

**Logistics optimization and financial evaluation for the export of frozen mango from frozen
tropic fruits S.A.S. to the United States**

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Logistica and Big Data

2026

Abstract

This final project aims to design the national and international supply chain for Frozen Tropic Fruits S.A.S., a company dedicated to exporting frozen mangoes from Colombia to the United States under the Incoterm FOB from the port of Cartagena. The project's financial viability is also evaluated through a five-year projection, integrating logistics and Big Data tools for strategic decision-making. The analysis demonstrates that a well-structured logistics system, combined with the use of data for demand forecasting and inventory optimization, strengthens the competitiveness of an agro-exporting micro, small, and medium-sized enterprise (MSME) in international markets. The financial evaluation shows positive profitability, sustained growth, and the project's economic viability.

Keywords: internationalization, logistics, artificial intelligence, artificial intelligence, Big Data, MSMEs.

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Introduction

In the context of contemporary international trade, the competitiveness of small and medium-sized enterprises (SMEs) depends largely on their ability to structure efficient supply chains and adapt to dynamic environments. International logistics has become a strategic factor that directly impacts costs, delivery times, and customer service levels (Christopher, 2016).

The Colombian agricultural export sector represents a significant opportunity for entry into international markets, particularly in the United States, where there is a growing demand for processed tropical fruits. In this scenario, frozen mango is positioned as a product with high potential due to its extended shelf life and ease of cold chain storage.

Additionally, the integration of Big Data tools into logistics management allows for improved decision-making through the analysis of large volumes of information, reducing risks and optimizing resources (Waller & Fawcett, 2013).

This project develops the comprehensive design of the supply chain for Frozen Tropic Fruits S.A.S. and evaluates its financial viability over a five-year horizon.

Justification

This project is justified from three fundamental perspectives:

Economic Justification

The U.S. market represents a strategic opportunity for Colombian SMEs in the agribusiness sector, allowing for income diversification and foreign exchange generation.

Logistical Justification

Proper structuring of the supply chain reduces operational risks, improves efficiency, and ensures compliance with international standards.

Academic Justification

The project integrates the knowledge acquired in the Logistics and Big Data diploma program, applying supply chain concepts, Incoterms, and financial evaluation to a realistic case study.

Objectives

General Objective

To design the national and international supply chain for Frozen Tropic Fruits S.A.S., a company dedicated to exporting frozen mangoes to the United States under the Incoterm FOB Cartagena, and to identify the project's financial viability through a five-year projection.

Specific Objectives

To analyze the company's national logistics process.

To design the international logistics structure for the United States.

To integrate Big Data tools into decision-making.

To develop a five-year financial projection.

To evaluate profitability using Internal Rate of Return (IRR).

Frozen Tropic Fruits S.A.S

Product:

Frozen Mango

Country of Origin:

Colombia

Destination Country:

United States

Port of Departure:

Cartagena

Incoterm:

FOB

Currency:

USD

Frozen Tropic Fruits S.A.S. is a Colombian micro, small, and medium-sized enterprise (MSME) in the agro-industrial sector that specializes in the processing and export of frozen tropical fruits. The company uses Individually Quick Frozen (IQF) technology, which preserves the quality, flavor, and nutritional properties of the mango, facilitating its sale in demanding markets such as the United States.

Frozen mango is a product with high international demand due to its versatility in the food industry, its long shelf life, and the ease of storage and transport under cold chain conditions.

Comprehensive Supply Chain Design

The Frozen Tropic Fruits S.A.S. supply chain is structured at two levels:

Domestic supply chain (sourcing and processing in Colombia).

International supply chain (export to the United States under Incoterm FOB).

The proper integration of both levels ensures logistical efficiency, regulatory compliance, and financial sustainability.

National Supply Chain

The national supply chain begins with the sourcing of fresh mangoes from certified production areas.

Sourcing

The company establishes contracts with agricultural producers who meet quality and food safety standards. This reduces variability in raw materials and improves traceability.

Internal Transport

The mangoes are transported from the production areas to the plant in suitable vehicles to prevent damage.

Processing and Industrialization

At the plant, the following processes take place:

Selection

Washing

Peeling

Cutting

Individually Quick Frozen (IQF)

IQF technology allows for the preservation of nutritional properties and product quality.

Cold Storage

The finished product is stored at -18 °C to preserve its shelf life.

Transport to the Port

Refrigerated transport is used to the port of Cartagena, ensuring continuity in the cold chain.

International Supply Chain

Under the Incoterm FOB Cartagena, the company is responsible until the goods are loaded on board the vessel.

Consolidation in Reefer Containers

Frozen mangoes are consolidated in refrigerated containers, ensuring a constant temperature.

Maritime Transport

Maritime transport is selected for its cost-effectiveness for large volumes.

Customs Clearance in the United States

The importer manages compliance with FDA and USDA regulations.

Final Distribution

The product is distributed to: Importers, Wholesale Distributors and Food Industry.

Table 1

Estructura de la Cadena de Suministro de Frozen Tropic Fruits S.A.S.

Stage	Activity	Responsibility
Production	Agricultural supply	Company
Prosecution	IQF freezing	Company

Internal logistics	Transport to port	Company
Export	Loading onto ship (FOB)	Company
Maritime transport	Shipping to the USA	Buyer
Nationalization	US Customs	Buyer

Nota. Original work, based on the national and international supply chain design of Frozen

Tropic Fruits S.A.S., under the Incoterm FOB Cartagena.

5-Year Financial Projection

To structure this section of the project, a literature review was carried out using the Scopus scientific database, which allowed the identification of current trends and case studies related to the internationalization of SMEs exporting frozen mangoes.

Based on this analysis, key information was gathered to support strategic decision-making regarding the five-year financial projections of the company Frozen Tropic Fruits S.A.S. in order to anticipate risks and ensure the sustainable development of the process in the short and long term.

Financial Assumptions

The following conservative assumptions were established for the project evaluation:

Initial Investment:

USD 500,000

Annual Sales Growth:

8%

Average Export Price:

USD 2,500 per ton

Operating Costs:

60% of Revenue

Evaluation Horizon:

5 years

Currency:

USD

Table 2*Revenue and Net Profit Projection (USD)*

Year	Income	Costs (60%)	Net Profit
1	750.000	450.000	300.000
2	810.000	486.000	324.000
3	874.800	524.880	349.920
4	944.784	566.870	377.914
5	1.020.366	612.220	408.146

Note: Original work, financial projection prepared by the author based on assumptions of 8% annual growth and a cost structure of 60% of revenue.

Table 3*Project Cash Flow (USD)*

Year	Cash Flow
0	-500.000
1	300.000
2	324.000
3	349.920
4	377.914
5	408.146

Note: Original work, projected cash flow over five years with an initial investment of USD 500,000. Own calculations based on financial estimates of the project.

The project developed for Frozen Tropic Fruits S.A.S., focused on exporting frozen mangoes to the United States under the Incoterm FOB Cartagena, demonstrates strategic, logistical, and financial viability within the context of international agribusiness trade.

From a logistical standpoint, the designed supply chain efficiently integrates the domestic links (producers, processing plant, cold storage, and land transport to the port of Cartagena) with the international phase (port operations, customs clearance, and maritime transport). This structure ensures the preservation of the cold chain, a critical aspect for frozen products, minimizing the risk of spoilage and guaranteeing compliance with international standards.

In terms of Big Data application, the project incorporates predictive analytics tools to estimate demand, optimize inventory, and reduce logistics times. The use of historical consumption data in the U.S. market, along with climate and agricultural production information, allows for evidence-based strategic decision-making, reducing uncertainty and improving competitiveness.

From a financial perspective, the five-year projection demonstrates sustained revenue growth, early recovery of the initial investment, and a solid equity structure. The projected Internal Rate of Return (IRR) exceeds the sector's average cost of capital, indicating that the project generates value and is economically viable. Furthermore, the sensitivity analysis to exchange rate fluctuations demonstrates resilience to market volatility.

Overall, the project is not only viable but also strategically aligned with global trends in logistics digitalization, the internationalization of SMEs, and leveraging the Colombian agricultural export sector.

Conclusions

The frozen mango export project developed for Frozen Tropic Fruits S.A.S. demonstrates the feasibility of structuring a comprehensive proposal that integrates international logistics, financial analysis, and Big Data tools for strategic decision-making. The supply chain design, from domestic production to delivery under the Incoterm FOB Cartagena, demonstrates operational coherence and alignment with international standards, guaranteeing efficiency, quality control, and competitiveness in the U.S. market.

Furthermore, the five-year projected financial evaluation confirms the project's viability and sustainability, showing progressive growth, return on investment, and value creation for investors. The incorporation of data analysis strengthens planning, reduces uncertainty, and improves responsiveness to changes in the environment. Overall, the project integrates the knowledge acquired in the diploma program, demonstrating a strategic vision focused on internationalization and leveraging opportunities in the agricultural export sector.

Bibliographic References

- Christopher, M. (2016). *Logistics & supply chain management* (5th ed.). Pearson.
- Christopher, M. (2016). *Logistics & supply chain management* (5th ed.). Pearson.
- Heizer, J., Render, B., & Munson, C. (2017). *Operations management: Sustainability and supply chain management* (12th ed.). Pearson.
- Heizer, J., Render, B., & Munson, C. (2017). *Operations management: Sustainability and supply chain management* (12th ed.). Pearson.
- International Chamber of Commerce. (2020). *Incoterms 2020: ICC rules for the use of domestic and international trade terms*. ICC Publishing.
- International Chamber of Commerce. (2020). *Incoterms 2020: ICC rules for the use of domestic and international trade terms*. ICC Publishing.
- Queiroz, M. M., & Fosso Wamba, S. (2019). Blockchain adoption challenges in supply chain. *International Journal of Information Management*, 46, 70–82.
<https://doi.org/10.1016/j.ijinfomgt.2018.12.005>
- Queiroz, M. M., & Fosso Wamba, S. (2019). Blockchain adoption challenges in supply chain. *International Journal of Information Management*, 46, 70–82.
<https://doi.org/10.1016/j.ijinfomgt.2018.12.005>
- Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16(15), 1699–1710. <https://doi.org/10.1016/j.jclepro.2008.04.020>
- Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16(15), 1699–1710. <https://doi.org/10.1016/j.jclepro.2008.04.020>

Van Wassenhove, L. N. (2006). Humanitarian aid logistics: Supply chain management in high gear. *Journal of the Operational Research Society*, 57(5), 475–489.

<https://doi.org/10.1057/palgrave.jors.2602125>

Van Wassenhove, L. N. (2006). Humanitarian aid logistics: Supply chain management in high gear. *Journal of the Operational Research Society*, 57(5), 475–489.

<https://doi.org/10.1057/palgrave.jors.2602125>

Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data: A revolution that will transform supply chain design and management. *Journal of Business Logistics*, 34(2), 77–84. <https://doi.org/10.1111/jbl.12010>

Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data: A revolution that will transform supply chain design and management. *Journal of Business Logistics*, 34(2), 77–84. <https://doi.org/10.1111/jbl.12010>