



Diagnosis to the cold chain of Ransa Colombia Colfrigos of the Regional Antioquia, based on the international standard CCQI

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Dedication

Our family, who were the people who gave us unconditional support throughout this training process, because thanks to their dedication, understanding and effort motivated us every day to culminate our educational process, in times of weakness were to encourage and guide us By the best way.

Gratitude.

We want to thank God, our heavenly Father, who during this academic process filled us with wisdom, patience and tolerance, to fulfill our dreams and goals; In moments of restlessness, fatigue and doubts, they did not abandon us, on the contrary gave us the strength to get ahead.

We thank our family who supported us unconditionally on this long road and for motivating us to fight day by day for our dreams.

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We also thank all the friends and friends who were part of this journey, who gave us their support and their voice of encouragement to get ahead in moments of weakness.

Resumen

A través de una investigación descriptiva y utilizando el método cualitativo, se realizó un estudio sobre las normas de sistema de gestión de calidad, que actualmente regulan y estandarizan los procesos de los eslabones de cadena de frío. Se encontró que en el año 2004 fue creada la norma de indicadores de calidad de la cadena del frío (CCQI- *Cool Chain Quality Indicators*), la cual se centra en orientar a las organizaciones para mantener las condiciones y el ambiente deseable para los productos sensibles a la temperatura y perecederos.

Para el desarrollo de este trabajo, se escogió al operador logístico Ransa Colombia Colfrigos de la Regional de Antioquia, con el fin de identificar si actualmente esta cumple con los requisitos obligatorios de la segunda parte de la norma llamada “Conformidad de la Cadena del Frío” para certificarse en la norma CCQI.

Palabras clave: (Perecederos, Normas, Operador Logístico, Cadena del frío, Conservación, distribución).

Abstract

Trough of a descriptive investigation and using the qualitative method a study was carried out on the norms that currently regulate and standardize the processes to improve the quality of the links of the cold chain. It was found that in 2004 norms cold chain quality indicators (CCQI) was created, which focuses on guiding organizations to maintain the conditions and the desirable environment for temperature sensitive and perishable products. For the development of this work, the logistic operator Ransa Colombia Colfrigos of the Regional of Antioquia was chosen, in order to identify if this company currently meets the mandatory

requirements of the second part of the standard called "Conformity of the Cold Chain" To be certified in the CCQI norms.

Keywords: Perishable, Transport, Distribution, Cold Chain, Conservation, Logistic Operator.

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Lista de Abbreviations

- **BASC:** Business Anti-Smuggling Coalition
- **BSI:** British Standards Institution
- **CS:** *Cadena de suministro* (Supply Chain)
- **CCA:** Cool Chain Association
- **CCQI:** Cool Chain Quality Indicators
- **CELAC:** *Comunidad de Estados Latinoamericanos y Caribeños* (Community of Latin American and Caribbean States).
- **CSA:** *Cadenas de Suministro Agroalimentarias*. (Agribusiness Supply Chains)
- **DNP:** *Departamento Nacional de Planeación*. (National Planning Department)
- **FINAGRO:** *Fondo para el sector agropecuario*. (Fund for the agricultural sector)
- **GLA:** Germanischer Lloyd Certification.
- **IFPRI:** *Instituto Internacional de Investigación sobre Políticas Alimentarias*. (International Food Policy Research Institute)
- **IARW:** International Association of Refrigerated Warehouses
- **IACSC:** International Association for Cold Storage Construction
- **TTI:** Time Temperature Integrator
- **ISO:** ISO-International Organization for Standardization
- **IRTA:** International Refrigerated Transportation Association
- **PTSPs:** Products Temperature Sensitive and Perishables
- **WFLO:** World Food Logistics Organization

Introduction

The loss and waste of food is an increasingly worrisome issue worldwide, the human population has had a very important growth and due to the current management in the production processes and distribution of food there are high rates of loss and waste of these.

Among the different techniques of food preservation, which have been developed over time can be found the following (Cesar, 2016):

- Cold storage: where three methods are used, refrigeration, freezing and ultra-freezing.
- Heat conservation: where the methods used are pasteurization, sterilization and scalding.
- Conservation with chemical methods: where the methods used are salting, smoking, acidification, pickling and the addition of sugar.
- Dehydration.
- Freeze-drying.
- Desiccation.
- Vacuum packed.

This degree paper talks about the standard of cold chain quality indicators CCQI, which is focused for those companies that carry out activities of distribution and storage of products that need a controlled temperature. If the processes of the cold chain do not have the right temperature, there is a risk of decomposition and loss of products, due to the proliferation of microorganisms that contain and accelerate the process. This is why the cold chain becomes essential for the care and conservation of perishable products.

The logistics of the cold chain are responsible for keeping the temperature controlled in all processes, that is, from production, through storage, distribution and transportation, to reach an end consumer (Navarro, 2013-A). This logistics has a fundamental role regarding the quality of a product, as it can meet the needs of customers. A cause of this need, the production companies have modified their operations, as they prefer to outsource the processes and this is where the participation of logistics operators in the important part of the cold chain. The efficiency of a logistic operator specialized in cold processes is based on the versatility of services they provide and on the solutions they offer to customers who opt for their services (ZonaLogistica, 2016, par. 3)

Ransa Colombia Colfrigos S.A.S, is a company of the logistics sector of Colombia, has a trajectory in the market of 33 years, provides the service of distribution, storage and transport as ally-operator to companies producing and commercializing perishable products nationwide.

The present work is centered on Ransa Colombia Colfrigos of the regional of Antioquia, located in the municipality of Sabaneta-Antioquia, which has an infrastructure specially designed for the handling of products that require special care for its conservation. Although the company has a long history in the market and experience in handling perishable products, it has had problems in terms of losses of perishable goods, which has affected them economically.

In the different sections of this work, we can find a brief history of how the human being began to conserve his products, how he has developed and has progressed over time the method of conservation through cold. There are also different ways to preserve cold products, the special logistics that this type of products require, which international bodies have developed standards that can guarantee a high level of cold chain processes, and what standards has been adopted Ransa Colombia Colfrigos SAS to improve and control all processes related to the cold chain.

1. Formulation of the project.

1.1 Background.

About 15,000 years ago, the need to conserve food comes from the surplus caused by agricultural production in the different seasons of the year. Because some foods have a short shelf life, in which they lose their physical-chemical and biological qualities, the need to preserve food was seen. Drying, pickling, smoking and salting were used as conservation media. The winter season also allowed the preservation of food for months (Salvadó, Lorda & Ripollés, 2005).

In 1755 Scottish physician and chemist William Cullen was the first man to produce ice, Cullen made a vacuum pump to achieve the rapid evaporation of water fluids in an empty space, however, this system was not efficient, since it was He needed a considerable amount of water vapor. The followers of Cullen improved the system progressively and at the beginning of the 19th century began to use the mechanical production of cold by compression / decompression of ammonia. This advance in the industrial technology, improved the conditions of the fishing boats since they could go to places a little more remote of its coasts (Salvadó, Lorda & Ripollés, 2005).

The manufacture of refrigerating equipment and artificial ice began to be present between the years 1840 and 1860 in places where the use of the natural cold was common in domestic, industrial and commercial level. This system expanded until the 20th century where there were already big consumers who used cold equipment, including the fishing industry, beer and meat industry. During the 20th century, the use of the industrial cold spread to the entire food industry (Salvadó, Lorda & Ripollés, 2005).

It is considered March 6, 1930, as the beginning of the marketing of frozen perishables because in Springfield, Massachusetts, USA, the first cabinet of frozen products was installed in a commercial establishment Open to the public (Marenco, 2015).

In 2007, Altra Investments II, LP, a company operating in the logistics and storage of frozen and refrigerated products sector in Colombia, which acquired a large part of Frigoríficos Colombianos S.A. (Colfrigos), carried out between 2007 and 2013 an expansion over 2.7 by the installed initial capacity of Colfrigos (Altra, 2011).

Mr. Norman Marín Monsalve Regional Director of Ransa Colombia Colfrigos de la Regional de Antioquia reported that in 2007 he had a warehouse which had 123 shelf positions between dry and frozen and a storage warehouse of 750 square meters. During the period 2007 to 2016 had a growth in infrastructure, as they currently have 2402 positions of shelves between dry and frozen and a storage warehouse of 3000 square meters.

Perishable products contain microorganisms, which when exposed to temperatures not suitable for their conservation, reproduce exponentially affecting their composition. This causes damage to its structure and that is why it is necessary to have a series of care, rules and processes in the cold chain of logistics, which allows to maintain in optimal conditions these products when they are being transported from one place to another (Pelayo, 2011).

There are three methods for the conservation of perishable products through cold, these are:

- **Cooling:** Consists of preserving the products at low temperatures, but above their freezing temperature. Cooling is between 0 ° C to 4 ° C to maintain product quality (Resolución No. 002505, 2004).

- **Freezing:** Is another form of conservation and consists of the solidification of the water in the products they are subjected to low temperatures (Equal or below -18°C) for long periods of time and thus delay bacteriological processes that lead to decomposition Of the same and also prevents the proliferation of microorganisms (Resolución No. 002505, 2004). In the freezing of perishable goods, transport, storage, storage and handling must be carried out using special methods and procedures to ensure that the properties of these products are not put at risk before reaching the final consumer. This is because frozen food will be consumed in the medium or long term (Quiminet, 2003).
- **Deep freezing:** Is the process in which the temperature is reduced to -40°C , which allows to keep to the maximum the physical structure of the food products. It is a process where the product undergoes a sudden cooling to quickly reach the temperature of maximum crystallization in a time not exceeding four hours. Subsequently food is stored at a higher temperature and stabilized being the most common between -18°C and -22°C , but can reach below -24°C , depending on the type of product (Trujillo, 2007).

Among the perishable products that require a cold chain can be found fruits, vegetables, vegetables, raw meats, sausages, milk and its products. Each of these products requires different relative temperatures and humidities (Navarro, 2013 - A).

Fruits, vegetables and vegetables are products that require a process of maturation and conservation in controlled temperatures. For this type of product, a pre-cooling process must be done to reduce the heat with which it is collected. The transpiration of these, ripening speed, loss of moisture, methane production and the spread of microorganisms are some of the causes of the deterioration of this type of product. The pre-cooling method will depend on the nature of the

product and can be done through chamber cooling, air cooling under pressure or wet compression, cooling by ice water, among others (Procolombia, 2014).

Milk because of its chemical composition is ideal for bacterial development, hence the importance of the cold chain throughout the handling and transport process, these should be refrigerated at $-2^{\circ}\text{C} \pm 4^{\circ}\text{C}$ immediately after milking or Delivered to the cooling or processing plants in the shortest possible time ensuring the conservation and safety of these products (Procolombia, 2014).

The transportation of meat, fish and temperature sensitive food is regulated in Colombia by Resolution No. 002505 of 2004 of the Ministry of Transport (Resolución No. 002505, 2004). The physical and chemical changes that occur in meat are strictly a function of temperature and humidity. The increase of the bacteria is reduced in half with each drop of the temperature of 10°C and practically stops in the freezing point in this type of products; ie it will be kept at least twice as long at 0°C . This type of product requires that the cold chain is not interrupted from the slaughter plant to the consumer. The ideal storage temperature for fresh meat oscillates around the freezing point around -1°C (Veall, 1993).

The cold chain is a part of logistics and is critical when it comes to preserving perishable products. Because these products require a suitable temperature and controlled relative humidity in the logistic processes (production, storage, distribution, packaging, transport, loading, unloading and retail) from the initial moment of production to the final consumer (Procolombia, 2014).

The cold chain is the temperature control of the perishable products, in order to maintain the quality of the product in each link from the postharvest of agricultural products, which are obtained through the cultivation of the land, until reaching the final consumer. If each of the links is carried out in an appropriate manner,

preventing any of them from breaking, it is possible to reduce losses and waste, ensuring that the perishable products are safe and of good quality at the time of consuming them (Corado, 2012).

Having a good process and logistical management of cold chain, allows companies to increase their market and profits, as they meet the needs of customers reaching remote places and playing a key role in the development of the world and economy (Procolombia, 2014).

Logistic operators of perishable products must have a series of logistic activities that guarantee that the product will reach its final destination in optimal conditions, for it is important that they know the proper temperature, have a good infrastructure of storage, transport, Technology, regulation, training, etc. (Navarro, 2013- A).

Air transport of perishable products requires a specific treatment, for example, having refrigerated containers so that it can withstand the temperature changes that are generated during the waiting in the dock, and the processes of loading and unloading. Also during the flight time the temperature and humidity must be controlled for the transported products (Eslava, 2008).

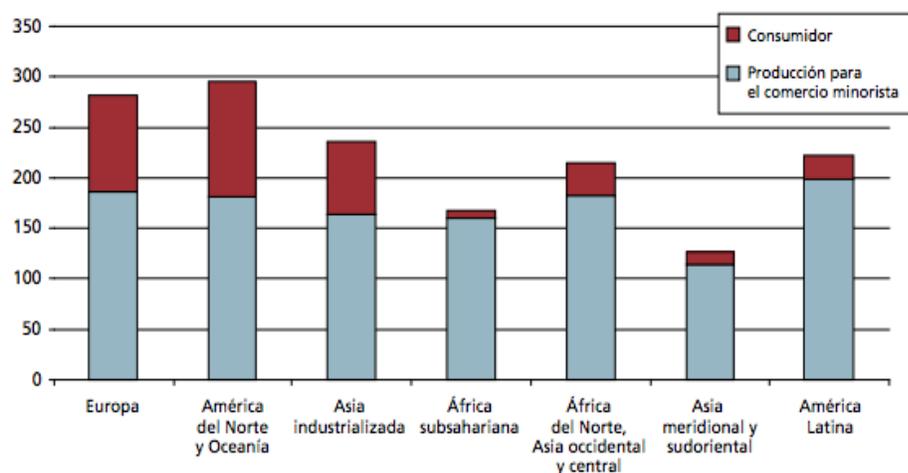
In maritime transport, the container is a fundamental element, since it is the one that allows to store and to mobilize the loads of a place to another one. The ideal in the maritime transport of these containers is that once it is loaded and sealed in an origin site, it is only open at the point of destination (Chavarro; 1991). For a clearer understanding, the container is a cargo container that can be used in sea, air and land transportation. It is used as packaging for large volumetric and / or heavy weight loads (Concha, 2016.)

A pesar del avance y desarrollo tecnológico, que se ha venido dando con el paso del tiempo para la conservación de alimentos durante los procesos productivos, aun se producen algunas pérdidas y desperdicios. La pérdida de alimentos se da en la producción agropecuaria, poscosecha y almacenamiento. Los desperdicios son los alimentos que se dañan en las etapas de distribución, retail y consumo (FAO, 2011).

According to FAO (2011) in Europe and North America per capita food losses were generated from 280 to 300 kg / year, while in sub-Saharan Africa and South and South-East Asia were 120-170 kg / year. Total per capita production of edible parts of food for human consumption in Europe and North America was approximately 900 kg / year, while in sub-Saharan Africa and South and South-East Asia it was 460 kg / year.

The amount of food per capita wasted by consumers was 95 to 115 kg / year in Europe and North America, while this figure reached only 6 to 11 kg / year in sub-Saharan Africa and South and South-East Asia. (See figure 1)

Figure 1. Food per capita losses and wastage in the consumption and pre-consumption phases in different regions of the world

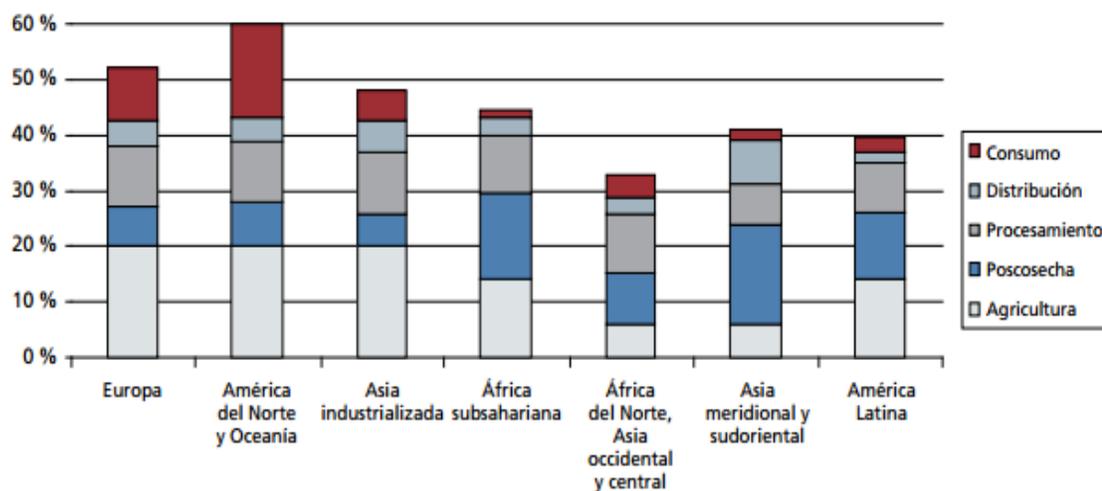


Source: FAO, 2011

The FAO classifies the foods that are lost or wasted are classified into seven groups: fruits and vegetables, roots and tubers, meat, fish, dairy products, cereals and grains. In this list of products the most lost or wasted are the roots and tubers and fruits and vegetables (FAO, 2011).

In terms of roots and tubers, the results (see figure 2) indicate that the three high- and middle-income regions lose the largest volume of food during agricultural production and consumer waste is also high (FAO, 2011).

Figure 2. Part of the initial production that is lost or wasted in the different stages of the Agribusiness Supply Chains (CSA - Cadenas de Suministro Agroalimentarias) of roots and tubers

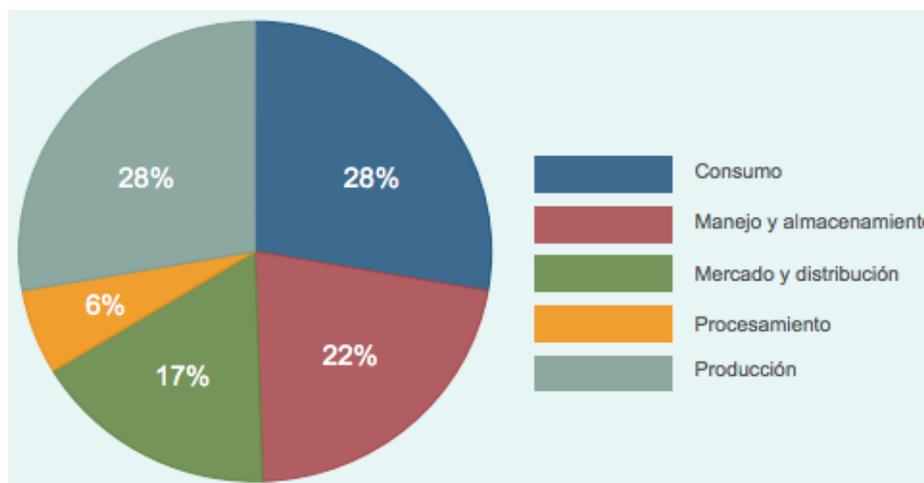


Source: FAO, 2011

FAO (2014) estimates that 6% of global food losses occur in Latin America and the Caribbean. Where food is lost and wasted, it is in the links of consumption and production; 28% of the waste occurs at the consumer level; 28% of production losses, 17% of waste occurs in marketing and distribution, and 22% of losses

occur during handling and storage and the remaining 6% at the processing level (see figure 3) (FAO, 2014)

Figure 3. Food losses and food waste in Latin America by food chain segment.

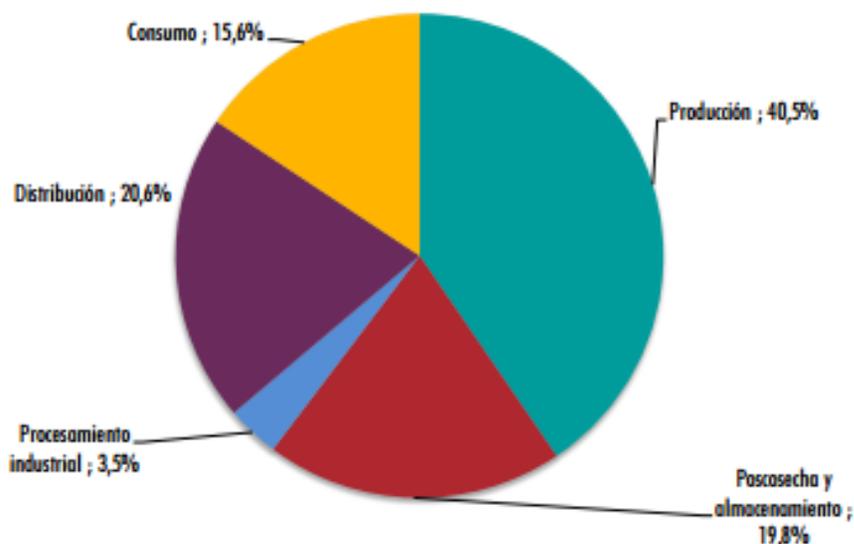


Source: FAO based on World Bank (2014).

According to the Ministry of Health and Social Protection and FAO (2014), in 2010 Colombia lost 1,426,932 tons of fruits and vegetables in the post-harvest stage, this figure is equivalent to 39% of total supply Of fruits and vegetables of that year; Of this total loss, 32% corresponds to fruits, equivalent to 1,170,816 tonnes and 7% to vegetables corresponding to 256,116 tonnes.

According to the National Planning Department (DNP) Colombia has a food supply of 28.5 million tons and a total of 9.76 million tons is wasted. Of the total food lost and wasted, 64% correspond to losses that occur in the production, postharvest, storage and industrial processing stages. The remaining 36% corresponds to wastes generated during the distribution and retail stages, and household consumption (see figure 4.) (DNP, 2016)

Figure 4. Distribution of loss and wastage by link in the food chain.

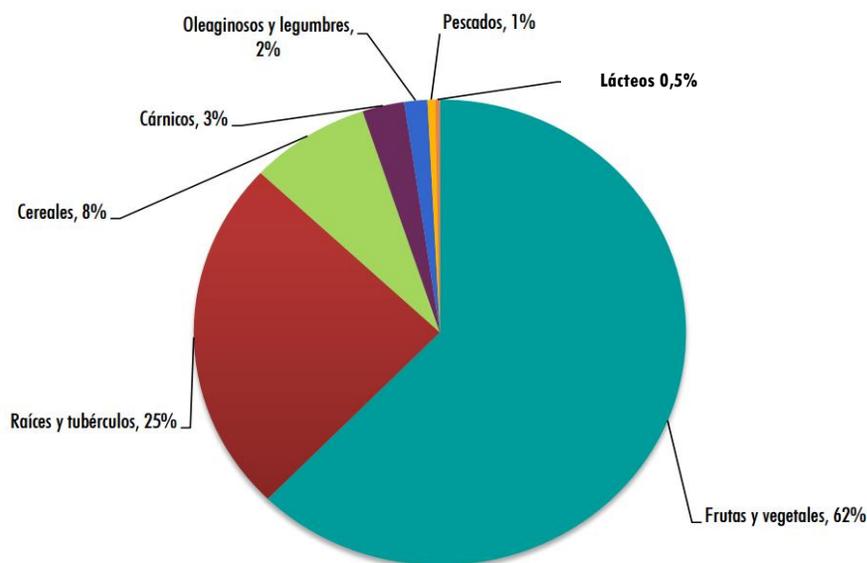


Source: DNP, 2016

Of the amount of food loss, 40,5% corresponds to the Production stage, 20,6% to Distribution, 19,8% to Postharvest and storage, 15,6% to consumption and 3,5% to Industrial Processing.

According to the DNP of the 9.76 million tons of food lost and wasted in Colombia, 6.1 million correspond to fruits and vegetables, 2.4 million to roots and tubers, 772,000 to cereals, 269,000 to meat, 148,000 to Oleaginous and legumes, 50,000 to fish and 29,000 to dairy products. (See figure 5.)

Figure 5. Distribution of loss and waste by food groups.

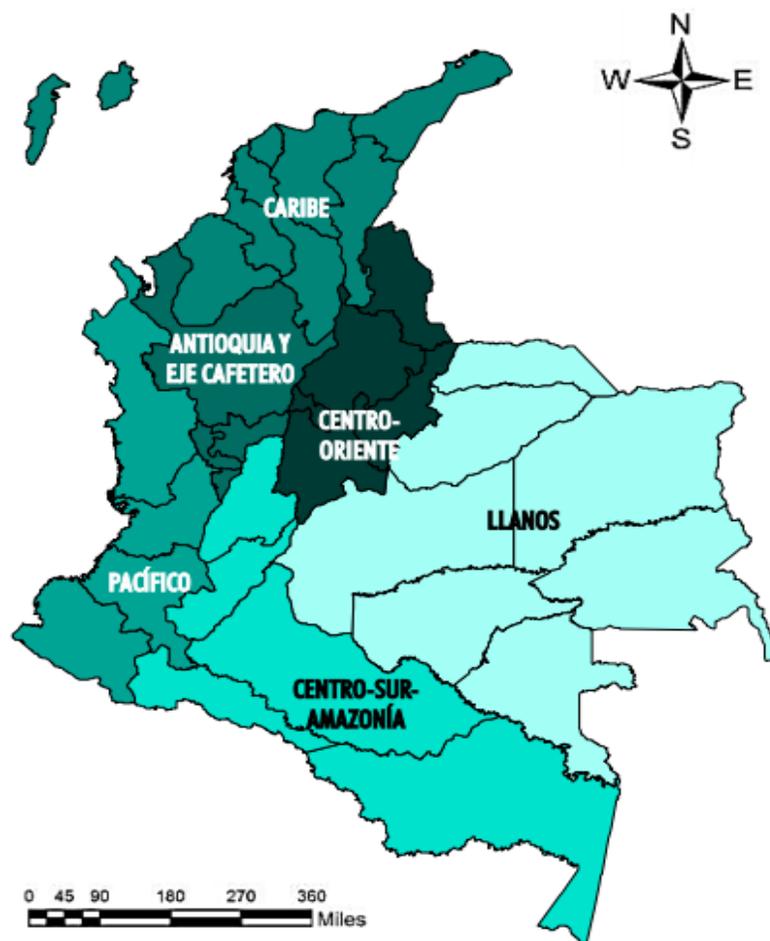


Source: DNP, 2016

In terms of loss participation in Colombia, the first region is the Central-Eastern region (Cundinamarca, Santander, Norte de Santander and Boyacá) with a 27.7% share of 1.7 million tons, followed by the (Comprising Atlántico, Bolívar, Cesar, Córdoba, La Guajira, Magdalena, San Andrés and Sucre) with a share of 18.2%, equivalent to 1.1 million tons. (DNP, 2016) (See Table 1)

In Colombia, the region with the largest share of waste is the Central-Eastern region, with a share of 48,3%, equivalent to 1.7 million tons, and in the second place is the coffee-growing region, Of Planning (DNP) groups in this region the departments of Antioquia, Quindío, Caldas and Risaralda. (DNP, 2016) (See Table 2)

Image 1. Location of regions by DNP in Colombia



Source: DNP, 2016

Table 1. Distribution of food waste by región.

Región	Desperdicio
Centro-Oriente	48,3 %
Eje Cafetero	18,3 %
Caribe	13,4 %
Pacífica	13,8 %
Centro-Sur	4,2 %
Llanos	2,0 %

Source: DNP, 2016

Table 2. Distribution of food losses by region.

Región	Pérdida
Centro-Oriente	27,7 %
Caribe	18,2 %
Eje Cafetero	17,1 %
Pacífica	17,1 %
Llanos	10,9 %
Centro-Sur	9,0 %

Source: DNP, 2016

In Colombia the loss is 64% and waste is 36%, in the world this proportion is 54% loss and 46% waste. Comparing data on waste and losses between Colombia and the world, Colombia identified a loss level of 10% higher than the world average and waste is 10% lower than the world average (DNP, 2016).

For effective action, FAO (2014) refers to the implementation of new technologies, investment in infrastructure, training, establishing regulatory frameworks, strategic alliances between the public sector and private and awareness-raising campaigns for both businesses and individuals.

According to Choudhury (2006), one of the forms of prevention is investment in infrastructure and transportation. Governments should ensure continuous improvements in the infrastructure of roads, energy and markets; Companies should also improve the quality of investments in their storage and cold chain facilities as well as transport (FAO, 2011).

For several years, organizations, systems and quality standards have been created to improve the links in the cold chain and to reduce the losses and waste of perishable products.

The International Association of Refrigerated Warehouses (IARW) Was founded in 1891. It currently promotes best practices in temperature controlled storage and the logistics industry through research, industry benchmarking, networking and education (Global Cold Chain Alliance, 2016 - A).

The World Food Logistics Organization (WFLO) was founded in 1943 as a scientific and educational foundation, whose purpose is to advance in the application of refrigeration technology. This in order to improve the conservation of food and commodities, develop and support research in refrigeration science, cooperate with government and private institutions in research activities, train and educate staff and make available a repository Of scientific information on this industry (Global Cold Chain Alliance, 2016 - B).

The International Association for the Construction of Cold Storage (IACSC), was founded in 1978, this association supports the needs and interests of organizations involved in the construction of cold storage facilities (Global Cold Chain Alliance, 2016 - C).

The International Refrigerated Transport Association (IRTA) was established in 1994 to improve transportation processes in the industry and fosters good business relationships between transport companies, suppliers and customers (Global Cold Chain Alliance, 2016 - D).

The International Association of Refrigerated Warehouses (IARW) and the World Food Logistics Organization (WFLO) since the twentieth century have been working together in the food industry and in the development of moving refrigeration of food products. Moving towards the 21st century, some members of these organizations find it necessary to adapt business models because of the strong influences that were changing the industry.

In 2005 negotiations were formalized when the IARW and WFLO began to gain support from the International Refrigerated Transport Association (IRTA) and the International Association for the Construction of Cold Storage (IACSC). At the end of 2006, the four organizations mentioned above decided to create the Global Cold Chain Alliance (GCCA) and in 2007 the Global Cold Chain Alliance (GCCA) was officially launched, In order to represent the important industries in temperature controlled logistics and is committed to building and strengthening the (Global Cold Chain Alliance, 2016).

The International Organization for Standardization (ISO), develops management systems, allowing companies to improve the quality, safety and efficiency of products, services and systems ISO is the world's largest developer of International Voluntary Standards. It was founded in 1947, since then they have published more than 21,000 international standards. It currently has 163 member countries (ISO, 2016).

At the beginning of the year 1980 ISO designated a series of technical committees to work on the development of common standards, seven years later they published ISO 9000 - Quality Management, which aims to guide and offer specifications to companies on how to create And implement a quality management system to improve the organization's performance (ISO, 2016).

In 1994, the ISO 9000 standard was updated, focusing mainly on production process companies, which made it difficult for service companies to adapt to this standard and customers criticized bureaucracy issues. 2000, the standard was updated again, allowing all types of companies to adapt to the standard, without any problem (Migliaccio, 2016.).

In the United Kingdom the first quality management standard was developed, it was known as BS 5750, this standard specified how the manufacturing processes

should be managed. In 1987, BSI (British Standards Institution), a business standards company that helps organizations worldwide implement excellence in the operation of people and products, proposed that ISO adopt the BS 5750 as an international standard. It was named ISO 9001 with variants developed to cover the different types of companies (BSI, 2015).

In 2003, the Association for the Cold Chain Association (CCA) was created; in order to reduce waste, improve the quality and efficiency of the supply chain of the companies that carry out the distribution process, handling, and storage of temperature sensitive products (Cool Chain Association, 2016).

Companies that are part of the CCA identified that certifications as ISO 9001, are very general standards and do not specialize directly in the processes of the cold chain. This is how in 2004 the CCA created the standard for *Cool Chain Quality Indicators* (CCQI) and choose Germanischer Lloyd *Certification* (GLA) as an independent entity to certify companies that comply with the standard (Acuicola, 2008).

The CCQI standard has been developed to increase the quality of the cold chain of the organizations that carry out logistical operations of *Products Temperature Sensitive and Perishables* (PTSPs). It is an auditable management system, which is based on the risk assessment and management of the system (Cool Chain Quality Indicators, 2008).

The CCQI standard describes a quality management system consisting of two parts:

1. The CCQI indicators enable them to quantitatively assess the quality of the individual operations of the cold chain, such as: short and long term storage, transport in refrigerated vessels, truck and trailer transport,

platform handling, air transport, handling of refrigerated containers , among others. (Cool Chain Quality Indicators, 2008)

2. Cool Chain Quality Conformance (CCQC) Conformity with the quality of the cold chain describing the conformity that must be achieved (Cool Chain Quality Indicators, 2008)

Organizations that want to certify in this standard can do so in order to demonstrate the high quality of operations, reliability and the ability of an organization to process in the cold chain.

1.1.1 State of the Art.

In 2008, Wilson Riveros Lozano carried out a study titled *feasibility of an integral logistic operator for the management of the cold chain for frozen, pre-ready and frozen products at national level*. He did a general research on costs, transport, general aspects of storage, distribution, CCQI standards, etc., in order to reflect the current situation of logistic operators and to show to possible investors how viable the business is (Riveros, 2008).

A paper titled *new benchmarking approach in cold chain*, held at the Islamic UniversityAzad, Karaj Branch, Karaj. The main objective of this is to develop a model for the selection of the best sales agents as a point of reference (Shabani, Farzipoor & Mohammad, S., 2011).

A thesis of degree of the year 2012 of the Popular Catholic University of Risaralda was found, focused on the company EVE Distributions S.A.S, to make a proposal for the improvement of the management of the food cold chain. The purpose of the work was to describe and analyze the storage and transportation of medicines; In this study, reference was made to CCQI standards as a quality standard to

establish standards that serve as guidelines, standards or protocols for the management of cold chain medications (Castaño y Cadavid; 2012).

We also found a business plan developed by two students from the University of Santo Tomás in the city of Bogotá, where they conducted a study to create a logistic operation company in the fruit and vegetable cold chain, with a location in the department Of Cundinamarca. The Project develops a plan to implement integral solutions in the logistic operation of storage and distribution for the producer of fruits and vegetables at departmental level, taking into account the quality that must have this for the commercialization (Sanabria, Villamizar; 2015).

Marengo (2015), from the University of Valladolid in Spain, carried out a study in which the costs and operational difficulties involved in the creation of a company specialized in the management of the cold supply chain were studied. In order to carry out the analysis, the author created a fictitious logistic operator located in the central zone of El Salvador, establishing the main characteristics required by the logistics of the cold chain, such as the collection, storage, transportation, distribution, etc.

In the year 2016 an article was published entitled Improving cold chain systems: Challenges and solutions. This work is about the experience of the Clinton Health Access Initiative, Inc. (CHAI), which has been working with national immunization programs and partners to improve the vaccine cold chain in 10 countries since 2010: Ethiopia, Nigeria, Kenya, Malawi, Tanzania, Uganda, Cameroon, Mozambique, Lesotho and India (Ashvin, Brison & LeTallec, 2016)

Finally, an article was found in 2016, titled evaluation of time temperature integrators for shelf-life monitoring of frozen seafood under real cold chain conditions. The objective of this study was to evaluate the installation of a Time Temperature Integrator (TTI) in the cold chain, based on the monitoring of the

shelf life of frozen seafood, from production to the moment Of consumption. The TTI is a tool that can show in a measurable way the temperature and time changes that occur in the history of reading the temperature of a food product. A pilot study plan was carried out with the slices of *Prionace glauca* (type of fish). The results confirmed the applicability of TTI as effective indicators in the quality of frozen products during the cold chain (Tsironi, Giannoglou, Platakou & Taoukis 2016).

1.2 Problem Statement.

Due to lack of technology, infrastructure, ignorance of standards, little investment in training, bad processes in the links of the cold chain, among others, organizations dedicated to temperature controlled logistics, lose and waste 1.3 billion Tons of food worldwide (FAO, 2011) and FAO (2014) it is estimated that 6% of global food losses occur in Latin America and the Caribbean.

As Benitez (2014) mentions, "these losses and wastes affect the food system, reduce the local and global availability of food, generate less income for producers and raise prices for consumers" (par. 4)

To reduce losses and waste requires environmental conditions, regulatory frameworks and special handling during storage, distribution, packaging, transportation, loading and unloading until the final consumer.

There are currently standards that determine the requirements for a quality management system, which can be used by any type of organization. This is why a study of a logistic Operator of perishable products is carried out, in order to identify what certifications it has and the problems it has had during its logistics operation.

Mr. Norman Marín Monsalve Regional Operations Director of Ransa Colombia Colfrigos SAS of the regional of Antioquia reports that in the last 8 years the company has had problems regarding losses of merchandise of perishable products, which has been affecting economically the Company, as it has a margin of loss of 1% on its annual sales. The losses of goods have been presented due to the inconveniences that arise during the distribution, storage and delays of delivery of the merchandise.

¿ Can the company Ransa Colombia Colfrigos of the Regional Antioquia comply with the compliance requirements required by the International Standard CCQI, to contribute to the reduction of food losses in its distribution logistics chain?

1.3 Justification

The food losses and waste that are currently occurring in the world are considerably high, which affects not only producers and distributors, but also consumers.

To improve the quality of the links in supply chain logistics, organizations such as ISO and CCA (Association for the Cold Chain) have created several quality standards. However, it is important that the public and private sector invest in technology, infrastructure and implement good practices.

Quality management standards such as ISO 9000, ISO 9001, ISO 22000 and BASC Certification, can be used by any organization. For this reason it is necessary to use parameters unique to the cold chain processes.

In the interview made on September 5, 2016, the Director of the regional of Antioquia of Ransa Colombia Colfrigos, said that the company has a trajectory in the Colombian market for 33 years, however, they are not aware of the CCQI norms. For this reason we are interested in carrying out an investigation into the

logistic processes and the regulations implemented in the cold chain, in order to improve the quality standards, delivery times and service levels, thus reducing the losses that have occurred in Products that require an adequate temperature during their distribution.

Social Justification.

Due to overproduction, the imbalance of supply and demand and the inefficiency of the supply chains are factors that contribute to generate a considerable volume of waste. It can be seen that there is a missed opportunity on the subject of food waste, which could serve to feed the growing world population and could also help to combat hunger and improve the nutritional levels of the most disadvantaged populations (FAO, 2011).

The loss and waste of food generate a great environmental impact, by the amount of resources that are used for its production (earth, water, energy and others). When they finally do not reach the end of the supply chain (end consumer), it generates waste of time, money and manpower that affects all the links involved in the chain.

It was possible to identify Ransa Colombia Colfrigos S.A.S, for several years it has been making changes both logistically and administratively, in order to disminuir y control the waste generated during their operations of storage and transport of these products, thus increasing the profitability of the company and reliability to its customers.

Justification Staff.

As international business students it was surprising to find that about 1.3 billion tons of food are lost or wasted annually globally. For this reason we wanted to identify how efficient the handling, control and quality of this type of cargo (Perishable products) by the company Colfrigos S.A.S.

Also for us it will be gratifying to be able to contribute by reducing the food waste that we are generating from our homes, and to create awareness to our families of the great damage that we are doing to our planet and thus to take corrective actions in the treatment of products to the hour To buy, consume and waste.

1.4 Objective

1.4.1 General objective.

Make a qualitative diagnosis to the company Ransa Colombia Colfrigos S.A.S. Of the regional Antioquia, in the chain of cold used for the storage and transport of perishable products, based on the requirements of quality of the conformity with the cold chain of the international standard CCQI.

1.4.2 Specific objectives.

- To know the strategies that have been implemented by the countries, public and / or private organizations and Ransa Colombia Colfrigos of the Regional of Antioquia, to reduce losses and food waste.
- To know the logistic processes carried out by the company Ransa Colombia Colfrigos of the regional of Antioquia in the cold chain.
- Identify the required compliance requirements required by the normal CCQI for cold chain processes.
- Determine if the company Ransa Colombia Colfrigos of the regional Antioquia complies with the compliance requirements required by the CCQI standard.

1.5 Methodological framework

1.5.1 Method.

To make this diagnosis, the qualitative method will be used, where it will be possible to analyze if the company Ransa Colombia Colfrigos of the regional Antioquia, complies with the standards of conformity (CCQC) required by the international standard CCQI. In order to carry out this activity, the Director of Regional Operations of Medellín was contacted in order to provide the necessary and valid information to carry out this diagnosis.

1.5.2 Methodology.

Collection of Primary Information: To obtain truthful information, several visits were made to the company Ransa Colombia Colfrigos of the regional of Antioquia, where a structured interview was made to the Director of Operations of this region, which provided first-hand information on all the processes and activities used Within the Headquarters, thus obtaining real and updated information.

Collection of information Secondary: The information was collected through thesis of degrees, logistic magazines, and internet, since they are tools that allow us to know the current state of standards, processes, requirements, etc., in the logistics of the cold chain.

Field work: For this investigation interviews were conducted, this method allowed to collect first-hand information on the logistic processes of the company Ransa Colombia Colfrigos of the regional Antioquia.

1.6 Scope

The present work seeks to make a diagnosis to the company Ransa Colombia Colfrigos S.A.S (regional Antioquia) with respect to the cold chain processes that manage based on the international standard CCQI, which is divided into two parts:

The first part provides a quantitative evaluation by comparison of indicators called CCQI, which are adapted to each type of logistics operation in which perishables are managed. Among the operations we can find: transport, storage, distribution center, port terminal.

The second part describes the mandatory requirements that must be met by the company and its cold chain management system in order to be considered compliant by the standard, this second part takes its name CCQC - *Cool Chain Quality Conformance*.

It was decided to perform the diagnosis only the second part (CCQC) of this standard, due to the fact that there is very little time to perform the complete diagnosis, which includes the quantitative part of the quality of the company's operations.

With this study we will determine if the company Ransa Colombia Colfrigos S.A.S (regional Antioquia) complies with the requirements of Quality Compliance of a cold chain (CCQC) that requires the CCQI Standard. This will allow us to offer the company suggestions for improvement in the processes.

2. Project execution.

2.1. Theoretical framework.

2.1.1. Good practices for the implementation of cold chain logistics.

The cold chain is the logistic process that ensures adequate temperature during refrigeration, freezing and deep freezing for the preservation of perishable products in storage, distribution and transport activities (Pelayo, 2011). It is important that in all the links of the chain, proper control and supervision is carried out to ensure that perishable products arrive in good conditions to consumers, in a way that does not cause damage to health and also reduce the problem of Losses and wastes currently present (Procolombia, 2014).

The application of the cold is the most important factor, since this allows to diminish the alteration of the physical-chemical properties of the perishables. If during the storage, transport and distribution platform process, there is no proper control of the cold temperature, there may be problems that directly affect the product, such as the growth of pathogenic microorganisms that are hazardous to health, which can cause Intoxications and microorganisms that alter the composition of the product (Pelayo, 2011).

For this reason, logistic operators and companies in the cold chain sector must have specialized cold stores, adequate infrastructure and software that allows them to control the temperature in real time. In addition to highly trained personnel to handle, monitor and record all processes in the logistics chain (Pelayo, 2011).

The space where the perishables are stored must have a properly structured design, taking into account factors such as: product typology and cold levels. The space must be adequate for the distribution and preparation of the orders, in

addition the cavas should not remain long open and the loading and unloading of the perishable products must be carried out immediately (Navarro, 2013- B).

It is important that the products remain stored on plastic stools and shelves, otherwise you cannot over fill the cold store because it would make it difficult to clean and circulate the cold air, it should be inspected, labeled and dated products entering storage.

Transport is one of the stages, where there are also inconveniences that cause the loss of perishable products, to ensure an optimal process, should take into account aspects such as proper classification of vehicles, refrigeration equipment, perform preventive maintenance To equipment of the cold, to maintain properly the cleaning conditions and the products must be distributed in a way that does not hinder the cold (Navarro, 2013- B)

2.1.2. Initiatives to reduce losses and waste in the world and some Latin American countries.

FAO and IICA (Inter-American Institute for Cooperation on Agriculture) recommend improving regulatory frameworks, creating strategic alliances between the public and private sectors, and increasing investments and incentives (Mazariegos, 2016).

In 2011, the SAVE FOOD initiative was launched to reduce food losses. The Food and Agriculture Organization of the United Nations, Messe Düsseldorf GmbH (trade show organizer) and Interpack (packaging and processing fair) have invited organizations from the Chain of food supply to join the Save Food campaign, to contribute and unite the worldwide effort to reduce food losses and waste (FAO, 2016).

In 2013, a project was initiated in Argentina called food preservation technologies and by-product utilization, which has a duration of 6 years, with the objective of coordinating, implementing and proposing policies that address the effects of

losses and waste of foods. One of the lines of work is to deepen the diagnostics in storage and transportation infrastructure that contribute to the reduction of food losses in the postharvest and distribution stages (FAO, 2015, p. 10).

In January 2015, the CELAC (Community of Latin American and Caribbean States) Action Plan for Food Security, Nutrition and Hunger Eradication 2025 was approved in Costa Rica, which was requested by the community to FAO. The measures included in this Action Plan are: to promote the improvement of infrastructure in transport, energy and market facilities and to promote development and facilitate access to the equipment of new technologies and innovation to reduce the losses of Food in the stages of the chain (FAO, 2015, p. 5).

The Mexican government created the Food Loss and Merck Group to minimize post-harvest losses of food during transportation, marketing, distribution and storage. (FAO, 2015, p.26). The main causes of food losses and waste in the value chain are lack of certification, lack of quality standards, lack of infrastructure and untrained personnel. Among the action plans that can be implemented are: to incorporate specialized teams, to improve infrastructure and to carry out trainings (FAO, 2015, p. 27).

2.1.3 Initiatives to reduce losses and waste in Colombia.

On November 25, 2016, a strategy called "Zero Waste" was presented at Corabastos to reduce food waste and waste in Colombia, in order to create partnerships between the public and private sectors and to promote good practices and improve Marketing chains (FINAGRO, 2016).

FINAGRO (Fund for the Agricultural Sector) in partnership with Banco Agrario de Colombia, offer financing alternatives for producers to submit projects for

improvements in sowing, harvesting, distribution and marketing practices, contributing to the reduction of losses and wastes Of food (FINAGRO, 2016).

The DNP (National Planning Department) is working on best practice recommendations for the productive sector, cold chain, logistics, transportation and awareness-raising for marketers (Medina, 2016).

In terms of technology, Kerberus Ingeniería S.A.S, which has been a company dedicated to the services tecno surveillance, developed a system called spin-off KerberusFrio, which consists of a LoT platform for protection of cold chain. At present they have more than 400 sensors monitored, which have allowed the reduction of losses for its customers by 31% per year (Dinero, 2016).

2.1.4 Methods implemented by Ransa Colombia Colfrigos of the regional of Antioquia to reduce losses.

According to Mr. Norman Marín Monsalve Director of the regional, he informed that the company was certified more than 10 years ago in ISO 9001, in 2007 it is part of the *World Food Logistics Organization (WFLO)* Association and Since 2008 has been constantly working on training topics for all staff, follow-up on quality indicators, control in cold chain processes, implementation of new technologies and the due applicability of ISO 9001 in their processes.

Since 2013 the company began to reduce its losses and by 2017 the margin of losses will be 0.8% on its annual sales.

2.2 Research development.

2.2.1 History of Grupo Ransa Colombia Colfrigos S.A.S.

According to the operations director of the company Ransa Colombia Colfrigos de la Regional de Antioquia reports that Colfrigos has a trajectory in the market, 33 years ago was born as a union within which was the National Committee of Coffee Growers, who had the idea of Have cold storage warehouses in the city of Bogotá, started with flower storage, fishmongers, among others. For 30 years I seek to be recognized as a great store.

In 2007 a Financial Holding called Grupo Altra Inversiones, had a business idea which consisted in the creation of a great national operator in the subject of cold chain; For the creation of this project, it bought three companies: Colfrigos as a large warehouse located in Bogotá, Provisions and Services of the Caribbean, which was a logistic operator handling cold items with head office in Barranquilla and branches in Bogotá, Cali and Medellín, and lastly A food transporter company called Transportes Refrigerados de Colombia (TRC). By purchasing these three companies, the national expansion project is formed. In 2013, the sale negotiation with the Peruvian Ransa group was closed, this is a logistic operator with more than 75 years of experience in integral services and specialized logistics solutions, the Ransa group has more than 3 million square meters in Infrastructure and with nearly 7,000 employees, making it a multi-lingual company with presence in 7 countries (Colfrigos, 2016)

After this negotiation, the company was renamed Ransa Colombia Colfrigos S.A.S, offering the services of integral logistics solutions specialized in cold chain at national level. It also offers logistic services for dry loads if any customer requires it (Colfrigos, 2016)

The company Ransa Colombia Colfrigos has its own facilities, but its entire fleet of trucks is outsourced, this meets all the standards and requirements required by the Colombian transport ministry for the national mobilization of vehicles. Also, it counts on personnel trained for the logistic processes and with equipment of high technology that allows the constant control of the storage and distribution of the perishable products (Colfrigos, 2016)

2.2.2 Quality politics.

Ransa Colombia Colfrigos is a company that works constantly to improve logistics processes based on quality management systems. You can identify the business commitment that this organization has with its employees and customers. It is also committed to meeting quality standards, both internal and legal.

2.2.3 Logistics processes in the cold chain of Ransa Colombia Colfrigos S.A.S

On September 05, 2016, an interview is made to Mr. Norman Marín Monsalve, Director of the Regional Antioquia, which explains the services and processes of the cold chain provided by Ransa Colombia Colfrigos.

The activity of the company is governed within the regulatory framework of decree 3075 of 1997, which deals with companies or legal organizations with activities on perishable products that may generate risk factors for the consumption of these. (Decree 3075, 1997)

Ransa Colombia Colfrigos currently has the following operations known as:

Integrated logistics.

From receiving merchandise, warehousing, inventory management, packaging and distribution, both locally and nationally. It also provides maquila and / or cargo labeling services to companies that carry out foreign trade operations, this service is done inside the storage chambers and invoiced to customers.

Carrier Company.

This is known as Colfrigos Cargo, through which it provides the transport service for logistics between cities, from ports to the interior of the country or from the interior to the ports. Currently Ransa Colombia Colfrigos at national level only provides ground transportation service. It has at its disposal a heterogeneous fleet of vehicles whose capacity varies from a ton (Luv truck) to 28 tons (tractor trucks). These vehicles have units of conservation called Thermo king, the units that are independent work with Diesel, but there are others that depend directly of the unit of the vehicle. The vehicles used locally are the Luv, NHR, NKR, DPR and at national level simple trucks, double shift and tractor truck are used.

Within the transport company, there are some areas in charge of verifying the requirements that must be met by vehicles that are linked, that is, verify that the documents of the vehicle and the driver are complete and are not overdue, drivers must be Hired in a formal way, that the staff is trained, among others.

To guarantee the conditions of the vehicles there is a strategic plan of road safety, which has established several formats. The state of the vehicles must be inspected daily. Quarterly mechanical follow-up is carried out with a company that guarantees the condition of the vehicle (Certified Workshop), every two months, the Thermo king (maintenance unit) is revised to guarantee the cold conditions, at this time Ransa Colombia Colfrigos created several formats that Must be performed to ensure that the vehicle is in good condition.

Lines of business.

They currently serve companies such as Success, Jumbo Cencosud, Olympic, Consumption, Euro, Vaquita, Frisby, Kokoriko, among others. Within the line of business is the consolidation of perishable cargo.

The clients of Ransa Colombia Colfrigos deliver their load and this is in charge of the distribution; Consolidate cargoes from Medellín to the Barranquilla, Cali and Bogotá platforms; In the Coffee Hub there is no distribution zone, for that reason the caga is consolidated and dispatched in the vehicles.

Colfrigos also provides the service of labeling (Maquilas), labeling, counts of units as required by the client, thus generating added value to the service rendered

Inventories.

Within the overall inventory process, Ransa Colombia Colfrigos uses the Cross Docking distribution system. This system is responsible for receiving the logistic units in an enlistment platform and prepares them to be sent immediately.

They currently have a Warehouse Management System (WMS) called Sislog, this system gives the possibility of handling information through radiofrequencies and software that allows the traceability of incoming merchandise, which is stored and exits.

With many customers, the model for sending inventory information through e-mail has worked. When you have a stabilized inventory, that is, there is a high degree of reliability between the physical and the theoretical, an option is activated in the system so that the customer receives an email every day with the stocks that are in Colfrigos. When there is no defined inventory, what is done are weekly theoretical inventories or when the inventories are smaller, the daily information is sent, but the weekly and monthly inventory is generally used.

Storage.

Ransa Colombia Colfrigos currently manages an indicator of rotation in storage, which is between 6 and 8 days at the most in platform, since the vast majority of products are refrigerated, and these only have a shelf life of 8 or 10 days.

When a due process of storage is not done the products are damaged and what they must do is to throw the ones that are in bad condition and / or donate those that are in good condition.

Distribution.

In the distribution of the products, continuous monitoring of the temperatures during their mobilization is carried out. This is done by a traffic department that operates 24 hours. A satellite system is used to monitor the double shift, simple and tractor vehicles and for urban vehicles, the Locta device is used, which controls the temperature, which, each time the drivers pass to settle a freight, information about the temperature controls During the tour.

In the distribution centers there is an internal satellite system and software, which are adapted to the compressors that provide information every 20 minutes of the sequence of temperatures and alarms on blackouts.

Personal.

It is established that all staffing is firstly outsourced through temporary companies, which act as providers of this service. The company Ransa Colombia Colfrigos defines the profile for the position or place of work and the temporary company is in charge of making the evaluation and selection of the applicants according to the profile sought by Colfrigos.

After the staff completes a year working with the company, a performance evaluation is made that the company has had in that period. If the person meets the required level of performance, he or she will be hired directly by the company

Colfrigos to an indefinite term. Ransa Colombia Colfrigos gives the opportunity to employees who are in the process of training or have an advanced level of business knowledge, to ascend within the company.

All personnel who are exposed to low temperatures within the processes of the cold chain, must count a caloric compensation between 5 to 10 minutes for every 2 hours of work, having at least one snack with a hot drink, this is supplied by The company (Colfrigos).

Training and staff training.

General trainings are carried out for all the personnel in general, first it is done when entering the company. People are constantly being fed back. There are no stipulated dates of training because these are made according to the need you have at the time.

An induction talks about BASC certification, BPM (Good Manufacturing Practices) and finally the processes of reception of goods, inputs, storage, enlistment and consolidation.

For a training process they focus on different business processes, what is done is that in a single block the general information is given and then feedback is fed back.

Certifications.

The headquarters of Bogota is certified in ISO 9001 and BASC, the regional are not certified. The certifications are in the headquarters of Bogota, which makes the parent company that homologates processes for the regional ones. The regional ones from the intranet can download the formats of the company, they can review the internal processes, the complaints and claims of the clients, among others.

All that starts from logistic processes, in terms of assembly of distribution centers, infrastructure conditions and installation, do not have a dependency, but if from the technical subject must comply with a specific rules based on the WFLO.

Audits.

The Quality Department constantly audits the processes of Colfrigos according to the certifications of ISO 9001 and BASC.

Ransa guideline Colfrigos Colombia.

In the regional ones are the Directorates, such as the Director of Operations, Director of Quality, which supports and depends on each of the National Directorates and Directorates, which are located in Bogota-Colombia. The National Management and Management, such as: Commercial Management, Operations Management, General Management, Human Resources Management, Quality Management, Transportation Management and Security Management located in Bogotá-Colombia depend on the Peruvian Management, Where is the main headquarters of Ransa.

Containers.

Ransa Colombia Colfrigos does not have refrigerated containers, since to mobilize a container of this type at national level is too expensive. For this reason, the best way to mobilize the loads is to provide the tractor service with all the required conditions, which when arriving at the customer's production plant, load all the pallets and transport the merchandise to port and there they pass the merchandise To a container provided by the shipping company.

System of Complaints and Complaints.

Ransa Colombia Colfrigos has a logistics system (SIL), which loads all the billing information that is en route, stores the information of the license plate and the name of the driver with which the load is to be mobilized and at the end when the

Reception of the trucks, the information of the novelties is saved. At the end of this process, the logistic system generates automatic mails to the clients, informing in detail the presented novelties.

Liability for claims issues.

All goods that Ransa Colombia Colfrigos carries are protected by storage policies and transportation policies. As they are so delicate products, they have a high risk of alterations in their physical properties, for example, if there is a problem with the thermo king during the distribution process, the company is trying to transbordar or accelerate the arrival of That vehicle to its destination, however, it can happen that by this delay the merchandise deteriorates.

2.3 Cold Chain Conformity Requirements (CCQC).

As mentioned above, the CCQI standard is a quality management system for companies specializing in cold chain processes, which is divided into two parts. The first part focuses on CCQI indicators to quantitatively assess quality Of chain operations such as: short and long term storage, transport in refrigerated vessels, truck and trailer transport, platform handling, air transport, handling of refrigerated containers, among others¹, and the second part describes the conformity to be achieved with the Quality of the cold chain (CCQC).²

This paper focuses on the second part of the CCQI standard, which is why we mention below the requirements of the cold chain compliance that must be met by any organization, which are specified in number 5 of the standard *Cool Chain Quality Indicators* (CCQI), Version 2.0 of February 15, 2008, which in Spanish translates Quality Indicators of the Cold Chain. These requirements were created in order to improve the transport processes of perishable products, to specify the

¹ For more information consult the International Standard CCQI, version 2.0., 15-02-2008.

² For more information consult the International Standard CCQI, version 2.0., 15-02-2008.

mandatory and recommended practices to apply to the management of the cold chain.

The first requirement is about the organization's policy, which is based on establishing an appropriate policy for the cold chain and must be known by all employees of the company, must include a commitment to staff training and a commitment with the continuous improvement of the cold chain. In addition their suitability must be reviewed at least every year.³

The second requirement refers to the mandatory activities and control of the conditions of the Cold Chain. The organization must demonstrate that the perishable products they handle are received by the customer with instructions on the temperatures or ranges required for storage and / or distribution, and these instructions must be supplied to all subcontractors handling perishable products. The temperature measurements must be verified with the conditions established by law.

As for dangerous perishable products the organization can only accept if it has appropriate equipment, the training necessary for its handling and must store them in separate spaces of other perishable products.

Personnel handling perishable products must have adequate training. Equipment where stored and transported perishable products must be clean before use.

The points specified above must be documented in the internal manual of the organization.⁴

³ The requirements are specified in numeral 5.1 of the CCQI, version 2.0., 15-02-2008.

⁴ The requirements are specified in numeral 5.2 of the standard CCQI, version 2.0., 15-02-2008.

The third requirement is training. At this point the organization must have the list of personnel that is related to the cold chain and it must be competent in its training, skills and experience. In addition for each operation must have the listing with the data of the type of operation, geographical location and number of people employed.⁵

The fourth requirement indicates that the senior management should appoint a director of the cold chain who must have the authority and responsibility capacity to fulfill the required cold chain process obligations. Ensuring that every year audits are carried out, that the quality management system indicators are documented, established, implemented and maintained, and that the management of the quality management system's cold chain is informed in writing.⁶

The fifth requirement refers to suppliers and subcontractors of the cold chain. The organization must select suppliers and subcontractors with the necessary capacity to handle the perishable products that require the cold chain. The management of the organization must elaborate the cold chain requirements for each supplier or subcontractor who does not have a CCQI certificate and the organization must evaluate the capacity of suppliers and subcontractors and the Management should review this evaluation annually. The above mentioned points must be saved.⁷

The Sixth Requirement is about claims, nonconformities and customer complaints; these complaints, claims and nonconformities to the cold chain must be recorded and analyzed to determine the causes and preventive actions that must be taken to improve the processes of the cold chain and decrease the nonconformities by the customers.⁸

⁵ The requirements are specified in numeral 5.3 of the CCQI standard, version 2.0., 15-02-2008.

⁶ The requirements are specified in paragraph 5.4 of the CCQI standard, version 2.0., 15-02-2008.

⁷ The requirements are specified in numeral 5.5 of the CCQI standard, version 2.0., 15-02-2008.

⁸ The requirements are specified in numeral 5.6 of the CCQI standard, version 2.0., 15-02-2008.

The seventh requirement is focused on the documentation of the cold chain system and the records that show the results of the activities carried out. The documentation will be controlled and both the documentation and the requirements will remain legible and identifiable. The temperature records will be archived for 18 months and the other records for at least three years.⁹

The eighth requirement indicates that the organization's internal audits should be carried out annually and an audit program should be carried out to ensure that all areas where the cold chain activities are carried out are audited. Auditors may not audit their own work.¹⁰

The ninth requirement is that top management reviews the Cold Chain Management system annually and before the external audits, including CCQI cold quality indicators. In addition, the Directorate of the cold chain must make a report in which external audits are recorded, the evaluation made to suppliers and subcontractors, analysis and preventive actions on complaints, complaints and nonconformities, evolution of Quality Indicators Of the chain of the cold and finally the evaluation on the opportunities of improvement and changes in the politics of the organization and in the system of management of quality of the chain of the cold.¹¹

⁹ The requirements are specified in numeral 5.7 of the CCQI standard, version 2.0., 15-02-2008.

¹⁰ The requirements are specified in numeral 5.8 of the CCQI standard, version 2.0., 15-02-2008.

¹¹ The requirements are specified in numeral 5.9 of the CCQI standard, version 2.0., 15-02-2008.

2.4. Application verification of the CCQC cold chain conformity standard.

2.4.1 Results interview of Ransa Colombia Colfrigos de la Regional Antioquia.

In order to determine if the company Ransa Colombia Colfrigos of the regional Antioquia complies with the compliance requirements required by the CCQI standard, a second interview was conducted with the Regional Director (See Annex 1), which yielded a positive result in terms of Requirements required by the standard.

According to the requirement of the policy, the company Ransa Colombia Colfrigos of the regional of Antioquia, has policies that ensure a high standard, are appropriate to achieve awareness and improvement of the quality of the cold chain and annually is Revised its adequacy. The policies that the company has must be known by all employees, when a person enters to work with the company Ransa Colombia Colfrigos, they are made known and explained the policies.

On the other hand, the instructions and / or temperature ranges supplied by the customer are properly documented and compared with the requirements required by law. Documents that are provided to all subcontractors, such as instructions for handling perishable products, should contain temperature ranges. In addition, the company informs the customer that only products that are between the ranges or temperature scales are received, as follows.

- Refrigerated products: between 0 ° C and -4 ° C.
- Frozen products: between -15 ° C and -18 ° C
- In certain cases, the goods can be received at least -10 ° C.

They also define and document the points and steps for the acceptance of the products, carry out visual inspection of the packaging, checking for damages, conformity and verification that all documents supplied contain and contain the precise information. Deviations from the prescribed conditions, Ransa Colombia Colfrigos of the regional of Antioquia inform the responsible of the cold chain.

To document the operations, Ransa Colombia Colfrigos has an internal manual, which is required for external audit issues made by the Ministry of Transport, Secretary of Health, INVIMA, BASC officials, ISO officials. Sometimes, clients can also perform audits of the company's facilities.

Currently, the quality area of the company is in charge of controlling obsolete documents and control the distribution of documents of external origin.

The documents and the temperature records of the activities and results of each process are preserved for more than 4 years, according to the case of importance and the request of the client. In addition, the company can store all the information regarding the cold chain provided to its customers, so that when this client requests this information can be supplied. The information can be stored in a period of between 6 months and 5 years; As agreed with customers. You can also save this information for your own use in internal and external audits.

In relation to the management of perishable products is given in a general and standardized way. The process of entering merchandise to the refrigerators, is given by means of a bridge where the temperature is controlled and the vehicles that arrive are received by the operators, they carry out the unloading operation until the storage place in the cellar, Same happens but in reverse with the exit operation. The operators carry out the emptying of the inventory until the loading bridges so that these can be transported to the destination places.

The company does not transport products that it considers dangerous or allergens, since these can easily contaminate the others and due to this, it is a policy not to transport these. Nor does it carry seafood such as: fish, shellfish, among others and beef in the canal, due to its complex handling and prefer to leave it to companies specialized in the transportation of these products.

Regarding the cleaning of its storage facilities, the company does it every month with specialized liquids that allow to control or lower the pH of the environment.

On the other hand, the temperature of the refrigerator is always in constant monitoring and has an alarm system that is turned on when the temperature in some sector is failing.

It is important to note that all personnel working in Ransa Colombia Colfrigos and that is related to the cold chain, is competent according to their education, training, skills and experience. For this, they constantly train, train and induce on issues related to the logistics operation, which are performed in general for all employees involved in these processes and also keeps a record which is properly archived. The training is carried out in order to improve the quality of its operations and the equipment it has. In addition the equipment they use are properly programmed to meet the demands concerning temperatures.

For a greater control Ransa Colombia Colfrigos has all the information of the personnel that is involved with the processes of the chain of cold, that is to say, if for some eventuality it would need the contact of a specific person would not have problems for its location.

On the other hand, communication in the distribution process is given by means of cell phones where drivers are in constant communication with the logistics area. It is important to clarify that the entire transport fleet of Ransa Colombia Colfrigos is

outsourced. They are currently in the process of implementing software that allows the information to be uploaded to a management system.

Currently the company has a Director in each regional and these are named from the central in the city of Bogota. The Director of each regional must ensure the proper functioning of the plant and every three months must make a management report to the top management. This report has the consolidated information of the results in that period, you can find in the report the amount of tons handled, level of service, amount of complaints presented by customers, among others.

The company makes the necessary requirements, relative to the cold chain to suppliers and subcontractors, in order to comply with the quality standards that the company handles, in order to comply with this, mainly request documentation to create them as customers (Chamber of Commerce, Rut , Verify the capacity of indebtedness, among others).

The organization also selects suppliers and subcontractors who have the necessary capacity to carry out the processes of the cold chain by contracting a third party who carries out an evaluation to verify that they meet the necessary requirements to handle perishable products .

The person in charge in the regional Antioquia to carry out the supervision of suppliers and subcontractors is Diego Alejandro Mejía of the area of quality, that based on the quality standards that the company determines the acceptance or non-acceptance of merchandise.

Regarding the relationship with customers, Ransa Colombia Colfrigos of the regional of Antioquia, manages a good relationship, from the sale until the negotiation is sold as a strategic ally, giving the client the tranquility to be freed of

the logistic load and Which are still dedicated to their production and marketing of their products. It also seeks to establish a long-term relationship.

The most common problem when it comes to delivering or receiving merchandise, is the temperature related. Other problems can be generated by external factors such as strikes, strikes, demonstrations, among many others. This clearly affects the level of customer service.

Because of the previous problem. Ransa Colombia Colfrigos manages a registry of complaints of nonconformities made by its clients, takes control from issues of indicators of complaints and complaints, where they document the nonconformities of the clients, which are controlled weekly and monthly. Currently has a goal, which consists of not exceeding 12 complaints per billions of pesos billed, although it is not yet meeting this goal the idea is to always be constantly improving.

The company makes action plans to mitigate problems where its cold chain is affected. The action plan seeks to learn from error and not to commit it again in future processes. The most common complaint presented, is the delay of the shipment of the merchandise or that arrived a little late at the customer's place.

Once a month, the company performs internal audit in the logistic processes, this does it to maintain its high quality standard. This process is performed by the quality area and the maintenance area.

The company's senior management reviews the cold chain management system annually, the report includes the results of the audits, the assessments made to suppliers and subcontractors, including the report on the evolution of the quality indicators of the company. Chain of cold, evaluations on the opportunities for

improvement and needs for change in policies regarding the management of quality of the cold.

Finally, it is important to note that Ransa Colombia Colfrigos Regional Antioquia does not yet invest in R & D for the continuous improvement of its cold and logistic processes, this is done directly by the company at the headquarters in Perú.

3. Findings

In the investigation carried out to the company Ransa Colombia Colfrigos of the regional Antioquia, it is possible to identify that it has strengths, threats, opportunities and weaknesses which can allow a high degree of conformity with respect to the international standard CCQI. The following are the main aspects:

Strengths:

- Establish a clear and committed policy for the improvement of the cold chain, always seeking to be one step ahead of competitors.
- Control of the documentation. The company keeps all records of the processes performed and record all temperature ranges, in order to have evidence, in case there are future problems with a client or perform internal or external audits.
- Trained staff. The personnel that is directly related to the logistic processes, have the skills and the experience for the manipulation of the equipment and the perishables.
- The adequacy of the equipment for the handling of perishable products, as the company cleans the equipment before they are used, to ensure that one product is not contaminated with waste from another.
- The system of complaints and complaints that the company has for the customer service channel, which allows to measure the management of the company and improve its processes.
- Good relationship with customers and service providers.

- They have a responsible Regional Director with authority to ensure the continuous improvement in the processes of the cold chain. It also complies with the delivery of a report to senior management on audits, analysis of complaints and evolution of the quality indicators that were presented in a certain period of time.

Opportunities:

- Growth in the certification of quality standards. The company currently complies with the necessary processes to implement and improve the processes of the cold logistics chain.
- Thanks to the company's experience in the market, they could be members of organizations representing interests in the cold chain.

Weaknesses:

- Lack of infrastructure for the handling of perishable dangerous products.
- Lack of refrigerated containers for the handling and transportation of products.
- Lack of capacity in infrastructure that causes the loss of customers and the attainment of new businesses.

Threat:

- Faults in the technologies implemented for the control of the temperature during the transport of loads.
- Truck stoppages that occur continuously in Colombia. Due to this there are delays in the delivery of cargo, directly affecting the product and indeed the company and the customers.

Thanks to the due process and follow-up that the company Ransa Colombia Colfrigos of the regional of Antioquia, realizes to the norm ISO 9001, to the trainings, the indicators, complaints and claims of clients and to the

implementation of new technologies and software that allows them to take a Better control of the merchandise and temperatures, managed to reduce the margin of losses of 1% to 0.8% on anual.

In an analysis of the second part of the international standard CCQI, on the requirements of the Conformity of the CCQC cold chain and the processes currently carried out by Ransa Colombia Colfrigos of the regional of Antioquia, it was possible to determine that the company complies fully With each of the specifications in terms of policy, mandatory activities / cold chain condition control, training, authority and responsibility, suppliers and subcontractors of the cold chain, claims, nonconformities and customer complaints, control of Documentation, Internal audits and review of the system by the management.

4. Conclusions and recommendations.

4.1 Conclusions.

- The standard of quality indicators of the cold chain (CCQI), have been developed in order for companies in the cold logistics sector to improve and evaluate their processes.
- Due to the growing distribution of perishable products, several organizations and standards have been created that support companies in the cold chain sector to improve their logistics processes.
- When conducting the interviews with Ransa Colombia Colfrigos, it was possible to identify that if a company controls, supplies, invests in technology and infrastructure and performs due process in the cold chain of perishable products, it can reduce a problem such as loss and Food waste.

4.2 Recommendations.

The certification in the international standard CCQI would be a differentiating factor for the company Ransa Colombia Colfrigos S.A.S. If this company decides to apply and obtain such certification, it will be able to acquire a clear competitive advantage over the other companies in the specialized cold logistics sector of our country, and it should be mentioned that it would be the first, which would give high quality status to The organization, since its customers and control entities would look with great kindness the management and implementation of this certification in order to guarantee perishable products of first quality and a great added value.

Taking into account that this work was done on the basis of compliance requirements (CCQC), it would stand for other groups to conduct the first part investigation based on the quality indicators of the CCQI standard, which qualifies quantitatively the Quality of operations in the cold chain and in this way determine if the company Ransa Colombia Colfrigos of the regional of Antioquia meets all the requirements of the standard, to carry out the certification process.

It is extremely important that producers, marketers and consumers become aware of the large amount of food lost and wasted in the world. We are talking about 1.3 billion tons of food worldwide.

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ANNEXES.

ANNEXE 1. Results of the interview of the company Ransa de Colombia Colfrigos..

INTERVIEW - RANSA COLOMBIA COLFRIGOS S.A.S	
Saturday, October 07, 2016	
Full name of the company or organization: Ransa Colombia Colfrigos S.A.S	
Location (Locality - Department): Sabaneta – Antioquia	
Name of person interviewed: Norman Marin Monsalve	
Relación laboral: Director Regional	
Teléfono contacto: 309 74 88 – 320 803 0263	Correo electrónico: nmarin@colfrigos.com
<p>1. ¿What policies to ensure a standard standard for the cold chain?</p> <p style="text-align: right;">Please tick X one of the following:</p> <p>(x) Yes () No</p> <p>Observations: All personnel are trained and trained in cold chain issues, to ensure the best quality possible at the time of operations. The equipment used must be properly programmed so as not to break the temperature requirements.</p>	
<p>2. ¿Are the policies known to all employees involved within the chain?</p> <p>(x) Yes () No</p> <p>a. ¿ Are policies appropriate for raising awareness, improving the quality of the cold chain and maintaining controlled temperature conditions? Answer: Yes</p> <p>b. ¿ Does it include commitment to training staff working in the cold chain? Answer: Yes</p> <p>c. ¿ Does it include commitment to the continuous improvement of the cold chain? Answer: Yes</p> <p>d. ¿ Is its adequacy reviewed, at least during the annual review of the management system? Answer: Yes, All this is done by the quality area.</p> <p>Observations: The quality area is in charge of making the pertinent updates according to the external policies that are issued by the control entities. This makes the company internally, is updated to carry out its activities.</p>	

3. The company records the following documents:

- a. They document the temperature instructions or temperature ranges supplied by the customer and compare them with the requirements required by law and other conditions.
Answer: Yes
- b. They provide all subcontractors with the instructions for handling their perishable products, with temperatures or temperature ranges.
Answer: Yes
- c. They define and document the points and steps for the acceptance of the products.
Answer: Yes
- d. They carry out visual inspection of the packaging and the check of damages and conformity, and check that all the documents supplied have and contain the precise information.
Answer: Yes
- e. Due to deviations from the prescribed conditions, you inform the person responsible for the Cold Chain.
Answer: Yes

Observations: All this is called traceability and part of technical data sheets, the customer provides information on how their cargo should be handled and is settled between the agreements or the service level agreement (ANS). If the customer needs information on loads that have already been delivered in days, months or even years, the company (Colfrigos) is able to supply that information to the customer. By documentary theme, they can keep in inactive file information from 6 months up to and including 5 years.

4. ¿ How is the handling of perishables?

- a. ¿Will the organization only accept hazardous PTSP (Permeable Temperature and Perishable Products) products if qualified applicable training has been provided and appropriate equipment is available?
Answer: Yes
- b. ¿ if hazardous products are accepted, they will be stored in separate spaces of other PTSPs?
Answer: Yes
- c. ¿ Does the organization accept frozen PTSP only if it has adequate refrigeration equipment?
Answer: Yes
- d. ¿ Does the organization store and segregate PTSP as its internal documents recommend?
Answer: Yes
- e. ¿ Does the organization provide appropriate training to personnel involved in PTSP processes?
Answer: Yes
- f. The equipment will be clean and free of dirt and odors before use. Any irregularities in

these will cause the equipment to be rejected and recorded.

Answer: Yes

- g.** ¿ Is the storage temperature recorded while short-term or long-term perishables are being stored?

Answer: Yes

- h.** ¿ The capacity of refrigerated container containers should be specified in terms of maximum number of refrigerated containers and type of goods?

Answer: Not applicable, since Ransa Colombia Colfrigos has no containers

Observations: Ransa Colombia Colfrigos restricts the transport of perishable products allergens. These products are those that can provoke allergies to their collaborators and, as stated by Mr. Norman Marín these products can be those like fish that can have a high PH, products with high flour compositions, egg percentages, among others Must store them in another place, so that it can not contaminate the other products that are in storage, this in order not to be sanctioned by the INVIMA.

Ransa Colombia Colfrigos carries out environmental inspections, taking samples in the areas where the logistic operations are carried out, in order to carry out the measurement of the bacterial load. This measurement is done monthly, but the cleaning of the areas is done weekly with sprays of products compatible with food, taking the greatest precaution possible. The products used for cleaning, act as nebulizers to lower the load of bacteria that may be on the stools or shelves.

Colfrigos does not transport vaccines, at some point in the past I manage it but by decision of the top management it stopped providing the service.

5. ¿ Does the company perform internal audits to review its processes?

() Yes () No

- a.** ¿ How often do they do it?

Answer: once a month

- b.** ¿ Who does it?

Answer: Currently the head of quality, Mr. Diego Alejandro Mejía and the head of equipment maintenance Mr. Edwin Andrés Acevedo.

Observations: The processes they review include all administrative and cold chain processes.

6. ¿ Does the company have an internal manual documenting operations for external audit issues?

Yes, the company has an intranet access where you can find all the information about processes, formats and documents.

¿ What is the organization that performs external audits?

Answer: The Ministry of Transport, Secretary of Health, INVIMA, BASC officials, ISO officials.

Observations: Clients may also perform audits to the facilities of Ransa Colombia Colfrigos and is stipulated within the agreement of service level or contract of service provision. The only thing required by Ransa Colombia Colfrigos is that the person who is going to carry out this audit, has the clear documentation on What will do? And how are you going to do it?

7. ¿ What type of equipment do you use at critical points to communicate with the personnel performing the distribution process?

All the transportation fleet of Ransa Colombia Colfrigos is outsourced. In Colombia, 404 vehicles are available for the operation. The communication is constant and is done through the customer service channels or with the operators of the operation. This is done by means of cell phones, however, they are in process to implement a software that allows to load the information of agile way and fast to the logistic system.

8. ¿ Does the company have a list of all personnel related to the cold chain for their locations and operations?

(X) Yes () No

a. ¿ Describe the activities of the operation you are going to carry out?

Answer: Yes

b. ¿ Describe the type of operation you are going to carry out?

Answer: Yes

c. ¿ Specify geographical location ?:

Answer: Yes

d. ¿ Have updated information on the number of people employed?

Answer: Yes

e. ¿ Is the list subdivided by its occupations?

Answer: Yes

9. ¿ The personnel that is related to the cold chain is competent; Based on your education, training, skills and experience?

(x) Yes () No

a. ¿ Are they doing constant training?

Answer: Yes Constantly

b. ¿ Is the information general for all or the information provided according to the processes that each person handles?

Answer: Training is made general for all employees

c. ¿ Does the company invest in R & D for the continuous improvement of its cold and logistic processes? Do you have a R & D department?

Answer: This is done directly by the company at the headquarters of Peru, in Colombia they will just implement it.

Observations: The personnel they have in the company and is directly related to the cold chain are competent in each of their jobs; Have the experience and have the skills and abilities to perform their duties and those who enter with little knowledge are provided training and training where they acquire the skills to perform the job.

Each one that makes inductions, trainings or courses takes a record which is properly filed.

10. ¿ Are the responsibilities of the personnel within the cold chain defined?

Answer: Yes. Within the profiles of the positions are the responsibilities and functions that the person must perform.

11. ¿ Do you have a director of the cold chain?

Answer: Yes. These are called in the company Agency Directors, there is currently a Director for each Regional.

12. ¿ Does the Director fulfill the following functions?

- a. ¿ Ensure that the indicators of the cold chain management system are documented, established, implemented and maintained?

Answer: Yes

- b. ¿ Ensure that internal audits are performed annually?

Answer: Yes

- c. ¿ At least prior to the review of the system by the written management (registration) of the cold chain to which the quality management system refers and the improvement needs are reported to the senior management?

Answer: Yes

- d. ¿ Ensure awareness of the cold chain and customer requirements in the organization through appropriate measures, including training?

Answer: Yes

13. ¿ Is there any control over the documents that are handled in the company?

(x) Yes () 2. No

a. What is the control that they carry out with the subject of the documentation with respect to::

- Obsolete documents
- If you handle versions for documents
- If the external source documents are identified and controlled by distribution
- They handle records or documents that show the results of the activities carried out
- How long do they keep these documents

Observations: All these controls are performed and monitored by the quality area of the company. The documents and the temperature registers where the activities and results of each process are recorded are kept for more than 4 years, according to the case of importance and the request of the client.

14. ¿ Does the company keep the records that show the results of the activities carried out over a period of time, in order to evaluate its cold chain management system?

(X) Yes () No

15. ¿ What types of demands related to the cold chain do you request from suppliers and subcontractors to meet the quality standards that the company handles? ¿Which?

Answer: Mainly the documentation is requested to create them as clients (Chamber of Commerce, Rut, verify the capacity of indebtedness, among others ...)

They are specified that only the products that are between the ranges or temperature scales are received, as follows:

- • Refrigerated products: between 0 ° C and -4 ° C.
- • Frozen products: between -15 ° C and -18 ° C
- • In certain cases, the goods can be received at least -10 ° C

For customers who are given fixed storage logistics and enlistment, they are defined which are the packaging that must have, what are the minimum shipments and what is the weight of each product to be able to parameterize in the system (Warehouse Management System - WMS)

Customers are required to label and pack the products.

16. ¿ Who oversees suppliers and subcontractors?
Answer: The Quality area is in charge of carrying out these inspections. In the region of Antioquia the person performs the audits to suppliers and inspection of the goods is Mr. Diego Alejandro Mejía.
17. In general, ¿how is the relationship with customers?
Answer: Since the sale and negotiation, the image of Ransa Colombia Colfrigos is sold as a strategic ally, providing the client with the tranquility to be freed from the logistics burden and continue to dedicate themselves to their production and marketing of their products. It also seeks to establish a long-term relationship.
18. ¿ Have you had problems with customers in the aspect of delivery or receipt of cargo?
(x) Yes () No
Observations: In the logistics will always generate inconveniences and novelties outside the company, such as truck stoppages, strikes, demonstrations, technical failures with vehicles, among others, which can delay the delivery time of goods, affecting the level of service.
19. ¿ Have they rejected some perishable products to carry? ¿Which? ¿Why?
Answer: Yes, the transport of fresh fish and beef in the canal is restricted.
Observations: For the same requirements of product management, it is better to let other companies specialized in transporting meats and sea products do.
20. ¿ Do you have a record of the nonconformity claims that your customers make regarding the charges you handled?
(x) Yes () No
Observations: Ransa Colombia Colfrigos, handles a whole issue of indicators of complaints and complaints, which document the nonconformities of customers, which is controlled weekly and monthly. Currently a goal has been established, which consists of not exceeding 12 complaints per billions of pesos billed, although this goal is not yet being met, the idea is always to be constantly improving.
The most frequent complaint to customers is the delay in the delivery of orders and this causes customers to have delays in their operations.

21. ¿ What correctives do they take to reduce customer nonconformities? What is the most common complaint?

Answer: Action and follow-up plans are made to these claims in order to evaluate and carry out the respective correctives.

22. In case the top management will annually review the cold chain management system, they have a report that includes:

- a. Internal audits.
- b. Supplier and subcontractor evaluation report
- c. Analysis of complaints, nonconformities, customer complaints and corresponding preventive actions, and
- d. A report on the evolution of the Quality Indicators of the Cold Chain.
- e. One assessment of the opportunities for improvement and policy change needs in terms of quality management of the cold.

Answer: Yes, since all information on audits, supplier and subcontractor evaluation, complaints and complaints and indicator issues are fully digitized and documented.