Perishable Commodities

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1. Situational Analysis

Ethiopia has significant potential for the production and export of perishable product like fruit, vegetables, flowers, and meat….etc with abundant labour, water, and diverse climatic zones. This positions the country to become a leading exporter in horticulture, including fruits, vegetables, and flowers. Despite this potential, the horticulture sector has been underdeveloped compared to food grains and floriculture due to the need for cold chain logistics infrastructure for sea freight. To tap into this potential, Ethiopia has prioritized horticulture as a key sector for agricultural production and future export growth. The goal is to enhance horticulture development, contributing to the country's economic and social progress. However, the growth of Ethiopia's fruit and vegetable, meat, and flower industries lacks a cost-effective cold chain logistic solution. While successful trial shipments have been made using rail-sea freight combination, airfreight remains the primary mode of accessing global markets, limiting the range of products suitable for export.[1]

1.1 Cargo Flow and volume

For the development of Cold chain logistics and the development of cool logistics corridor, an overview of import and export cargo flows shall be categorized by product category. Based on the study by ROYAL HASKONINGDHV NEDERLAND B.V., [2], the import and export cargos are divided into primary and secondary flows. The primary flow primarily focuses on the export of fresh produce, which is the priority and catalyst project for the National Cold Chain Logistics Network. Secondary export flows include chilled

[1] Focus of the Ethiopian government on horticulture | Nieuwsbericht | Agroberichten Buitenlan

and frozen meat, as well as refrigerated flowers. In terms of imports, the following cargo flows are included: perishable medicines, frozen foods, fresh produce, and dry goods. The Primary and secondary cargo flows for Exports and Imports which require cold chain logistics are presented below.

1.1.1 Export

i. Fruit and vegetables

Ethiopia possesses significant potential for horticultural production owing to favourable soil and water conditions, as well as abundant land. The country's main fruit crops include avocados, mangos, bananas, citrus fruits, pineapples, papaya, and strawberries. Fruit production is mainly concentrated in the Rift Valley and southern part of the country. Major vegetable crops grown in Ethiopia include potatoes, tomatoes, onions, cabbage, green beans, carrots, green peppers, and peas.

Currently, Ethiopian exports of fruits and vegetables are limited, with most horticultural crops being exported to neighbouring countries such as Djibouti, Sudan, and Somalia. The lack of a competitive cold chain logistic solution for sea freight exports and high transportation costs contribute to the premature state of overseas exports of fruit and vegetable crops. It is widely believed, especially among horticultural producers and exporters, that addressing this logistical bottleneck is crucial for enabling the growth of the fruit and vegetable industry in Ethiopia.

The horticulture sector is a key focus of Ethiopia's previous consecutive five year plans, and the more recent 10-year perspective plan (2021-2031). These plans recognize horticulture as a major driver of economic development in Ethiopia, with the aim of increasing income levels, creating employment opportunities, and promoting stability in the farming community. Enhancing foreign currency earnings from the horticulture sector is also a priority, as it will contribute to the country's overall economic and social development.

In terms of horticulture exports, Ethiopia has the opportunity to accommodate overseas markets, particularly in Europe and the Middle East, where there is increasing interest in Ethiopian fruits and vegetables. Ethiopia can take advantage of these export markets during the off-season of other supply countries for specific fruit and vegetable crops. For example, Spain, Chile, and Colombia are major avocado suppliers to the European market but experience a drop in avocado exports during Ethiopia's prime avocado season from May to October. Ethiopia's geographic proximity provides the opportunity to fill the supply gap for export destinations in Europe and the Middle East during the off-season of other exporting countries.

This diagnostic study considers various fruit and vegetable crops for export based on their potential. The selection of crops takes into account factors such as current farming and growth potential, future production capacity, product value and competitiveness on international markets, demand in target markets, and seasonality of crops. The fruit crops included in the scope are avocados, blueberries, grapes, mangos & guavas, melons, and pineapples. The vegetable crops included are green beans, broccoli & cauliflower, carrots, garlic, ginger, lettuce, onions, paprika, sweet potatoes, and tomatoes.

ii. Flowers

Ethiopia is currently the fifth-largest producer and exporter of flowers in the world. The sector has been growing at a steady pace, with export revenues reaching $400 million in 2019. However, the flower sector in Ethiopia faces several challenges that could impede its future growth and market potential.

One of the main challenges is the low diversity and volume of exports. Ethiopia's flower exports are heavily reliant on a few key markets, including the Netherlands, the United States, and Japan. This puts the sector at risk of market fluctuations and changes in demand from these countries.

Another challenge is the lack of investment in infrastructure and technology. Ethiopia's flower farms are mostly small-scale and scattered, with limited access to modern equipment and transportation systems. This hinders the sector's ability to scale up production and reach new markets.

Experts in the sector advices that in order to enhance the growth and future market potential of the flower sector in Ethiopia, the Ethiopian government should focus on several key areas. These include boosting domestic GDP through investment in infrastructure, education, and training for flower farmers. Improving transportation systems and logistics can also help the sector reach new markets and increase export volumes.

Additionally, the government should work on stabilizing exchange rates and promoting policies that encourage foreign investment in the sector. Encouraging diversification of exports and expanding the range of flower varieties produced can also help mitigate risks associated with reliance on key markets.

A positive outlook for the flower sector in Ethiopia is expected for the years 2027 and 2032, with increased export volumes projected[2][3].

Currently all the flower export in Ethiopia is carried out by using air freight. Given its flourishing floriculture industry with high export volumes and the relatively close distance of production regions to dry ports, Ethiopia has the potential to transition its flower transportation modes from airfreight to sea freight. This transition would allow the industry to benefit from the cost advantages that

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[2] Study Conducted to Assess the Opportunity of Banks in Financing in Horticulture Sub-Sector in Ethiopia (Study Conducted to Assess the Opportunity of Banks in Financing in Horticulture Sub-Sector in Ethiopia by Moroda Kenea :: SSRN)

[3] Flower production prospects and sustainability challenges in Ethiopia: A systematic review (Frontiers | Flower production prospects and sustainability challenges in Ethiopia: A systematic review (frontiersin.org))

sea freight transportation provides. To achieve this, it is important to meet the right logistics performance criteria. In anticipation of the development of cold chain capacity, such as Cool Port Addis, and considering that railway transport is equipped with cold chain and reefer container facilities, it is feasible to include refrigerated flower exports as a secondary export cargo flow.

iii. Meat

The livestock sector plays a significant role in Ethiopia's economy, contributing to its growth and development. However, the sector faces numerous challenges that hinder its commercialization and growth. In response to this, the Ethiopian government in collaboration with International Livestock Research Institute (ILRI) has developed the Livestock Master Plan (LMP), a five-year investment plan geared towards prioritizing livestock production systems and value chains. The LMP aims to improve the sector, focusing on the livelihoods of smallholder farmers, poverty reduction, increased food security, and inclusive economic growth.

Currently, Ethiopia has twelve large meat producing companies, with most abattoirs located in the Modjo region. A significant portion of meat production is targeted for export markets, particularly in the Middle East. However, chilled meat products are the primary products exported, transported via airfreight. The sector envisions a transition from chilled to frozen meat products in the future, which will require the establishment of cold store facilities and the development of experienced handling and transport capacity.

The livestock sector in Ethiopia is characterized by two main production systems, the highland and lowland systems, and the Livestock Master Plan (LMP) prioritizes livestock production systems and value chains. With twelve large meat producing companies, Ethiopia's meat production is mainly targeted for export markets, particularly in the Middle East. Existing export abattoirs mainly have processing facilities for sheep and goats, with chilled meat being the primary product exported to destinations like Saudi Arabia and

the United Arab Emirates. However, there is a shortage of commercial stock domestically, constraining chilled meat production and affecting the sector's competitiveness[4].

To address this, Ethiopia plans to shift towards exporting frozen meat products, requiring the establishment of cold store facilities and experienced handling and transport capacity. Cool Port Addis, located in Mojo logistics hub, can serve as a consolidation centre for arranging rail transport and is likely to see an increase in aggregate export volume via sea freight. This shift towards frozen meat products will not only increase the sector's competitiveness but also provide opportunities for smallholder farmers, increase food security, and contribute to the country's economic growth[5].

1.1.2 Import

i. Medicine

With an estimated population of over 120 million, Ethiopia has a significant rural and underprivileged population that faces challenges accessing basic necessities such as food, healthcare, housing, and sanitation. The government is committed to improving the healthcare system and aligning with the United Nations' Sustainable Development Goals (SDGs). Public health sector investments have led to improved health outcomes, but communicable diseases like malaria and HIV remain a challenge. The Ministry of Health (MOH) is taking steps to decentralize management to regional health bureaus, while

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[4] Ethiopia livestock master plan a contribution to the Growth and Transformation Plan II (2015-2020) (https://cgspace.cgiar.org/bitstream/handle/10568/68037/lmp_roadmaps.pdf)

[5] GLOBAL FOOD SECURITY STRATEGY ETHIOPIA COUNTRY PLAN 2019 - 2023 (2017-2020.usaid.gov/sites/default/files/documents/1867/GFSS-Country-Plan-Ethiopia-FINAL-April-2019.pdf)

the Ethiopian Pharmaceutical Fund and Supply Agency (EPFSA) and Ethiopian Food and Drug Administration (EFDA) play crucial roles. EPFSA is in charge of purchasing and supply chain management of pharmaceuticals, medical supplies, and equipment, while EFDA regulates and oversees the registration, importation, and quality of medicines, supplies, and equipment.

Ethiopia heavily relies on imports to meet its domestic healthcare demand, with China and India being the major supplying countries. Together, they account for the majority of medicine, supplies, and equipment imports at the national level. The remaining imports are mainly sourced from European countries like Germany, France, and the United Kingdom (International Trade Administration, ITA).

Ethiopia imports medicine, including perishable and frozen items, through airfreight. While this mode of transportation is expensive, it is currently used because it allows for well-managed temperature control, and there is no alternative cool chain system available yet.

ii. Fruit and vegetables

In addition to local horticultural production, Ethiopia also imports fresh produce, particularly fruits, to meet domestic demand. Import volumes of fresh fruits and vegetables have been fluctuating in recent years, with key import crops including apples, grapes, dates, and onions.

As the Ethiopian economy continues to develop, the demand for fresh fruits and vegetables is expected to increase, especially for crops that cannot be cultivated domestically or have low production capacity and self-sufficiency rates. Cold chain facilities are required to serve as a storage and deconsolidation hub for the distribution of imported fresh fruits and vegetables within the country. Additionally, the inward flow of cooled produce ensures the availability of reefer containers for cooled exports, helping to balance the import-export imbalance.

It is important to note that as local production capacity in Ethiopia increases, the import quantity for some products may decline.

iii. Frozen Foods

Frozen foods and frozen consumable products are imported to meet the domestic demand in Ethiopia, particularly in the hotel and retail sectors in the Addis Ababa region. Examples of these consumable products include frozen fruits, vegetables, fries, fish, and ice cream. Currently, a significant portion of these imported consumables are stored in small-scale cold storage facilities of hotels and supermarkets, which are inefficient and require high maintenance. However, the import volume of frozen consumables is expected to grow significantly in the future due to rising income levels and the development of the hotel and retail sectors in Ethiopia. Central cold storage facility shall be constructed which can serve as a third-party storage and deconsolidation facility for frozen food imports, facilitating the future growth of this cargo flow. The products included in this scope are those with historically high import volumes, such as frozen fruits, nuts, vegetables, fish, meat, fries, and ice cream.

1.1.3 Estimated Market Potential for Perishable Products

The following section presents a summary of the prospective market potential in Ethiopia for both primary and secondary cargo flows within the scope of this study. The data source for the below projection is the "Feasibility Study Report for Cool Port Addis by ROYAL HASKONING DHV". The study aims to estimate the volumes of export and import flows at the national level in Ethiopia for the years 2027 and 2032[6].

[6] Feasibility Study Report for Cool Port Addis by ROYAL HASKONING DHV

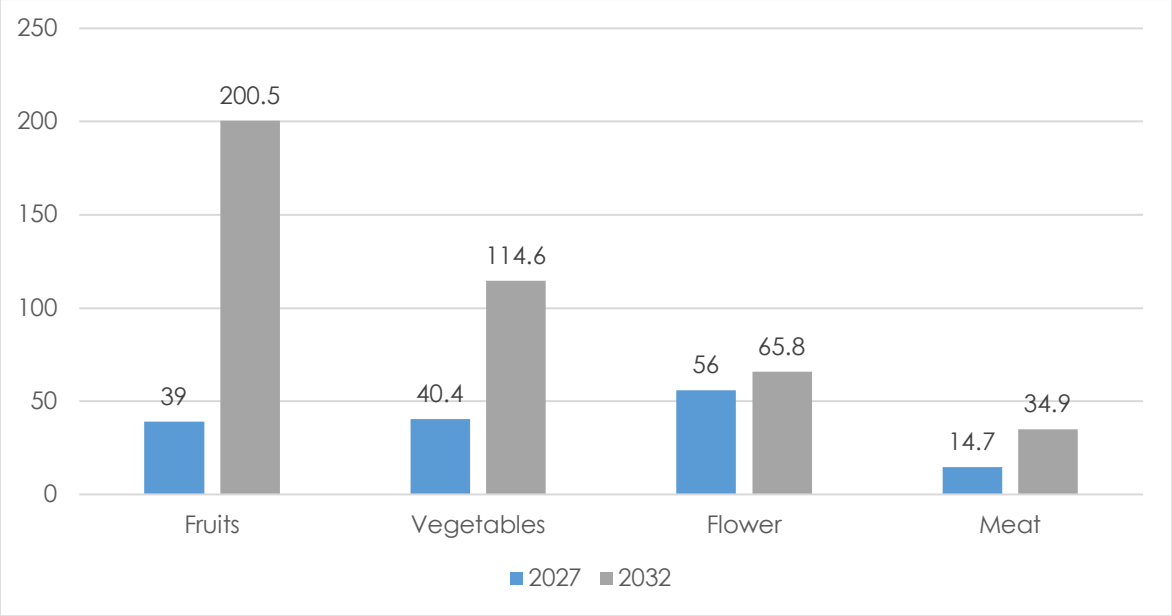

Figure 1: *Potential future Ethiopian export volume for perishable products to overseas target export markets in 1000 tones (2027 and 2032)*

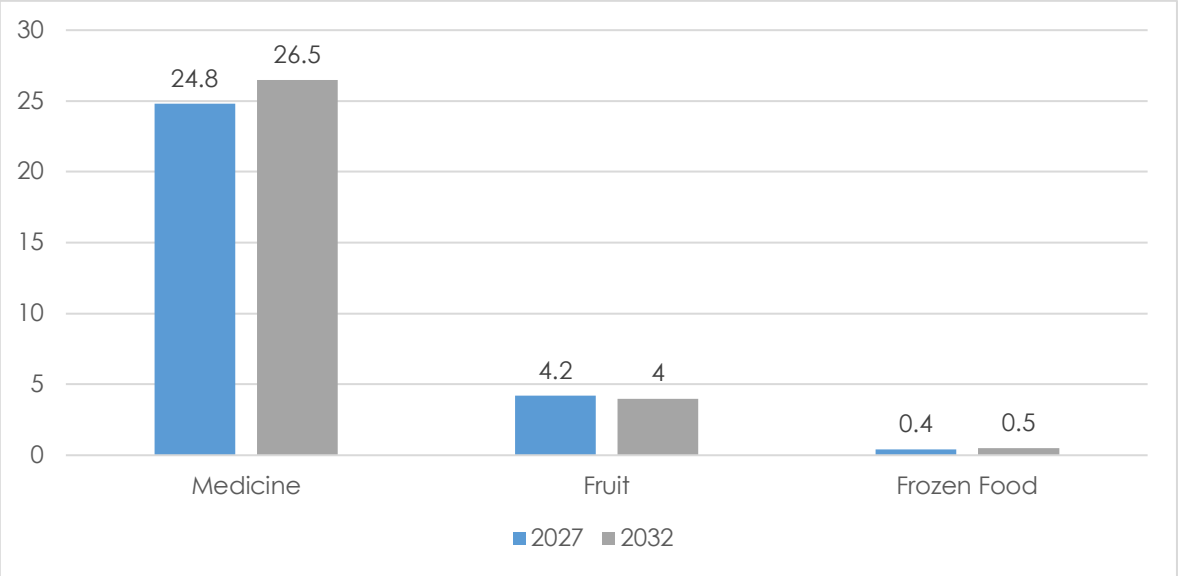

Figure 2: *Projected Potential Ethiopian import volume for perishable products in 1000 tones (2027 and 2032)*

2. Problems to be addressed

Ethiopia holds massive potential for Perishable Commodities production. An abundance of labour, water and a range of climatic zones allow Ethiopia to become a leading exporter in these perishable products like fruits, vegetables, flowers, and meat. These factors combined with affordable manpower and geographic proximity to major international markets (e.g., Europe and the Middle East) make that the country has great opportunity in this sector. However, there are still a number of bottlenecks preventing Ethiopia from unlocking its potential and hinder its growth and development. In this problem analysis, the emphasis is on logistics related challenges that need to be addressed to improve the sector's performance. Below are the key logistics related problems affecting the perishable commodities in Ethiopia:-

i. Limited operational cold storage

According to Rahiel et al. [7], post-harvest losses in Ethiopia amount to about 30% for perishable crops like fruits and vegetables, which is in line with the studies which show that post- harvest losses account for up to 40% of total food losses in Sub-Saharan Africa. The study by Humble and Reneby [8] highlights that avocado and mango experience significant losses during harvest, transport, and storage. Specifically, 20% of losses at the farm level and 69% of

[7] Assessment of production potential and post-harvest losses of fruits and vegetables in northern region of Ethiopia (Assessment of production potential and post-harvest losses of fruits and vegetables in northern region of Ethiopia | Agriculture & Food Security | Full Text (biomedcentral.com)

[8] The cost of postharvest losses in Ethiopia: economic and food security implications (The cost of postharvest losses in Ethiopia: economic and food security implications - PMC (nih.gov))

losses can be attributed to storage at wholesale level. These losses are a result of poor handling, inadequate infrastructure, and limited experience [9].

Among the existing cold storage facilities in the country, only a few are operational. Moreover, the currently available cold storage facilities often have inadequate or poorly maintained equipment, making them unreliable when it comes to controlling the climate, especially for temperature-sensitive products like avocados.

There are no aggregation centres, cross docking facilities and central cold storage facilities in the country.

ii. Inadequate cold transport trucks

Typically, transporting perishable goods is a costly and unreliable affair in Ethiopia. The shortfall of refrigerated trucks gives transport firms an upper hand when it comes to negotiation, making it challenging for growers to secure affordable and dependable transport services. As a result, organizations that have refrigerated trucks opt to handle transportation themselves. Such organizations can use the same vehicle for other perishable product transportation as they use for flower transportation. However, small and medium-sized enterprises (SMEs) and most growers do not have sufficient perishable product volumes to justify investing in refrigerated trucks. Regulations further complicate matters as growers are prohibited from receiving payment for transporting another grower-exporter's products in the same truck they own.

iii. Complicated administrative procedures for export

[9] Postharvest Loss, Causes, and Handling Practices of Fruits and Vegetables in Ethiopia: Scoping Review (Postharvest Loss, Causes, and Handling Practices of Fruits and Vegetables in Ethiopia: Scoping Review (sciendo.com))

This point was mentioned multiple times during the interviews. Export procedures are complex and time consuming. Besides it is not always clear which documents are required for the exports and imports (e.g., packaging materials). Most emerging avocados growers will likely also encounter this problem and will need to invest much time and effort in the issue, time and efforts that could be spend on optimizing production instead.

iv. Difficulty in accessing refrigerated containers

Transporting perishable products over long distances requires the use of controlled atmosphere (CA) reefer containers due to specific climate requirements. However, the availability of these containers is very limited in the country. Shipping lines are the sole providers of these containers for producers and exporters, and they prioritize customers that order many containers annually. Small shipments of just a few containers receive less priority in the context of a global shortage of reefer containers. Since the amount of perishable products exported is not significant enough, individual producers arranging for containers are not of interest to shipping lines.

Producers face planning issues when it comes to the arrival of containers due to the lack of cooling facilities. The harvest must be timed to coincide with the container's arrival to ensure the product can be quickly loaded. In some cases, producers transport the container to the farm to fill it up before trucking it to its final destination. However, this is an inefficient and costly process as the container is mostly empty during transportation. Additionally, if the harvest timing does not align with the container's arrival, the container may remain empty for multiple days at the farm, resulting in extra costs for the producer who must pay clip-on Genset rental fees of $110 per day to cool the container. Moreover, delayed arrival of the reefer can lead to increased post-harvest losses as the freshly harvested perishable products are kept warm for too long.

3. Possible solutions

Based on the current context and identified problems overall possible solution to the problems in the sector was developed. The analysis includes a detailed assessment of the current state of the industry, as well as projections for future growth and development. The identified possible solutions to the existing problems are:-

A. Cold Storage Facility Expansion

To address the lack of cold storage facilities in the nation, a two-step strategy is recommended to be used. Establishing a central, multi-user cold storage facility is the first step as a short-term solution. The expansion of decentralized local cool storage units, which can be viewed as a long-term solution, is the next step. With the increase of production of perishable produces in different locations, it will become financially more attractive to operationalize cold storage facilities in different parts of the country, therefore allowing for the creation of smaller regional storage location. Although it is crucial to cool down harvested perishable products before export, currently there is not enough volume at the local level to make decentralized cool storage units economically viable. It costs money to keep a cool storage running, and management abilities must be developed. Perishable products that are ready for export must be kept in a central location where they will be processed and handled. It is important to keep in mind that a central multi-user facility has the following benefits:

- It is easier to find crops to be stored in the avocado off-season so that the facilities are always in use, as it is possible to bring in crops from different climatic regions with different seasonal patterns.
- When the storage is operational year-round, the workers can be retained, therefore allowing to really invest in capacity building.
- It is easier to achieve higher standards in one location (certifications, quality control…etc) and consequently scale up.

Transport can be organized for the individual clusters by means of cooled trucks (depending on the distance) and aggregated in a central location. This requires coordination to ensure that the product is harvested and ready to pick up when the truck arrives to minimize the time that the fresh produces are spending outside of the cooling.

B. Enhance Availability of Refrigerated Trucks and Create Clustered Transport System

The first step is to address the issue at policy level by putting in place an incentive mechanism for private sector to invest in the refrigerated trucking business. Moreover, the regulations prohibiting growers from transporting other growers' products in their trucks could be reviewed and potentially revised to allow for more flexibility and collaboration among growers.

Corresponding to the establishment of central cold storage facility proposed above in part A, a clustered transport system shall be devised. This system could be managed by a cooperative of growers and/or transport firms. The centralized system would provide refrigerated trucks on a rental basis, allowing SMEs and growers to access affordable and dependable transport services. The system could also include proper maintenance and monitoring of the trucks to ensure their reliability.

Until decentralized cold storages are established cooled trucks (or uncooled but covered trucks for short distances) can be used to collect the produce directly at the farm gate. These will initially be mainly small trucks but could become large trucks with a trailer in a later moment. As it is not possible to pass from each individual SME farm, the produce should be aggregated at appointed collection points (commercial farms/clusters/cooperatives) and picked up there. In a later stage, when cool storages are available locally as nearby collection centres, the growers will be able to bring their produce themselves to the local collection centre.

C. Easy-to-access custom services

To attract private investors, it is important for the custom service in Ethiopia to be clear and efficient. One way to achieve this is by establishing a centralized point for handling customs and export documentation. This would help expedite the process, especially if the service is specialized in horticultural products like avocados and is connected to relevant governmental entities such as the Phytosanitary department. Additionally, it would be beneficial to create a factsheet or overview specifically outlining the export requirements for perishable products.

D. Develop a System to Improve The Availability of Reefer Containers

To ensure the availability of reefer containers and minimize unnecessary travel, it is recommended to establish a central location specifically for these containers. This central location can also serve as a stuffing point, where the containers can be filled, thus reducing the need for inland movements and optimizing transportation by truck. Moreover, by aggregating exportable fresh products, such as avocados, in this central location, shipping lines will be attracted by the larger export volumes, resulting in better prices. This central location will also function as a storage facility for the perishable product and a filling point for the reefer containers. By having the avocados already on-site when the containers arrive, idle times can be eliminated, reducing the risk of postharvest losses. To further enhance cost-efficiency, the implementation of cross-docking services is recommended. This involves importing containers with dry or chilled cargo, taking advantage of Ethiopia's net-importer status. By coordinating and sharing the cost of container bookings between importers and exporters, a win-win situation can be created.

E. Capacity Building

The management of a cold storage facility, the operation of reefer containers, and the management of cold trucks are all crucial aspects of the cold chain industry. These tasks require specific skills and knowledge that can be

introduced through capacity building initiatives. Capacity building refers to the process of developing and enhancing the abilities of individuals and organizations to effectively carry out their roles and responsibilities. In the context of cold chain management, capacity building programs can focus on training personnel on proper temperature control, inventory management, and maintenance of equipment. Additionally, it can also include educating staff on best practices for handling and transporting perishable goods to ensure their quality and safety. By investing in capacity building, companies can equip their workforce with the necessary skills and expertise to efficiently manage cold storage facilities, operate reefer containers, and handle cold trucks, ultimately improving the overall efficiency and effectiveness of the cold chain system.

F. Integrated logistics service provider

To enhance the overall cool chain logistics, it is crucial to establish one or several integrated logistics service provider companies that possess the necessary technical knowledge and expertise to effectively coordinate the entire supply chain. These logistics companies would play a vital role in ensuring the smooth and efficient management of cold storage facilities, the operation of reefer containers, and the management of cold trucks. By having a dedicated logistics company or companies in place, the cool chain logistics process can be streamlined and optimized, leading to improved efficiency and reduced risks of temperature fluctuations or spoilage. While it is preferable for these logistics companies to be private entities, the key focus should be on their ability to effectively manage and coordinate the various aspects of the cool chain logistics process.