

Biodegradable packaging made from cassava and coconut as an innovative solution.

*Internationalization Plan*

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## INTRODUCTION

Excessive plastic use has become one of the major environmental issues worldwide. Every day, diverse types of plastic waste are dumped into oceans and rivers, causing serious harm to ecosystems and human health. These plastics on the ocean's surface release methane and greenhouse gases, with emissions increasing as the plastics break down. According to the IUCN *International Union for Conservation of Nature*, 460 million tons of plastic are produced annually, and 20 million tons end up in the environment, taking between 65 and 1,000 years to degrade. This situation has prompted international markets to adopt stricter regulations and pursue sustainable solutions to lessen the environmental impact.

Against this backdrop, Terraplastik Pack emerges as an innovative response to the environmental crisis caused by the widespread use of conventional plastics. The company offers biodegradable alternatives made from raw materials such as cassava and coconut, helping to reduce pollution that affects oceans and biodiversity. Its focus on the circular economy and technological innovation seeks not only to replace highly polluting materials, but also to promote a more responsible packaging industry aligned with international sustainability regulations.

This study focuses on assessing the feasibility for Terraplastik Pack to export this type of packaging to foreign markets. To achieve this, key factors such as international demand, current regulations, distribution channels, competition, and the company's projected export capacity as a growing venture will be analyzed. Thus, we aim to gain a thorough understanding of the opportunities for launching the product into global markets, while encouraging business innovation and the adoption of sustainable practices aligned with international environmental development goals.

## COMPANY PRESENTATION

Terraplastik Pack is a Colombian business idea focused on designing and producing biodegradable packaging from natural raw materials such as cassava and coconut. Its main goal is to provide sustainable solutions to address the growing need to replace conventional plastics, which have caused significant environmental impacts worldwide. The innovative project aims to incorporate sustainability criteria, circular economy principles, and technological innovation, while supporting environmental protection and promoting responsible practices in the packaging industry.



**Figure 1.** Logo

*Note.* Taken from Terraplastik Pack.

Terraplastik Pack's value proposition is based on three pillars:

- Environmental sustainability
- Innovation and competitiveness
- Social responsibility.


Terraplastik Pack's vision is to become a leader in sustainable packaging solutions, expanding its reach beyond the Colombian market to respond to the growing global demand for environmentally responsible alternatives. Its export strategy is focused on identifying markets where biodegradable packaging can replace conventional plastics, ensuring compliance with international environmental standards. Through research, innovation, and the formation of partnerships with distributors abroad, Terraplastik Pack aims to enhance its competitiveness and promote responsible consumption globally,

establishing itself as a key player in the sustainable transformation of the packaging industry.

## PRODUCT IDENTIFICATION

Among the products included in Terraplastik Pack's business plan, it has been decided to focus on Ecoduo, due to its high potential for international market positioning. As shown in Table 1 Ecoduo is a line of biodegradable packaging made from cassava starch and coconut fibers, designed to meet the needs of the food, cosmetics, and consumer goods sectors. It is 100% biodegradable, versatile, and suitable for food contact, making it an innovative alternative to traditional plastics, which aligns with the company's sustainable purpose and global projection.

**Table 1.** Technical specifications for Ecoduo

Product Name	Ecoduo
	
Description	Ecoduo is a line of biodegradable packaging made from cassava starch and coconut fibers, designed to meet the needs of the food, cosmetics, and consumer goods industries. These containers are 100% resistant and versatile, making this product an innovative alternative to common plastics.
Tariff classification	3923.30.20.00 Plastic and plastic products. Plastic items for transport or packaging; plastic stoppers, caps, lids, and other closures. - Carboys, bottles, jars, and similar items
Place of production	Colombia, Bogotá
Applications	Food, cosmetics, and consumer goods industries
Technical specifications	<ul style="list-style-type: none"> <li>* 100% biodegradable and compostable</li> <li>* Strong and versatile</li> <li>* Suitable for food contact</li> <li>* Made from renewable raw materials</li> </ul>
Presentations	Containers for food, cosmetics, and mass consumption (cups, trays, boxes, rigid containers)
Color	Natural (beige/light brown), can be adapted with organic pigments

*Source:* Own elaboration.

## **COMPANY CONTEXT AND PRODUCT IN GLOBAL MARKETS**

In this context, biodegradable packaging has become more relevant as a practical alternative to traditional - single-use - plastics because it is made from natural raw materials and breaks down more quickly and effectively in the environment, taking anywhere from several months to a few years depending on factors such as its composition, environmental conditions, and the degradation environment.

However, biodegradable packaging must comply with European standard EN 13432, which specifies the requirements for materials or packaging to be considered biodegradable. The criteria for EN 13432 certification require that the material or packaging disintegrate within a specified time. Biodegradability tests must be carried out, generally requiring 90% biodegradation within approximately 6 months, and there must also be a limit on heavy metals such as lead, mercury, and cadmium, as these can be toxic to plants (Droppe, 2024).

That is why the bioplastics market has been experiencing continuous growth in recent years. By 2024, it reached \$107.4 billion USD, and it is estimated that by 2033 it could grow at a 5.2% rate. (IMARC Group, 2024). Its main exporters are China, Germany, the United States, Poland, and France. In the Latin American market, biodegradable plastics reached a value of \$279.10 million USD, and it is projected that they will grow by 8.70% by 2033 (IMARC Group, 2024).

Based on this data, Terraplastik Pack is presented as an innovative proposal, centered on producing biodegradable plastic packaging from cassava and coconut. The goal is to develop a potentially successful international project that addresses the growing demand for sustainability in the packaging industry and facilitates the implementation of effective positioning strategies in global markets.

## JUSTIFICATION

According to the United Nations Environment Programme (UNEP), more than 460 million tons of plastic are produced annually, of which approximately 20 million metric tons end up in the environment, directly impacting terrestrial, aquatic, and marine ecosystems (IUCN, 2023). This pollution has caused biodiversity loss, ecosystem degradation, and contributed to the worsening of climate change. The accumulation of plastics in inappropriate conditions poses a growing threat to human health and food security by generating microplastics and toxic substances (IUCN International Union for Conservation of Nature, 2024).

The problem worsens due to the widespread use of single-use plastics and packaging, mainly made from fossil fuels. These materials account for about 85% of marine debris, and estimates indicate that the 11 million metric tons of plastic entering the oceans annually could triple within the next 20 years. Improper disposal also negatively affects agricultural soils, damaging their quality and productivity.

Additionally, the production and disposal of plastics significantly raise greenhouse gas emissions. Incinerating plastic waste releases over 850 million metric tons of CO<sub>2</sub>e annually, while refining and transformation processes consume large amounts of energy, worsening the climate impact. If this trend continues, it is projected that by 2050, emissions from plastic production and incineration could surpass 2.75 trillion metric tons of CO<sub>2</sub>e. (Gálvez, 2022).

The environmental impact of excessive single-use plastic use has reached alarming levels, compromising biodiversity, ecosystem quality, and human health. This situation has led international markets to establish stricter regulations and promote the adoption of sustainable alternatives that reduce dependence on conventional plastics.

It is therefore essential that people become aware of how their daily decisions can contribute to reducing this global problem, and that different business sectors promote the use of biodegradable materials and innovative solutions that mitigate environmental damage, thereby encouraging the development of more responsible consumption habits.

In this context, there is a need to develop innovative projects that provide real solutions to the environmental crisis and are, simultaneously, economically viable and competitive. The Terraplastik Pack proposal is a business idea centered on the design and production of biodegradable packaging made from natural, renewable, and locally sourced raw materials, including cassava and coconut. These materials enable the packaging manufacturer with a lower environmental impact, aligning with the principles of the circular economy.

The relevance of this project lies in its response to current consumer demands and sustainability trends in global markets, thereby generating international opportunities for the company. Similarly, it contributes to reducing plastic waste and greenhouse gas emissions, promoting responsible practices in the packaging industry. In this way, the rationale for this work is based on the need to assess the feasibility of internationalizing a product that, in addition to being competitive and innovative, contributes to the fulfillment of the Sustainable Development Goals (SDGs), especially those related to responsible production and consumption (SDG 12), climate action (SDG 13), and life below water and on land (SDGs 14 and 15) (United Nations, 2025).

## **OBJECTIVE**

### **General objective**

To assess the feasibility of internationalizing the Terraplastik Pack business idea, which is dedicated to designing and producing biodegradable packaging made from cassava and coconut, for global market positioning and environmental sustainability.

### **Specific objectives**

- To analyze the current situation of the international market for biodegradable packaging based on consumer trends and market selection.
- To examine the regulations and technical requirements for export and marketing of biodegradable packaging in foreign potential markets.
- To determine the logistical capacity, the most viable channel distribution, competition, positioning strategies, and sustainability to meet the demands of internationalization.

## **COUNTRY PRESELECTION**

Based on the information compiled in Annex 1 – “*Preselection Matrix-1.xlsx*”, a comparative analysis of countries was conducted to identify the most attractive markets for introducing Terraplastik Pack biodegradable packaging. The study considered variables such as potential demand for sustainable packaging, import requirements (including certifications and labeling), commercial opportunities, current environmental regulations, as well as agreements and logistical facilities with Colombia.

The results of this assessment highlight Germany, Canada, and Japan as the most viable markets. These countries exhibit sustained growth in bioplastic consumption, have stringent environmental policies that promote the use of biodegradable materials, and have regulatory frameworks that, although demanding, favor suppliers that comply with standards such as EN 13432 certification. Additionally, trade agreements and logistical conditions facilitate a competitive entry that aligns with global sustainability trends. Please refer to **Annex 1** for specific data and criteria used in this pre-selection.

### **JUSTIFICATION OF SELECTED COUNTRY:**

Germany is the largest economy in the European Union and the third in the world (Deutschland.de, 2025). By 2024, its gross domestic product (GDP) reached US\$4.66 trillion, while its GDP per capita stood at approximately US\$55,800. The country has a population of 83.5 million and borders France and Switzerland to the south, Austria to the southeast, Belgium, the Netherlands, and Luxembourg to the west, Denmark to the north, and Poland and the Czech Republic to the east. Its capital is Berlin, with 3.88 million inhabitants, followed by Hamburg (1.9 million) and Munich (1.5 million). The official language is German, and its currency is the euro (€) (Oficina de Información Diplomática., 2025).

The German economy stands out for its strength and diversification. Its industry is mainly based on the automotive, mechanical, chemical, and electrical sectors, which are the pillars of its economic prosperity. German products are recognized worldwide for their high quality, innovation, and competitiveness, making Germany the largest patent applicant in Europe and the fifth largest worldwide (Santander Trade Markets, 2024). Germany is also one of the world's leading exporting nations, surpassed only by the United States and China. In 2023, its exports reached US\$1.65 trillion, while its imports totaled US\$1.38 trillion.

The select market has an extensive international network, with diplomatic representation in around 225 countries, chambers of commerce offices in more than 90 countries, and a government agency, Germany Trade & Invest (GTAI), dedicated to promoting foreign trade and investment. The country ranks 22nd in Ease of Doing Business Index and has advanced infrastructure, particularly in the energy and transportation sectors.

The Federal Republic of Germany has been a federal, democratic, and social state since 1949. Its main objectives include managing immigration, protecting the climate, fostering European cooperation, and committing to global peace and security. Germany currently plays a key role in supporting Ukraine in its conflict with Russia, which has sparked internal debate about the economic impact of this support. In 2024, the government decided to restore border controls to reduce irregular immigration (Santander Trade Markets, 2024).

In terms of social welfare, Germany has one of the most comprehensive social security systems in the world, encompassing compulsory health, pension, accident, unemployment, and long-term care insurance, which guarantees comprehensive protection for its citizens. The poverty incidence rate is 0.2%, while the country ranks 7th worldwide

in the Human Development Index (HDI), with a life expectancy of 81 years, high levels of education, and a decent standard of living.

Likewise, Germany stands out for its strong environmental commitment. The country has developed advanced technologies in renewable energy and efficient use of natural resources. In 2024, 54% of its energy came from renewable sources, and the government projects a 65% reduction in greenhouse gas emissions by 2030, to achieve climate neutrality by 2045. Since July 2021, a ban on single-use plastics has been in place. In 2023, measures became stricter, including the elimination of disposable plastic bags and the active promotion of biodegradable and compostable packaging (Berg, 2023).

Germany has one of the most advanced legal frameworks in Europe for environmental objectives, governed by the National Circular Economy Action Plan, which has been in force since 2024, and the Federal Climate Protection Act, which aims to reduce the negative environmental impact of single-use packaging.

The German Packaging Act (Verpackungsgesetz – VerpackG) came into force in 2019 and was amended in 2022 to strengthen sustainability and circular economy policies in the country. This regulation governs the production, use, distribution, and recycling of packaging throughout Germany, and applies to both domestic manufacturers and foreign exporters who place products on the market.

The German and European legal frameworks provide a highly favorable environment for Ecoduo, as they promote the replacement of conventional plastics with sustainable and biodegradable packaging. Standards such as the VerpackG, LUCID registration, and EN 13432 certification guarantee traceability, biodegradability, and environmental compliance as required in Germany. This represents a key opportunity for TerraPlastik Pack, allowing it to position its product within a market that values

sustainability and ecological innovation. However, it also involves challenges related to the continuous updating of certifications, adapting labeling, and strict compliance with European regulations on packaging and waste management.

Under this law, all producers and importers are required to register their packaging in the LUCID system, administered by the Zentrale Stelle Verpackungsregister (ZSVR), prior to its placement on the market. The VerpackG also requires that the materials used be recyclable, reusable, or sustainable, in line with the European Union's environmental objectives, and that the minimum recovery and recycling rates established at the EU level be met. (Plan Internacional de Navarra, 2023)

Furthermore, it is necessary to comply with European regulations, as Germany, as a member state of the European Union, applies Directive (EU) 2019/904 on reducing the environmental impact of single-use plastics. This directive establishes restrictions on the manufacture, import, and marketing of non-reusable plastic products, promoting the use of sustainable and biodegradable materials.

The European standard EN 13432 must be considered, which defines the technical requirements a material must meet to be biodegradable and compostable. This standard establishes the time limits for disintegration, as well as the conditions for biodegradation and industrial composting, which must be demonstrated through certifications recognized in the European Union (Ecozema, 2025).

Germany ranks third in logistics performance according to the Logistics Performance Index (LPI), making it one of the countries with the best infrastructure and logistics efficiency worldwide (The world bank, 2023).

The country has more than 60 ports and auxiliary subports, enabling extensive international maritime connectivity. From Colombia, exports are mainly directed to the

ports of Bremen-Bremerhaven and Hamburg, both renowned for their advanced technology and operational capacity. Maritime services departing from the Colombian Atlantic coast have an approximate transit time of 16 days, while those departing from Buenaventura have an estimated transit time of 24 days (Procolombia, 2025).

In air transport, Germany has 539 airstrips and around 18 airports with customs facilities. Exports from Colombia are mainly directed to the airports of Berlin, Bremen, Cologne-Bonn, Düsseldorf, Frankfurt, Hamburg, Hanover, Munich, Nuremberg, and Stuttgart. From Bogotá, more than 5 airlines offer cargo services to Germany, ensuring a fast, safe, and reliable connection between the two countries (Procolombia, 2025).

## **METHODOLOGY**

Since 1872, Germany and Colombia have maintained diplomatic relations based on mutual respect, courtesy, and bilateral cooperation (Federal Ministry for Economic Cooperation and Development, 2024). Over the years, both countries have strengthened their ties through joint initiatives in climate action, sustainable development, peace processes, and environmental protection.

On June 16, 2023, both nations signed the Partnership for Climate Transition and Just Energy. This agreement promotes renewable energy, sustainable urban development, and biodiversity preservation, thereby contributing to Colombia's fulfillment of its commitments under the Paris Agreement.

This alliance strengthens technical and economic cooperation between the two countries, opening opportunities for commercial and technological exchange in sustainable sectors, such as biodegradable packaging, where Germany is a key strategic partner for Colombia (Federal Ministry for Economic Cooperation and Development, 2024)

By June of this year, Colombia's exports to Germany had increased by 46.3%, reaching approximately €150 million. Among the main products exported are coffee, tropical fruits, and coal, which remain in high demand in the German market due to their quality and sustainable origin. On the other hand, imports from Germany to Colombia decreased by 12.6%, standing at around €126 million. Among the most representative products are automobiles and caravans, pharmaceuticals, and medical, surgical, and orthopedic equipment, reflecting the strength of the German industrial and technological sector. (OEC, 2024)

### **Data Analysis**

As Figure 2 shows, the PESTLE analysis applied to TerraPlastik Pack reveals a highly favorable environment for exporting Ecoduo, its line of biodegradable packaging, to Germany. In the political and legal sphere, regulations such as VerpackG and EN 13432 promote the use of sustainable materials, giving eco-friendly products a competitive advantage. Economically, Germany maintains a stable market with high purchasing power and growing demand for green solutions. From a social perspective, high consumer environmental awareness drives more responsible consumption. The technological factor favors innovation and material traceability, while the environmental factor drives the transition to a circular economy. Together, these elements position Ecoduo as a proposal aligned with the sustainable policies and consumer preferences of the German market.

TerraPlastik Pack's PESTLE analysis was constructed based on triangulation of secondary sources such as IMARC Group, Droppe, OEC, and the Spanish Diplomatic Information Office, which provide up-to-date data on Germany's economic, legal, and environmental context. IMARC Group reports confirm the sustained growth of the

European market for biodegradable packaging, while Droppe studies highlight the industrial sector's transition to sustainable materials.

According to (OEC, 2024), there has been an increase in imports of eco-friendly products and strong demand for innovative packaging solutions. Finally, the Office of Diplomatic Information and the International Plan of Navarra underscore Germany's commitment to the circular economy and the reduction of single-use plastics. Taken together, these sources validate the commercial and regulatory viability of the Ecoduo product in the German market.

# PESTEL Analysis

	<h2>Political</h2> <ul style="list-style-type: none"> <li>• Germany is a federal, democratic, and social state.</li> <li>• As a member of the EU, its regulations in terms of production, trade, and the environment have a strong influence on it.</li> <li>• There are environmental policies in place that promote sustainability, the reduction of plastics, and the spread of biodegradable materials.</li> <li>• The infrastructure that supports foreign trade and exports is modern, allowing innovative products to enter the market.</li> </ul>
	<h2>Economical</h2> <ul style="list-style-type: none"> <li>• Germany is the largest economy in the EU, with a high GDP and strong purchasing power.</li> <li>• It faces challenges such as dependence on energy imports, vulnerability to fluctuations in global trade, and pressure on production costs.</li> <li>• There is a strong export orientation and a highly developed manufacturing industry, which favors demand for innovative solutions in materials and packaging.</li> <li>• Biodegradable packaging is experiencing significant growth in the German market, although margins and price competitiveness must be monitored</li> </ul>
	<h2>Social</h2> <ul style="list-style-type: none"> <li>• The German population is increasingly aware of issues such as sustainability, the environment, and responsible consumption.</li> <li>• There is an aging demographic structure (which changes consumption habits) and consumers who are demanding in terms of product quality and origin.</li> <li>• Cultural values include a high regard for quality, transparency, and also for organic products.</li> </ul>
	<h2>Technological</h2> <ul style="list-style-type: none"> <li>• Germany has a high level of technology, strong R&amp;D development, advanced industry, and a solid innovation ecosystem.</li> <li>• Technological requirements for materials, production processes, automation, and quality are high.</li> <li>• Digitization and traceability in supply chains favor the use of sustainable packaging with certification and differentiated attributes.</li> </ul>
	<h2>Environmental</h2> <ul style="list-style-type: none"> <li>• Germany has ambitious goals for emissions reduction, energy transition, and the circular economy.</li> <li>• Environmental awareness is high in both society and business, so biodegradable packaging aligns well with market trends.</li> <li>• Energy and raw material costs can be high, which can impact the final cost of production and logistics.</li> <li>• It is essential to have certifications that support the sustainability of biodegradable packaging, which has a significantly lower ecological footprint than traditional plastic alternatives.</li> </ul>
	<h2>Legal</h2> <ul style="list-style-type: none"> <li>• Germany operates under a rigorous legal framework: in terms of production, trade, material safety, the environment, etc.</li> <li>• European Union regulations establish clear guidelines on the compostability, recyclability, and composition of materials used in packaging and packaging waste.</li> <li>• To export biodegradable packaging, it is essential to comply with German and European regulations on labeling, registration, waste management, and recycling.</li> <li>• Failure to comply with these regulations can lead to barriers to entry, financial penalties, or rejection of the product on the market.</li> </ul>

**Figure 2.** Pestel Analysis

*Note.* Own elaboration

## **SELECTED MARKET: GERMANY**

Düsseldorf is the most strategic market for launching biodegradable packaging exports to Germany. The capital of the federal state of North Rhine-Westphalia has a population of approximately 642,888, making it the sixth-largest city in the country. This region is one of the most industrialized and economically powerful, notable for its concentration of major companies in the cosmetics, pharmaceutical, chemical, and food sectors.

Düsseldorf is home to *Interpack*, the world's most important international trade fair for packaging and industrial processes (Interpack, 2025), making this city a strategic location for positioning and expanding the Ecoduo product in the German market and, in the future, throughout the European Union. Some potential includes Marubeni Europe PLC (headquartered in Düsseldorf), R. v. Klier, Henkel AG & Co. KGaA, and CBC Europe GmbH, companies located in Düsseldorf that operate in sectors related to sustainable packaging and represent commercial collaboration opportunities for TerraPlastik Pack.

### **Regulatory Requirements**

Exports of Ecoduo products (biodegradable packaging made from coconut and cassava) to Germany must comply with both national and European regulations. These requirements include:

#### ***1. Registration in the German packaging system – Verpackungsgesetz – VerpackG***

To introduce the Ecoduo product to the German market, the company TerraPlastik Pack must register on the LUCID-Verpackungsregister portal managed by the ZSVR (Zentrale Stelle Verpackungsregister) in order to comply with the Packaging Act in Germany.

Once registered with LUCID, a license must be obtained to participate in the dual recycling system, allowing the Ecoduo product to be introduced to the end consumer.

## ***2. Compliance with European regulations on packaging and waste***

Compliance with EU Directive 2019/904 is required, the primary objective of which is to prevent and mitigate the environmental impact of single-use plastics by promoting a circular economy based on sustainable and innovative materials. EU

Regulation 2025/40 of 2024 aims to establish requirements for the life cycle of packaging, ensuring that it is reusable or recyclable by 2030.

## ***3. Documentation and requirements***

The Ecoduo product must be certified in accordance with EN 13432, whereby the packaging must comply with biodegradability standards, which are as follows:

- 90% degradation of the packaging within 6 months when subjected to high CO<sub>2</sub>, which must be tested using the EN 14046 standard method (ISO 14855)
- 90% degradation of the packaging in 3 months when exposed to organic materials, tested using the standard method EN 14045.

The requirements for labeling, marking, packaging, and containers, as well as product quality and performance requirements, must be met. Failure to comply with the mandatory measures for export to Germany may result in fines of up to €200,000, a sales ban, and the removal of the product from platforms such as Amazon and eBay.

## ***4. Regulatory Financial Details***

According to data from the Market Access Map, the general ad valorem tariff applicable to biodegradable packaging entering the European Union (EU), including Germany, is 6.5%. However, thanks to the Trade Agreement between the European Union and Colombia, products that comply with the rules of origin established in that treaty can

benefit from a preferential tariff of 0%, significantly reducing import costs and facilitating Ecoduo's entry into the German market.

## **MARKETING PLAN**

Terraplastik Pack will implement the Piggyback strategy as a mechanism for accessing the German market, leveraging the commercial infrastructure, reputation, and distribution channels of established companies in the sustainable packaging or organic food sector. Under this model, the company will act as a partner supplier (rider) to a major export company (carrier) already established in Germany, which will incorporate Ecoduo biodegradable packaging into its product portfolio.

This strategy significantly reduces entry risks and initial logistics costs, as the carrier assumes part of the marketing, transportation, and storage, allowing Terraplastik Pack to focus on production, quality control, and European regulatory compliance (EN 13432, VerpackG).

The piggyback method also facilitates learning about the target market, contacting end customers, and adapting the product to German consumer standards and preferences. In the medium term, this collaboration will enable Terraplastik Pack to establish its own presence, with a consolidated distribution network and operational experience in the European market.

### ***Value proposition***

Partnering with an established distributor in Germany provides immediate access to existing distribution channels without requiring investment in new infrastructure. This approach significantly reduces entry costs and logistical risks while building greater trust among end buyers through association with a recognized brand. Additionally, it allows for the transfer of valuable market knowledge regarding local regulations, customer

preferences, and pricing structures. Such collaboration also facilitates the scalability of operations into other European Union markets, including the Netherlands, Belgium, and France.

### ***Marketing mix strategies (4Ps)***

Terraplastik Pack's marketing mix (4Ps) strategies focus on adapting the Ecoduo product to the German market with a sustainable and competitive approach. In terms of the product, biodegradable packaging with visible certifications that meet European standards is offered. The pricing strategy applies a penetration policy adjusted to certification costs, seeking to position itself against local competitors. In distribution, partnerships are established with distributors in Düsseldorf and participation in trade fairs such as Interpack is planned to strengthen commercial presence. Finally, promotion focuses on B2B digital campaigns, environmental storytelling, and collaborations with sustainable companies to highlight the positive ecological impact of the packaging.

<b>Variable</b>	<b>Strategy</b>
<b>Product</b>	Biodegradable packaging adapted to European standards, with visible certifications on the label.
<b>Price</b>	Initial penetration strategy, adjusted to certification costs.
<b>Place (Distribution)</b>	Partnerships with local distributors in Düsseldorf; participation in trade fairs such as Interpack.
<b>Promotion</b>	B2B digital campaigns, environmental storytelling, strategic alliances with sustainable companies.

### ***Proposed marketing campaigns***

The campaigns proposed by Terraplastik Pack will be developed comprehensively to position the Ecoduo product in the German market. The first, “Zero-footprint packaging,” will promote biodegradable packaging through LinkedIn and business newsletters, highlighting its environmental impact. The second, “Ecoduo at Interpack,” will take place at the international trade fair in Düsseldorf with live demonstrations and certified promotional material. The third, “From coconut to consumer,” will disseminate videos on social media about the natural production process, connecting consumers with the product's origin. Finally, “Green companies, secure future” will promote alliances with sustainable German companies through joint social responsibility projects and shared advertising, strengthening the brand's ecological image and international presence.

#### **Campaign 1: “Zero-footprint packaging”**

- Objective: Position Ecoduo as the sustainable option for B2B companies.
- Channels: LinkedIn, industry newsletters.
- Actions: Comparative infographics, pilot customer testimonials, environmental impact metrics.

#### **Campaign 2: “Ecoduo at Interpack”**

- Objective: Raise visibility at the international packaging fair in Düsseldorf.
- Actions: Interactive stand, composability demonstrations, promotional material with certifications.

#### **Campaign 3: “From coconut to consumer”**

- Objective: To connect emotionally with consumers and companies.
- Channels: Instagram, YouTube, TikTok.

- Actions: Short videos showing the life cycle of the packaging and the role of Colombian farmers.

#### **Campaign 4: “Green companies, secure future”**

- Objective: Create synergies with sustainable German companies.
- Actions: Co-branding with Henkel, shared social responsibility programs, joint advertising.

#### ***Action plan***

- Short term (1 year): Registration with LUCID, EN 13432 certification, digital pilot campaign.
- Medium term (2–3 years): Participation in Interpack, partnerships with Henkel and CBC Europe GmbH.
- Long term (5 years): Positioning as a leading supplier of biodegradable packaging in the EU.

### **INTERNATIONAL PHYSICAL DISTRIBUTION PLAN– EXPORT OF**

### **TERRAPLASTIK PACK BIODEGRADABLE PACKAGING**

- **Product:** ECODUO Biodegradable Packaging
- **Destination country:** Germany
- **Incoterm:** FOB (Free On Board) – Port of Cartagena

The Ecoduo product is biodegradable packaging made from natural coconut fibers and cassava starch, developed by Terraplastik Pack as an eco-friendly alternative to conventional plastics. This packaging is 100% compostable, moisture resistant, and has an average degradation time of between 90 and 120 days. It is aimed at food, cosmetics, and sustainable packaging sectors.

### **Product presentations:**

- Biodegradable cups, 250 ml – 500 ml
- Containers for dry foods
- Cosmetic containers

### **Target market: Germany – Düsseldorf (Port of Hamburg)**

The target market selected is Germany, specifically the city of Düsseldorf, due to its great opportunities in the industry. Our DFI plan established the export of Ecoduo by sea.

#### **1. Maritime access:**

As previously analyzed, Germany has more than 60 ports with excellent infrastructure. However, Colombia offers export services to the main ports: Bremen-Bremerhaven and Hamburg. Therefore, based on the analysis of times and costs, the port of Hamburg has been chosen as the best option for exporting Ecoduo to the country.

**1.1. *Port of Hamburg:*** Widely known as “Germany's gateway to the world,” it is the second largest port in Europe, with nearly 300 docks, 50 specialized facilities, and four container terminals. This port has the highest activity in the world.

#### **2. Packaging and packing for export**

The packaging and packing of Terraplastik Pack biodegradable containers are designed according to criteria of sustainability, safety, and compliance with international transport and labeling standards required by the European Union.

- **Primary packing:** These are transparent biodegradable bags made of PLA (polylactic acid), designed to protect the containers from moisture, dust, or external contamination. Each bag contains 50 units and has a compostable hermetic seal. This packaging includes a label with product information, batch number, date of

manufacture, and country of origin in accordance with EU Regulation No. 1169/2011.

- **Secondary packing:** Consists of 80% recycled corrugated cardboard boxes, each box containing 50 bags (500 units) and properly sealed with 3M packing tape. The sides would include the company logo, destination, gross/net weight, QR code, and international handling symbols. This design would comply with ISO 780 (handling symbols).
- **Packaging:** Products are grouped on wooden pallets treated in accordance with ISPM No. 15 (FAO). Each pallet contains 20 boxes, wrapped in biodegradable stretch film to ensure stability during maritime transport. Each loading unit is identified with a visible label that includes the batch code, box number, organic certification, and country of origin.

**Figure 1.** Packaging and packing to Ecoduo and Export label on packaging



*Notes:* Created using artificial intelligence

**Type of cargo:**

- **Subtype:** Dry cargo, packed or packaged
- **Nature of the product:** Biodegradable manufactured goods (non-chemical, non-liquid, non-flammable).

**3. Cost matrix**

After analyzing the components of the international physical distribution (IPD) of Ecoduo biodegradable packaging, the following FOB cost matrix is presented, corresponding to the exporting country and national transit to the port of Cartagena.

Costs in the importing country are not included, since the selected Incoterm FOB covers the delivery of the goods on board the ship in the Colombian port.

**Table 1.** Terraplastik Pack Cost Matrix

<b>TERRAPLASTIK PACK COST MATRIX</b>		
<b>BASIC PRODUCT INFOMATION</b>	<b>PRODUCT: Trade Name</b>	ECODUO biodegradable packaging
	<b>TARIFF HEADING</b>	3923.30.20.00 (Plastic containers for transport or packaging of goods)
	<b>COMMERCIAL SALES UNIT</b>	Box of 50 units
	<b>VALUE PER UNIT</b>	COP \$77,800 - EUR 17.6 - USD 20.3
	<b>TYPE OF PACKAGING</b>	Biodegradable corrugated cardboard box with logo and eco-friendly labels
	<b>PACKAGING DIMENSIONS</b>	50 x 40 x 40 cm
<b>INFORMATION ABOUT THE SEIZURE</b>	<b>ORIGIN / COUNTRY OF LOADING</b>	Port of Cartagena, Colombia
	<b>DESTINATION / COUNTRY OF UNLOADING</b>	Port of Hamburg, Germany
	<b>TOTAL WEIGHT IN KG</b>	15,000 kg (15 tons)
	<b>LOADING UNIT</b>	40-foot High Cube shipping container
	<b>COMMERCIAL UNITS</b>	1,000 boxes (50,000 biodegradable containers)
	<b>TOTAL SHIPMENT VOLUME M3</b>	80 m <sup>3</sup> (approx. useful capacity of 40' HC container = 76.3 m <sup>3</sup> )
	<b>TERMS OF SALE</b>	FOB

<b>OTHER IMPORTANT INFORMATION</b>	<b>FORM OF PAYMENT AND TIME</b>	Letter of credit - 60 days	
	<b>EXCHANGE RATE</b>	1 USD = 3830 COP 1 EUR = 4417 COP	
<b>EXPORTING COUNTRY</b>	<b>Concept Export costs</b>	<b>COP</b>	<b>USD</b>
	<b>EXW value</b>	\$ 77.800.000	\$20.313
	<b>Unitarization</b>	\$ 1.800.000	\$470
	<b>Local handling by exporter</b>	\$ 800.000	\$209
	<b>Domestic transportation</b>	\$ 5.500.000	\$1.436
	<b>Documentation</b>	\$ 1.000.000	\$261
	<b>Domestic insurance</b>	\$ 155.600	\$41
	<b>Intermediate storage</b>	\$ 257.000	\$67
	<b>Pre-shipment handling</b>	\$ 681.500	\$178
	<b>Shipment handling</b>	\$ 2.010.000	\$525
	<b>Freight forwarder/customs agent</b>	\$ 48.329	\$13
	<b>Administrative costs</b>	\$ 900.000	\$235
	<b>Inventory capital</b>	\$ 389.000	\$102
<b>TOTAL FOB</b>	<b>\$ 91.341.429</b>	<b>\$ 23.849</b>	

*Source:* Data taken from (Port of Cartagena, 2025) and (DIAN, 2025)

## **RISK ANALYSIS AND MITIGATION**

In the context of international trade, risks can arise at different stages of the operation, production, transportation, documentation, logistics, market conditions, or external factors such as exchange rate or political fluctuations.

This analysis seeks to anticipate such situations through a systematic assessment of the probability of occurrence and the level of impact of each risk, establishing preventive and corrective actions that guarantee business continuity and compliance with commercial commitments.

Likewise, the risk matrix presented below allows for the prioritization of the most relevant risks and the assignment of realistic and sustainable mitigation measures aimed at strengthening the operational and financial capacity of the exporting company, contributing to the efficient and secure management of International Physical Distribution (IPD).

Figure 4 Matrix Risk analysis and mitigation

Nº	PROCESS	TYPE OF RISK	MITIGATION MEASURES	IN CHARGE	RISK MANAGEMENT	FOLLOW-UP MECHANISM
1	Marketing / Sales	Strong local competition	Product differentiation, strategic alliances, sustainable marketing strategies.	Commercial Manager	Competitive monitoring, market analysis, business strategy adjustment.	Quarterly market reports, competitive benchmarking
2	Market Research/ Product Development	Changes in consumer preference	Consumer surveys, product adaptation, biodegradable packaging innovation.	Product Manager	Monitoring trends and adaptation of products according to market preferences.	Biannual reports on trends and preferences
3	Marketing / Branding	Lack of brand positioning	Digital/local marketing campaigns, presence in fairs and social networks, sustainable branding.	Marketing Manager	Branding and marketing planning focused on the target market.	Branding, sales tracking and engagement KPIs
4	Logistics / Marketing	Difficulty in finding distributors or partners	Identification of strategic partners, clear contracts, participation in trade fairs.	Export Manager	Selection of strategic partners and management of business relationships.	Monthly review of contracts and partner performance
5	Production / Quality control	Differences in quality and packaging standards	Prior certification, strict quality control, internal audits and laboratory testing.	Production Manager	Quality monitoring and compliance with international standards.	QA reports, quarterly audits
6	Legal / Compliance	Regulatory non-compliance	Training in regulations, legal consultancy, documentation review and certification.	Legal Manager / Compliance	Regulatory compliance, internal controls and ongoing legal advice.	Six-monthly regulatory compliance reviews
7	Marketing / Sales	Strong pressure on prices	Value-added strategy, price negotiation and exclusivity agreements.	Commercial Manager	Margin management and continuous evaluation of prices against competition.	Monthly review of margins and prices
8	Marketing / Commercialization	Low initial product acceptance	Pilot tests, promotions, customer testimonials, educational campaigns on biodegradability.	Marketing Manager	Customer perception tracking and communication adjustments.	KPIs de ventas iniciales, encuestas de satisfacción
9	Communication / Legal	Language or Cultural Barriers	Professional translation, intercultural training and legal review of documents.	Legal Manager / Communication	Management of intercultural communication and document review.	Contract tracking and customer feedback
10	Strategy / Legal	Changes in market regulatory trends	Legislative monitoring, participation in industrial associations, scenario planning.	Gerente Legal / Estrategia	Strategic adaptation and proactive regulatory compliance.	Revisiones trimestrales de cambios regulatorios

11	Marketing / Sales	Dependence on few customers or distributors	Diversification of customers, long-term contracts and sales monitoring.	Commercial Manager	Customer portfolio management and sales concentration control.	Monthly review of sales per customer
12	Logistics / Export	Customs withholding tax	Documentary checklist, customs agent, export staff training, tracking software.	Logistics Manager	Document control and standardized logistic procedures.	Monthly audits of documentation and transport
13	Quality and Certification Management	Loss or de-accreditation of EN 13432 certification	Quarterly internal audits, annual certification renewal, and testing through a recognized European laboratory	Quality Assurance Manager	Ensure continuous compliance with EU biodegradability and compostability standards	Audit reports, laboratory testing certificates, and annual external certification renewal verification
14	Financial / Treasury	Exchange rate fluctuation	Foreign exchange risk coverage, credit insurance, advance payments, collection tracking.	Financial Manager / Treasury	Financial management and control of monetary risks.	Monthly exchange rate review and accounts receivable

## **RECOMMENDATIONS FOR TERRAPLASTIK PACK**

It is recommended that Terraplastik Pack strengthen its positioning as an innovative company in eco-friendly packaging, highlighting the use of natural raw materials such as coconut and cassava, and maintaining international environmental certifications like EN 13432 or OK Compost.

The company should obtain European biodegradability certifications from TÜV Austria and DIN CERTCO and complete its registration in the LUCID Packaging Register to guarantee unrestricted access to the German market. It is also advisable to establish agreements with sustainable distributors or eco-friendly packaging companies in areas such as Düsseldorf and Hamburg, to reduce logistics costs and strengthen the distribution chain.

Additionally, the company should include clear messages about the positive environmental impact of its products on labels, catalogs, and marketing campaigns, and analyze eco-friendly consumption trends within the European Union to adapt the design and functionality of its packaging to local preferences.

## **RECOMMENDATIONS FOR DOING BUSINESS IN THE BIODEGRADABLE PACKAGING SECTOR**

It is recommended that companies entering the biodegradable packaging sector focus on identifying high-value market segments, such as premium food products, eco-friendly cosmetics, and take-away packaging from sustainable restaurant chains. Products should offer distinctive value using local raw materials like coconut and cassava, supported by eco-friendly certifications and attractive, functional design.

It is essential to ensure that all stages production, packaging, logistics, and delivery remain aligned with sustainability principles, including renewable resources, low energy consumption, minimal plastic use, and efficient transportation. Furthermore, businesses

should form strategic partnerships with food or cosmetic brands to launch limited eco-friendly editions that enhance visibility and sales.

Continuous monitoring of consumer trends is key, particularly those related to visual appeal, product traceability, and storytelling about sustainable origins. Finally, active participation in trade fairs and B2B platforms specializing in sustainable packaging, using physical samples, bilingual catalogs, and high-quality images, will strengthen brand credibility and international market positioning.

Link with presentation online: <https://youtu.be/0ZQoDJCMwsk?si=cmJbgnDE0IMPXQs8>

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**Annex**

**Annex 1.** Preselection matrix market

**Annex 2.** Matrix PESTLE

**Annex 3.** <https://youtu.be/0ZQoDJCMwsk?si=cmJbgnDE0IMPXQs8>