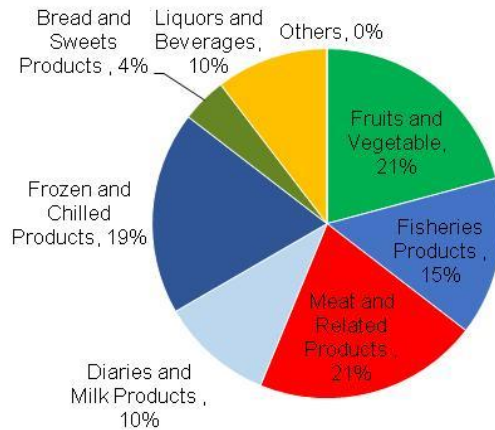
Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
4	5	8	2	6	2	3	0	30

Chinese Taipei



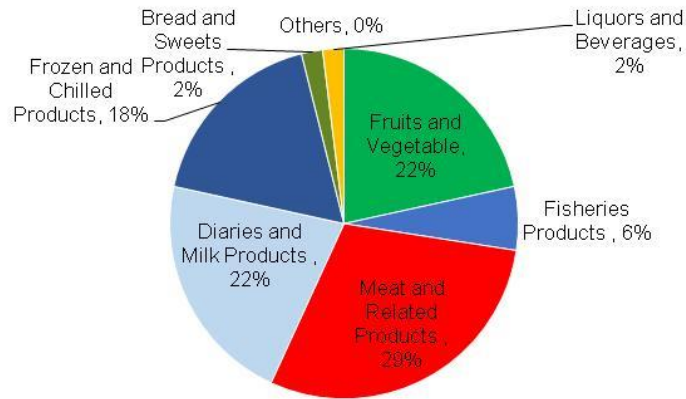
Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
2	4	2	2	3	2	0	0	15

The Philippines



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
10	7	10	5	9	2	5	0	48

Mexico



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
11	3	15	11	9	1	1	0	51

<Fruits and vegetables>

- I have seen many advances (technologies) for the conservation of these products

<Meat and related products>

- Because I work in a distribution company derived meat and have made great progress in this issue

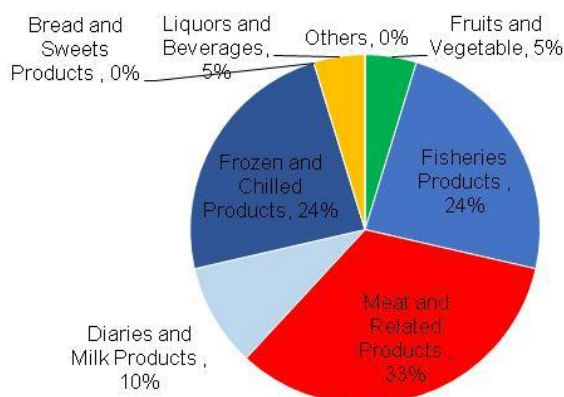
<Diaries and milk products>

- The wide variety of dairy products on the market, which vandes milks, cheeses and creams.

<Frozen and chilled products>

- For the variety of vegetables and meat products in precooked forms and other verities

Chile



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
1	5	7	2	9	0	1	0	21

<Fruits and vegetables>

- Today, Chile has elements, parameters and regimes as laws, to enforce them

< Fisheries products>

- In recent years, livestock laws have been modified to have been problems in the health of people, which led to obtain better results today
- Fishery products with adequate cold chain but by the very poor industrial production (and sold the craft side).

<Meat and related products>

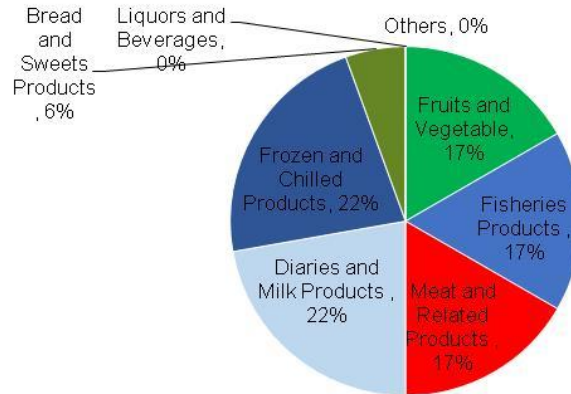
- In livestock, the SAG⁴¹ oversees each product with specific standards, which helps to strengthen the cold hours, depending on the animal and its purpose.
- Meats and it takes several years which is marketed under cold chains and no stress upon its commercialization

<Frozen and chilled products>

- Frozen and refrigerated products are a variety carrying adequate cold chain

⁴¹ Servicio Agrícola y Ganadero. <http://www.sag.cl/>

Peru



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
3	3	3	4	4	1	0	0	18

<Fruits and vegetables>

- Because they come to Europe in good condition

<Fisheries products>

- Fish consumption in good condition is not being characteristic in the fishery region.

<Frozen and chilled products>

- Good packing technology

Q2-3 Which products do you think the three less advanced products in terms of cold chain? (Multiple answers allowed)

Q2-3-1 Please describe the reason why you chose them.

Survey 1

Points

- “Fruits and vegetables” tend to be chosen as less advanced products in terms of cold chain.
- Some economies point out that local and small farmers living in remote areas do not have cold chain facilities, thus the foods from them are not able to keep freshness before reaching urban consumers.
- Although the traditional markets are the essential source of food supply in some economies even today, those markets seldom have appropriate facilities to maintain the food fresh.

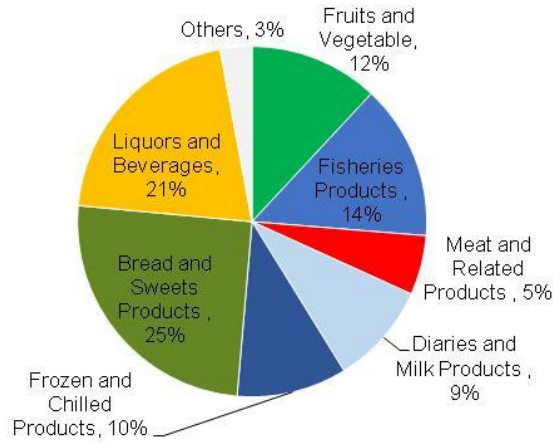
Answers

Economy	Products	Reason
Chinese Taipei	Fruits and vegetables	• Fruits and vegetables can be kept in better condition if the pre-cooling or CA system been applied right after harvested. They are usually distributed directly for consumption after harvested, thus cold chain system is relatively unnecessary.
	Bread and sweets products	• Cold chain equipment is not required for consumption habits.
Indonesia	Fruits and vegetables	• Mostly sold by traditional retailers <wet market, street vendors> without appropriate facilities
	Meat and related products	• Mostly sold directly as fresh products which does not require any cold chain facilities
	Liquors and beverages	• Characteristic of the products does not require cold chain facilities.
The Philippines 1	-	-
The Philippines 2	Fruits and vegetables	• Highly perishables and there are many small farms who do not have such facilities
The Philippines 3	-	-
Singapore	Fruits and vegetables	• Leafy Vegetables in particular, coming from Malaysia are low cost items and there are large number of wet markets which lack cold store facilities to store them for retailing.
	Bread and sweets products	-
Republic of Korea	Liquors and beverages	• They don't need cold chain.
Thailand 1	Fruits and vegetables	• These products are very short shelf life and they can keep in room temperature for few days.
	Bread and sweets products	• As they are processing products, so they can keep in room for 2-3 days. If keep in cold might be destroy the quality.
	Others, please specify <grain>	• If grains are dry, they can keep for long time and no need cold room.
Thailand 2	Fruits and vegetables	• In Thailand, fruits and vegetables are season dependent so there are lots of fruits in one time. So it is not easy to keep fruits fresh and good condition at market and there are so much vegetables and fruit were thrown away.
	Meat and related products	• Usually we have it fresh.
	Diaries and milk products	• Often I found it in bad condition.

Economy	Products	Reason
Thailand 3	Fruits and vegetables	• Thai people prefer fresh fruits and vegetables.
	Bread and sweets products	• Bread and sweets products: not staple foods for Thai people
	Liquors and beverages	• Liquors and beverages: the drinkers can use ice
Chile	Vegetables <only>	• There is no infrastructure in wholesale produce markets.
Mexico	Fruits and vegetables	• Missing of cold nets and other ways to keep fruits and vegetables, besides low prices when there is a lot of production, means product's losses.
	Fisheries products	• Mexico has a good chain to offer fresh fishery products at markets every day, but needs to work to have other options to keep these products for longer periods of time, for example with high vacuum packing.
	Meat and related products	• Mexico has enough trail plants, but not all of them have te best practices to do the activity.
New Zealand	-	• No products have been selected as less advanced. All food products come under similar food safety legislative requirements when temperature is identified as a risk, and are all well advanced.
Papua New Guinea	Fruits and vegetables	• Fruits and vegetables are grown in the remote rural areas but they do not get to cities and towns where the consumers are due to absence of cold chain for fruits and vergies.
	Diaries and milk products	• Diaries and milk products do not get to the consumers in the rural villages. Most of these dairies and milk products are imported.
	Bread and sweets products	• Breads produced cities do not get consumed in the rural villages due to absence of cold chain.

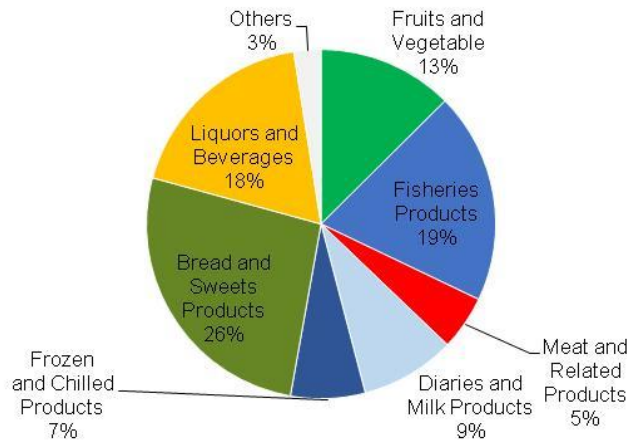
**Survey 2
Answers**

ALL



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
61	73	28	48	52	128	105	15	510

The United States



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
20	31	8	14	11	42	29	4	159

<Fruits and vegetables>

- High demand even during off-season requires shipments to come from many areas.

<Fisheries products>

- Need to be separated from other products
- Because refrigeration is not required, these products are relatively low-maintenance.

<Meat and related products>

- Need to be on a separate storage
- very poor quality control

<Diaries and milk products>

- Usually no improvement and produces same kind of products.

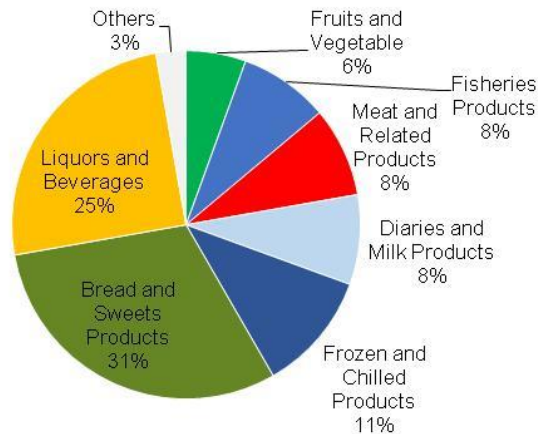
<Bread and sweets products>

- Vast distances to transport
- Because refrigeration is not required, these products are relatively low-maintenance.

<Liquors and beverages>

- Most beverages don't need refrigeration during transport.
- Very localized populations densities
- Temperature need to be control
- Not packaged well
- Inspection and corruption

Australia



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
2	3	3	3	4	11	9	1	36

<Fruits and vegetables>

- Packaging is becoming harder to open.

<Fisheries products>

- We live in a society where the consumer is afraid of a blemish and too many tons of perfectly edible products either are rejected before distribution or at the retail level.

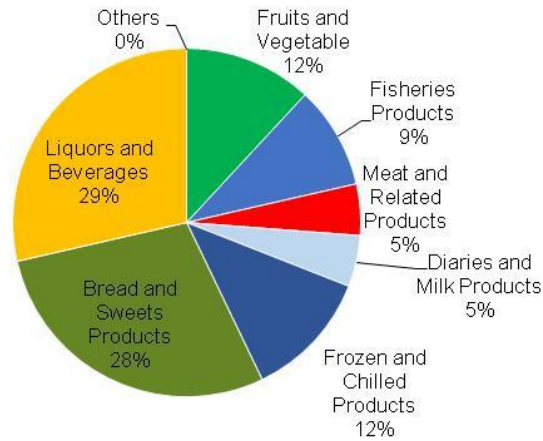
<Meat and related products>

- Packaging is becoming harder to open.

<Bread and sweets products>

- We live in a society where the consumer is afraid of a blemish and too many tons of perfectly edible products either are rejected before distribution or at the retail level.
- Packaging is becoming harder to open.

New Zealand



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
5	4	2	2	5	12	12	0	42

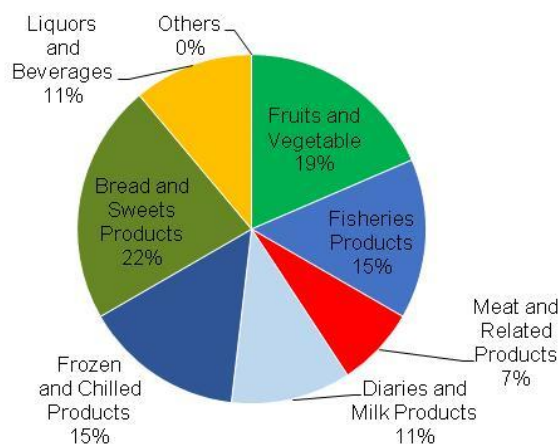
<Fisheries products>

- Ocean too far away from inland locales

<Liquors and beverages>

- System perfected long time ago, no need to improve

Singapore

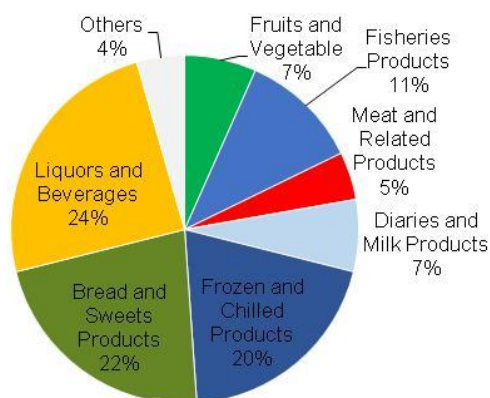


Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
5	4	2	3	4	6	3	0	27

<Bread and sweets products>

- No cold storage required

Canada



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
3	5	2	3	9	10	11	2	45

<Fruits and vegetables>

- Many fruits and veggies are bred to withstand long trips and aren't affected terribly by warmth.

<Meat and related products>

- They are a complete mess

- Your cooling needs this to a temperature of 8 degrees Celsius.

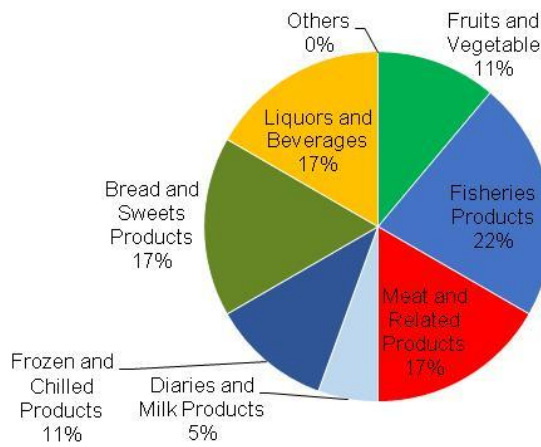
<Frozen and chilled products>

- There may be less investment.
- At least that gives management the final intermediary does not convince me, turn your refrigerator overnight.

<Liquors and beverages>

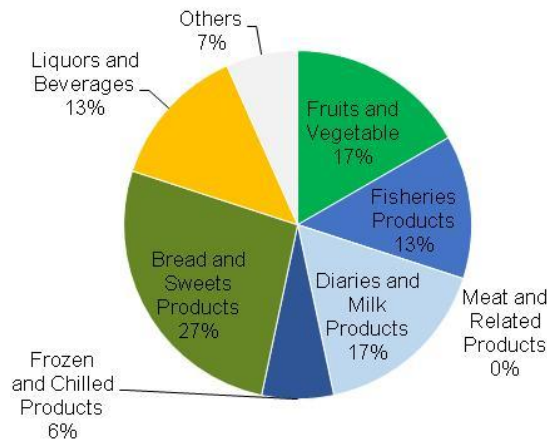
- Store at room temperature

Hong Kong



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
2	4	3	1	2	3	3	0	18

Malaysia



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total

5	4	0	5	2	8	4	2	30
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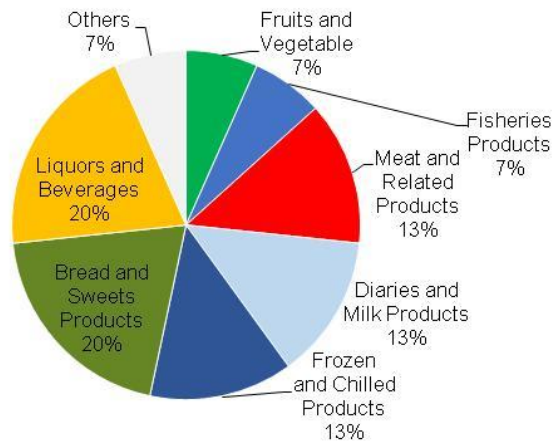
<Fisheries products>

- They are only outdoors.

<Bread and sweets products>

- Poor timing between drop off and refrigeration once at the establishment
- Little or no cooling

Chinese Taipei



Fruits and Vegetables	Fishes Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
1	1	2	2	2	3	3	1	15

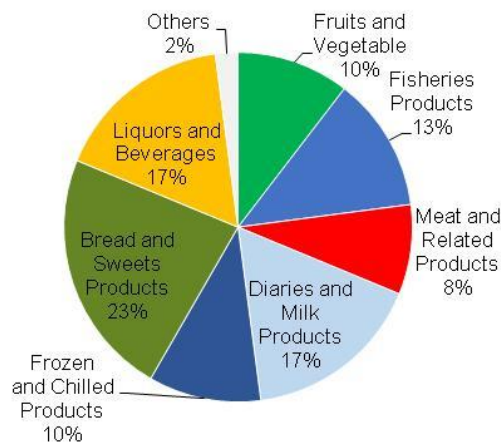
< Meat and related products>

- Not as many people are buying frozen things.

< Frozen and chilled products>

- Not in high demand right now.

The Philippines



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
5	6	4	8	5	11	8	1	48

<Fisheries products>

- Can be locally grown whereby cold truck is not require to preserve its freshness

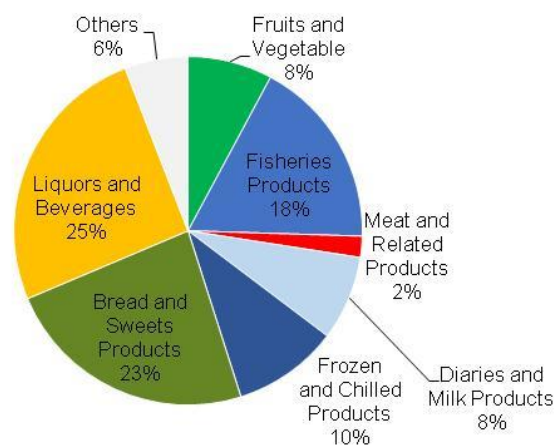
<Diaries and milk products>

- Can be in the form of cold & hot products

<Liquors and beverages>

- Not enough plantation for liquors

Mexico



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
4	9	1	4	5	12	13	3	51

<Fisheries products>

- Because we throw away or waste more of these than any other type of food due to over ripening and spoilage.

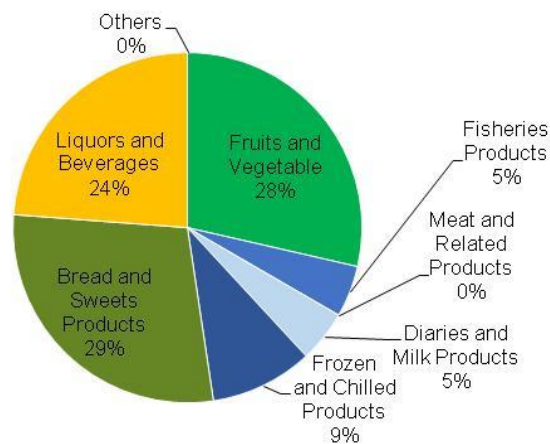
<Frozen and chilled products>

- We live in a hot economy.

<Liquors and beverages>

- Because cost compared to value seems to have stayed the same regardless of economy.

Chile



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
6	1	0	1	2	6	5	0	21

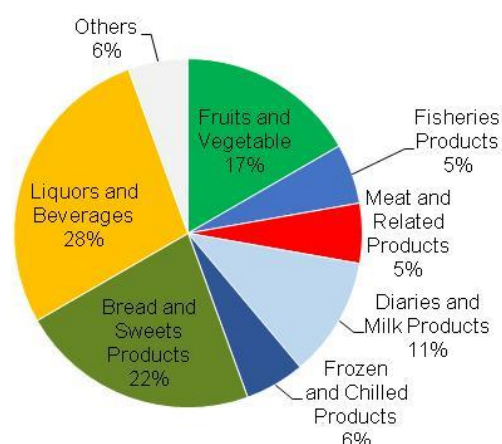
<Fruits and vegetables>

- Fruits are usually marketed natural and very little time is sold with a cold chain.

<Liquors and beverages>

- Generally they do not sell alcoholic beverages in cold chains.
- Reduced or switched off to save energy in their windows
- Alcoholic beverages do not require a cold chain for conservation, but rather is cooled when consuming.

Peru



Fruits and Vegetables	Fisheries Products	Meat and Related Products	Diaries and Milk Products	Frozen and Chilled Products	Bread and Sweets Products	Liquors and Beverages	Others	Total
3	1	1	2	1	4	5	1	18

Q2-3-2 What kinds of assistances or cooperation are needed in these areas in the field of cold chain in your economy?

Survey 1

Answers

Economy	Assistances or cooperation
Chinese Taipei	<ul style="list-style-type: none"> Chinese Taipei has well developed technologies of cold chain system. Thus we consider the education and promotion of cold chain systems should be scale-up and the surveillance and traceability measures should also been included.
Indonesia	<ul style="list-style-type: none"> a) Capacity building of the related stakeholders on appropriate technology to transport and store agricultural products b) Investment on cold chain facilities
The Philippines 1	<ul style="list-style-type: none"> Financial assistance thru loan or grant for construction of CS facilities in small and medium enterprises.
The Philippines 2	<ul style="list-style-type: none"> Private and government partnerships would be needed.
The Philippines 3	<ul style="list-style-type: none"> Financial assistance for infrastructure/farm to market roads and a more competitive cold chain for SME's, Food Business Operators and a Competency training of FBO's on the cold chain control and management
Singapore	<ul style="list-style-type: none"> Sharing of knowledge on cold chain technology and management with the industry stakeholders
Republic of Korea	<ul style="list-style-type: none"> Knowledge and information exchanges
Thailand 1	<ul style="list-style-type: none"> Transfer Technology on cold chain system Provide knowledge relate to cold chain to food producer for reducing food losses
Thailand 2	<ul style="list-style-type: none"> Transportation
Thailand 3	<ul style="list-style-type: none"> Technologies that can help reducing energy consumption/cost in the cold chain for small farmers and fishers
Chile	<ul style="list-style-type: none"> New technologies applicable to cold chains in order to optimize resources and product lifetime.
Mexico	<ul style="list-style-type: none"> Mexico needs assistance or cooperation to improve cold chains and also farmers needs strategies to increase their income by delivering value-added to reduce their product's losses. Mexico has started a Clusters program in that sense.

Economy	Assistances or cooperation
New Zealand	<ul style="list-style-type: none"> · The main assistance is training and guidance to food production and processing workers to understand and properly use cold chain requirements. · The other area is in food labeling which must (legislative requirement) include storage instructions before and after opening when cold temperature is a food safety risk. · The infra-structure and technology to keep the food cold is generally already in place, and is part of the initial capital investment prior to gaining registration of cold chain premises and operators under NZ food safety legislation.
Papua New Guinea	<ul style="list-style-type: none"> · We need specialized, tailor designed refrigerated trucks for fruits & vegetables, fish, dairies and milk products. We also need consolidation/deconsolidation depots.

**Survey2
Answers**

Economy	Assistances or cooperation
The United States	<ul style="list-style-type: none"> • Trade for cheaper product. • We need better ways to get our products to the consumer in a faster cheaper way. With gas prices being so high it is truly hard to get a decent transport service that doesn't charge an arm and a leg. • Refrigerated Trucks and cold Storage • Making sure transportation vehicles are properly maintained and that delivery and stocking or storing of supplies are done promptly. • Better inspections • Better communication • More trucks • More federal control guidelines • Less government oversight • Government subsidy • Between manufactures and distribution centers they must come up with viable solutions to keep the temps for all foods at a level that will not abuse people to get sick. • Time and temperature logs must • A whole crew • Drivers • The consumer either needs to become reeducated about the continual amounts of waste in the supply chain. Growers and manufactures should have a way to sell less than picture perfect food items at local • Making sure all food items are kept properly temperature controlled and safe for consumption • A big cold freezer • Freezers • Need to better shorten how many places products have to travel to before they are on the shelves at stores • Better wholesale responsible • Better communication between plane, truck, driver, and facility to which the products are being delivered • Better shipping methods or packaging, finding ways to extend the shelf life and lower the cost • Awareness should be more with the products.
New Zealand	<ul style="list-style-type: none"> • More research into higher yielding items and more unique to handle food points • Government assistance • More delivery trucks • Bigger local market • More investment • Regular checking of product removed from cold chain and then returned later after Product has expired • Take more care in retaining the original quality of the product and have frequent supplies instead of products that stay long before being bought. • Supermarkets
Singapore	<ul style="list-style-type: none"> • Real time information for specific logistical requirements of each respective product needs • Storage • Reefer Truck, air conditionally storage warehouse, lead time of delivery • Sources from other economy and good supply chain management
Canada	<ul style="list-style-type: none"> • Time and transportation methods. • Cargos
Hong Kong	<ul style="list-style-type: none"> • Logistics
Malaysia	<ul style="list-style-type: none"> • Good cold storage system • Energy efficient cold storage equipment • Government should provide properly fund • Improve the industry's technology • Need more advance technology

Economy	Assistances or cooperation
Chinese Taipei	<ul style="list-style-type: none"> · Cold chain operation · Pre-storage cooling
The Philippines	<ul style="list-style-type: none"> · Finance · The government should provide economic assistance in building food related infrastructure like cold chain facilities. · Training and seminars to improve and produce new products. Micro financing for the local farmers. · Of course, further training and information drive as to how the products benefit the consumers are necessary. First, there must be free tasting and promos to promote the Products in the market to make · The storage · Strict assistance and cooperation of individual · Good marketing strategy and affordability of the products · Bigger cold storage and clean ones · Funds, great management · Financial assistance and new technology
Mexico	<ul style="list-style-type: none"> · Government loans · Better support and technology in the sector · Good refrigeration · More machinery. Industries etc. · Greater control in transport · Hygiene and careful in the snack · Government support and to prevent hoarding. · New technologies and improvements in planning and distribution · Review the costs of both packages that allow keep them fresh, as shelves for storage
Chile	<ul style="list-style-type: none"> · Less human contact in bakeries · Government policies that go in support are needed. · Best Professional maintenance machines (Specialization) /Best Information · Greater control by regulators. · The most important thing would be nutrition analyzes before and after the string in order to keep the nutrients in good condition for consumption
Peru	<ul style="list-style-type: none"> · Information in consumer products as temperature must be kept · Training of cold chain, to understand this will be transcendental for the food industry. · Freezers · More personalized assistance at the level of the entire production chain packing and freezing.

Survey 1

Q3. Policies, strategies, laws and frameworks etc.

Q3-1 Please describe the main policies, strategies, laws and frameworks to promote or improve cold chain of your economy. *reference URL (if any)

Answers

Economy	Main policies, strategies, laws and frameworks
Chinese Taipei	<ul style="list-style-type: none"> Chinese Taipei has been implementing and promoting the Certified Agricultural Standards (CAS) Chinese Taipei (Taiwan) Premium Agricultural Products based on the Agricultural Production and Certification Act⁴².
Indonesia	<ul style="list-style-type: none"> Ministry of Agriculture has assisted farmer's organization on cold chain facilities, particularly those producing vegetables.
The Philippines 1	<ul style="list-style-type: none"> D.A. Admin Order No. 21 series of 2011 Mandatory Accreditation of Cold Storage Warehouse for Agricultural and Fisheries Products D.A. Admin Order No. 9 s 2003 Mandatory Implementation of HACCP in NMIS Accredited "AAA" Meat Establishments D.A. Admin Order. No.21 s 2014 Mandatory Implementation of GMP in NMIS Accredited "AA" Meat Establishments
The Philippines 2	<ul style="list-style-type: none"> I have no knowledge on this
The Philippines 3	<ul style="list-style-type: none"> The regulatory framework, policies & strategies are crafted in accordance with the internationally accepted req's of Codex. Basically, the system of control involves the inspection, approval & recognition, monitoring/audit & product & estabs cert.
Singapore	<ul style="list-style-type: none"> 1) Regulatory requirements on the temperature of transport container have been imposed for chilled and frozen meat products under the Wholesome Meat and Fish (Transportation of Meat Products) Rules.⁴³ 2) Cold chain standards for food have been established by Singapore Standard Committee for voluntary adoption by food industry e.g. Cold Chain Management of Vegetables; Code of Practice for cold chain management of chilled pork; Code of practice for cold chain management- milk and dairy products; Specification for chilled and frozen partially cooked fish balls⁴⁴ 3) Others⁴⁵
Republic of Korea	<ul style="list-style-type: none"> We have laws and policies regarding support the cold chain⁴⁷ Law: act on distribution and price stabilization of agricultural and fishery products
Thailand 1	<ul style="list-style-type: none"> Export fishery products have to compliance to Department of Fisheries' standard.
Thailand 2	<ul style="list-style-type: none"> Agricultural zoning policy
Thailand 3	<ul style="list-style-type: none"> Government's policy to make Thailand to be "Kitchen of the world." Government's policy on Food Security and Safety
Chile	<ul style="list-style-type: none"> Cold chain promotion has mainly been addressed by destination markets. Till now, there have been very few policies in domestic market to promote cold chain. Therefore, according to the Ministry of Health, what should be done is: "1) Update on national regulation requirements for products in which cold is a requirement to maintain safety, 2) promote their implementation through building plans and 3) supervise its application throughout the food chain." In the area of fishery exports, products must maintain their storage according to the

⁴² <http://www.cas.org.tw/>

⁴³ http://www.ava.gov.sg/docs/default-source/legislation/wholesome-meat-and-fish-act/62web_wmf_transportationofmeatproductsrules.pdf

⁴⁴AVA implements research programmes to test-bed and promote cold chain technologies to the food industry

⁴⁵<http://www.singaporestandardseshop.sg/product/product.aspx?id=c3609cca-0bfb-42ec-896f-7f0aeacd182bx>

⁴⁶Public agencies (e.g. SPRING) provide funding to private sector to encourage the adoption of cold chain technologies/ infrastructures

⁴⁷<http://www.law.go.kr>

Economy	Main policies, strategies, laws and frameworks
	process conditions. See HPB / NT1 document below: ⁴⁸ 48495051
Mexico	<ul style="list-style-type: none"> • National plan of Development (Plan nacional de Desarrollo): considers the national strategies to improve the national agricultural activities; Internal Rules of Secretary of Agriculture (Reglamento Interior de la SAGARPA): to establish and coordinate the national committees (Comité Sistema-Producto) to improve the agriculture production, storage, processing and distribution of agricultural products Law of Sustainable Rural Development (Ley de desarrollo Rural Sustentable): Points out the legal frame to do actions to improve the strategic agriculture and fishery products (corn, sugar cane, beans, wheat, rice, sorghum, coffee, eggs, milk, bovine meat, pork and chicken meat, and fish in Mexico)
New Zealand	<ul style="list-style-type: none"> • Registration of premises, transporters, stores and operators under the Food Act or the Animal Products Act. The risk based approach in this legislation requires identification of cold temperature when this is necessary for food safety and appropriate measures must be in place to ensure the food is at appropriate temperatures.⁵²525354
Papua New Guinea	<ul style="list-style-type: none"> • A number of policies, strategies, laws and frameworks exist in to promote or improve cold chain of my economy⁵⁵55 <ol style="list-style-type: none"> 1. PNG National Agriculture Development Plan 2. National Action Plan for the Fresh Produce Sub-sector Promotion 3. PNG Government National Strategic Development Plan 2010-2030 4. PNG National Fisheries Policy 5. PNG Rural Transport Policy 6. PNG Rural Electrification Policy 7. PNG SME Policy 8. Strategic Program Implementation Plan 2012-2020 of PNG National Agricultural Research Institute (NARI)

Q3-2 Please describe interested area (e.g. technologies, infrastructure, policies etc.) in the cold chain. *reference URL (if any)

Point

- According to the following answers, most of economies are interested in introducing appropriate or new technologies in the area of cold chain.

⁴⁸http://www.sernapesca.cl/index.php?option=com_repository&Itemid=246&func=fileinfo&id=2731 Regarding storage conditions, establishments carrying out this operation must meet the requirements set out in the document HPB /NT2:

⁴⁹http://www.sernapesca.cl/index.php?option=com_repository&Itemid=246&func=fileinfo&id=262

⁵⁰<http://pnd.gob.mx/>

⁵¹<http://www.ordenjuridico.gob.mx/listDependencia.php?idEst=12&poder=ejecutivo&liberado=si>

⁵²<http://www.foodsafety.govt.nz/>

⁵³<http://foodsafety.govt.nz/policy-law/food-regulation/nz-food-legislation/>

⁵⁴<http://foodsafety.govt.nz/policy-law/food-act-2014/>

⁵⁵<http://www.nari.org.pg/>

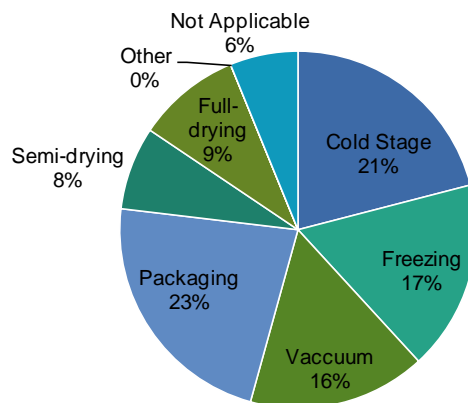
Answers

Economy	Interested area (e.g. technologies, infrastructure, policies etc.)
Chinese Taipei	<ul style="list-style-type: none"> Innovative technologies.
Indonesia	<ul style="list-style-type: none"> Technologies to increase the shelf lives of perishable agriculture products.
The Philippines 1	<ul style="list-style-type: none"> Interested on new technologies and policies to guide us in drafting of regulations about Cold Chain.
The Philippines 2	<ul style="list-style-type: none"> -
The Philippines 3	<ul style="list-style-type: none"> Technologies that relates to upgrading of cold chain infrastructure to be more globally competitive in terms of operational efficiency and reliability
Singapore	<ul style="list-style-type: none"> Knowledge on Cold Chain Technologies and Infrastructures
Republic of Korea	<ul style="list-style-type: none"> Policies
Thailand 1	<ul style="list-style-type: none"> -
Thailand 2	<ul style="list-style-type: none"> Policies and infrastructure
Thailand 3	<ul style="list-style-type: none"> Appropriate technologies and equipment for SMEs
Chile	<ul style="list-style-type: none"> Areas of interest about cold chain are mainly related to products maintenance during their transfer to commercialization (market destinations). Technologies in these areas have not evolved much. Progress has been seen in the area of maintaining refrigerated cooled products by applying a modified atmosphere. This is an area that is not extended, and would provide benefits in terms of marketing cooled refrigerated products.
Mexico	<ul style="list-style-type: none"> Better technologies, infrastructure and financial support
New Zealand	<ul style="list-style-type: none"> Cold chain is not identified as a particular area of interest or need for investment as it is already well established in the NZ food system from farm to fork.
Papua New Guinea	<ul style="list-style-type: none"> Building and promoting of Designated refrigerated transport and cold chain (trucks and depots) for fruits and vegetable is the critical need in my economy because in the rural area where 85% of the economy's population live, they produce good fruits and vegetables, but these produce do not get to consumers (market) in cities because absence of refrigerated trucks and depots.

Survey 2

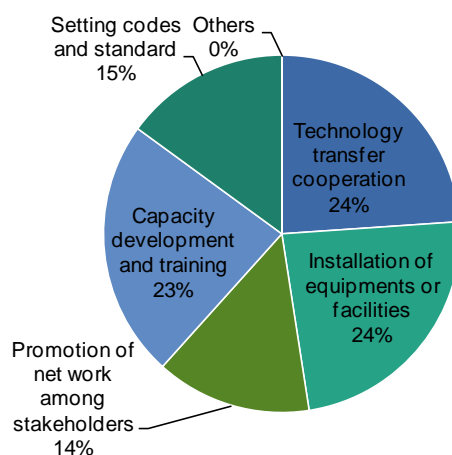
Q3. Cold chain technologies

Q3-1 Which cold chain technologies are needed to be improved or updated? Please check (multiple answers allowed)



Technology	No. of Answer	Percentage	Rank
Cold Stage	78	21%	2
Freezing	64	17%	3
Vacuum	60	16%	4
Packaging	84	23%	1
Semi-drying	28	8%	6
Full-drying	35	9%	5
Other	0	0%	8
Not Applicable	23	6%	7

Q3-2 What kinds of assistances or cooperation are needed to improve or update cold chain technologies checked in the above question? Please check (multiple answers allowed)



Technology	No. of Answer	Percentage	Rank
Technology transfer cooperation	83	24%	1
Installation of equipments or facilities	82	24%	1

Technology	No. of Answer	Percentage	Rank
Promotion of net work among stakeholders	49	14%	4
Capacity development and training	81	23%	2
Setting codes and standard	52	15%	3
Others	0	0%	5

Q3-3 Please describe particular cold chain technologies of Japan you are interested in, if any.

Reference URL (if any)

Answers

- Units to ship items (The United States)
- RFID (The United States)
- DHL (The United States)
- Rapid cooling (Australia)
- Deep sea freezing capacities and vacuum packaging (New Zealand)
- Cold Chain Parcel Delivery Services (Singapore)
- Freezing cargos (Canada)
- Advance shipping cold storage (Malaysia)
- Home delivery (Chinese Taipei)
- Brand-new cold storage vehicle specifically designed for shipping frozen goods (The Philippines)
- Yamato was using a brand-new cold storage vehicle specifically designed for shipping frozen goods. The company aims to expand its market in countries across Asia, where the demand for cold-storage (is high.) (The Philippines)
- Cold storage and robotic technologies to achieve less defect of the product manufactured (The Philippines)
- Freezing, canning (The Philippines)
- Chiller and freezer made in Japan. (The Philippines)
- Protect natural foods and sea(Mexico)
- Freezing techniques and equipment. (Mexico)
- Freezing (Mexico)
- Cold chain controls in transport (Mexico)
- I have little knowledge about existing technologies in Japan, but in reality depends not only on technology but also of the research conducted in the field (Mexico)
- In general, Chile has good technology but needs specialists therefore be better people than technology training as such.(Chile)
- Transport and distribution, cold chain field. (Chile)
- Major infrastructure (Chile)

- Smart sensor for intelligent temperature measurement. (Chile)
- The interest would be about computers, reducing shrinkage and minimizing the cost of conservation and production. (Chile)
- One packaging for exporting grapes in northern Peru. (Peru)