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Topic:

Innovation and internationalization plan of ecological bicycles with bamboo frames to the United States market. Case study: Bambú Bici

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DEDICATION:

This work is dedicated to Beatriz, my mother, who was my unconditional support and have had inspired me to carry on despite adversity and today she celebrates with me from heaven this triumph of both.

To Edgar, my father, who with his example has known how to guide me as a person and also towards the professional that I aspire to be.

Likewise, I dedicate my work to my family, my grandparents, and especially to my mom America who has dedicated her life to support me at all times and with her blessings and advice has given me the strength to achieve it.

To Ignacio, I also dedicate my work and all the effort of my career, I thank him for his perseverance and support in every step I take.

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RESUMEN

El presente trabajo de titulación propone un plan de internacionalización de bicicletas ecológicas con marcos de bambú al mercado de los Estados Unidos de Norteamérica. Basado principalmente en el caso de Bambú Bici como modelo de innovación y en una revisión teórica de comercio exterior que resalta teorías como la ventaja comparativa de David Ricardo y el modelo de Heckscher-Ohlin que explica la abundancia relativa de un producto para la exportación. El modelo de gestión de proyectos como el mencionado anteriormente proponen una articulación de sistemas de producción que impulsan el trabajo conjunto entre territorios y que integran comunidades, actores a la vez que promueven el comercio local. Como parte del estudio de mercado se realiza un análisis del entorno que considera distintos factores de ambos países. En el segundo estudio se examinan aspectos relacionados con las características del producto y el modelo de producción del mismo, considerando la innovación y el modelo de economía circular para la internacionalización del producto. Finalmente se elabora un estudio económico con la finalidad de definir los procesos técnicos y financieros al mercado meta.

Palabras clave: comercio internacional, internacionalización, innovación, economía circular, exportación.

ABSTRACT

The present degree work proposes a plan for the internationalization of ecological bicycles with bamboo frames to the market of the United States of North America. Based mainly on the case of Bambú Bici as a model of innovation and on a theoretical review of foreign trade that highlights theories such as David Ricardo's comparative advantage and the Heckscher-Ohlin model that explains the relative abundance of a product to export. The project management model such as the one mentioned above propose an articulation of production systems that promote joint work between territories and that integrate communities, actors at the same time that they promote local commerce. As part of the market study, an analysis of the environment is carried out that considers different factors in both countries. The second study examines aspects related to the characteristics of the product and its production model, considering innovation and the circular economy model for the internationalization of the product. Finally, an economic study is prepared in order to define the technical and financial processes for the target market.

Keywords: international trade, internationalization, innovation, circular economy, export.

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MARKET STUDY, TARGET MARKET ANALYSIS

1.1.1 FUNDAMENTS OF THE PROJECT

1.1.2 THEORY OF FOREIGN TRADE

In the globalized world of the 21st century, foreign trade is a reality that has evolved over the years and represents different advantages for the markets of goods and services while facilitating trade between countries. Among them, one can consider the creation of employment in the localities where the goods are produced, providing the opportunity to access a salary, the creation of associations that provide services to international companies, the use and optimization of surplus products and therefore the positive impact on the economy of companies. There are countless advantages that can be highlighted, it is worth mentioning one of the negative aspects that are considered when talking about foreign trade, this is pollution due to mass production. Taking into account the evolution in foreign trade, every day there are more alternatives to improve the environmental aspect when it comes to production. A clear example is the use of renewable and non-polluting products that benefit both consumers and producers.

One of the theories that best explains the opportunities of foreign trade is David Ricardo's theory of comparative advantage, which indicates that, although a country does not have the absolute advantage in a product, it is possible to achieve production and export of this product whose absolute disadvantage is lower, since this would be the one with the comparative advantage. Alternatively, the Heckscher-Ohlin model explains the concept of relative abundance, where his proposal focuses on the export of products that require production factors

that a country has in abundance (González, 2011). In this case, Ecuador is a country rich in biodiversity that fosters productive activities using abundant and various raw materials, including bamboo, which can be found throughout the entire Ecuadorian territory.

Although in a generalized way foreign trade has always been seen as something unique and exclusive for big enterprises, SMEs and small companies are also actors that increasingly consider the challenge of access the international market and exploiting the potential of new products that are in great demand abroad. It is necessary to deconstruct the concept of foreign trade as something detrimental to local industries and see it as a marketing opportunity, considering the export of new, innovative and quality products that contribute to society from the conception of the product and that take advantage of efficiently non-polluting raw material as a new, more useful and sustainable form of business.

1.1.3 THEORY OF PROJECT EVALUATION

For the development of the analysis of this work, have been used as a basis and model the conceptual elements for the preparation and evaluation of projects contained mainly in the books Project Evaluation by Gabriel Baca Urbina and the book Formulation and Evaluation of Projects by Marcial Córdoba Padilla. Both books serve as a guide for structuring the project analysis, in which first of all is evaluated the market study that verifies the existence of an unsatisfied potential market to introduce into the market the product under study, followed by the feasibility study technique where the existence of the technology to produce it is demonstrated and finally the development of the economic evaluation that demonstrates the economic and social profitability (Baca, 2010).

To understand the importance of a project, the authors define it as the intelligent search to pose a problem that focuses on solving and satisfying a human need; so it is necessary to evaluate it in order to know its economic and social profitability. The evaluation carried out comprises different activities related to the desired result, based on the location of the project and its organization. For this project, not only the return on investment is considered, but also the social contribution to the locality where it is carried out in a special way. As Marcial Córdoba explains in his book, projects are important because they are the impulse that promotes the development of a region (Córdoba, 2006)**.**

Due to the different political, social and economic conditions of the place where the project is located, different criteria are taken into account since they directly influence the results of the project and how it should be approached. The evaluation process is fundamental since it gives the guidelines on which the project is carried out. In this case, as part of the evaluation, the PESTA analysis is carried out, which considers the five external factors that affect the project, in which in addition to those mentioned above, environmental and technological factors are added. As mentioned in Córdoba's book, the analysis of the environment is an important part when determining the impact of the controllable and uncontrollable variables.

1.1.4 PROJECT MANAGMENT MODEL

The following work uses information from the Bambú Bici project developed by the Direction of Community Economy of the Provincial Government of Azuay between 2019 and 2020. The detailed data is based on the project “Assembling ecological bicycles with bamboo frames for efficient mobility in the province of Azuay”. The frame production part of the ecological bicycle project is located in the community of Uzhupud, Chicán parish of Paute, Azuay province. With this initiative, the Prefecture of Azuay tries to promote ecological transport

such as bicycles, the use of environmentally friendly materials and also promote small productive sectors such as the agricultural, artisanal and metalworking sectors; those who use and take advantage of resources in sustainable terms obtaining economic profitability, social justice and environmental awareness. For this reason, it was created the production line for bamboo bicycle frames, for their subsequent assembly and sale, activities that take place in the facilities of the Prefecture in the city of Cuenca (Provincial Government of Azuay, 2020).

As it is a public investment project, the State through the Provincial GAD, is the investor that places its resources for its execution. For its part, the Provincial Government of Azuay in this case, within its powers seeks to provide elements that allow the economy of the province to be boosted through the reactivation of local production, the generation of jobs and the capacitation of the population (Córdoba, 2006). The project seeks more than economic profitability to create a social impact, so that the social return allows the project to recover the investment. With this project, the Provincial Government seeks environmental sustainability by generating competitive and innovative services and businesses with public-private operation models, friendly to the environment.

The need to create a transport that respects the environment arises from the conception of the Ecuadorian State that, through the Constitution of the Republic of Ecuador, in its articles 14 and 66 stablish the right of the population to live in a healthy and ecologically balanced environment, free of pollution and in harmony with nature, that guarantees sustainability and good living known as sumak kawsay. Likewise, in Art. 71 nature or Pachamama, where life is reproduced and carried out, is recognized as a subject of law so that its existence and the maintenance and regeneration of its vital cycles, structure, functions and processes are fully respected. In this way, the Prefecture of Azuay focuses its efforts on transforming the province

into a productive reference that in an ecologically sustainable way promotes the economic development of its inhabitants through all the activities and projects that it executes.

In this sense, there are three mainstreaming approaches considered: firstly, the gender approach is raised in the economic axis, where the manufacturing activity is carried out by women, however, for this particular project it is they take into account the capacities of men, women and people who are part of priority attention groups, both for the production and marketing processes, considering fair trade. The line of action is focused on making the transformation of products more technical for maximum use and diversification, which is why it is linked to the generation of spaces for participation and collaboration of women who are part of the agents of the artisanal sector of the economy for recovery of ancestral customs, through which it is possible to create and develop initiatives that improve competitiveness.

Secondly, the environment is considered, with entrepreneurship in new sectors of the economy and recovery of ancestral customs, with which the Provincial Government of Azuay articulates the strategy in the task of consolidating a vision of sustainable development.

En tercer lugar, se encuentra el enfoque de la interculturalidad, que contribuye a la construcción del Estado plurinacional e intercultural y a la eliminación de la discriminación racial, exclusión étnica y cultural, que afectan a los pueblos y nacionalidades, motivo por el cual es importante recuperar los múltiples conocimientos, saberes y aportes de las diversidades, así como entregar herramientas y técnicas de trabajo que permitan construir colectivamente con la ciudadanía la interculturalidad desde las localidades, recuperando experiencias locales a la vez que se generan procesos de aprendizaje e inclusión en todos los sectores.

The management model with which the Provincial Government of Azuay works for the commercialization of the product is contained in the ordinance issued by the Provincial Council of Azuay who created the "Experimental Eco-Productive Unit Tarpuy Pacha / Sowing Times", as part of the Direction of Community Economy of the Provincial Government of Azuay. Likewise, and according to the objectives of the Experimental Eco-Productive Unit / Tarpuy Pacha, the development of productive activities that generate added value is established, actively participating in the construction of an economic system based on growth and innovation; as well as environmentally sustainable and eco-efficient. Regarding the production systems, this initiative promotes the articulation of different production subsystems between territories, in which rural and urban communities of this and other provinces are integrated to promote their productive offer at the local, national level and in the future also on an international level.

Because the Direction of Community Economy is in charge of the processes of production, collection, exchange and commercialization of the products created by the Experimental Unit Eco-Productiv Tarpuy Pacha / Times of Sowing, the financing for the projects to be carried out by of the Eco-Productive Unit is considered in the Annual Budget Planning (ABP) 2020 of this direction. In addition, other sources of income are considered, such as a budget destined to the promotion of production, donations, funds obtained through international cooperation and the income from sales or services generated by the Eco-Productive Unit (Provincial Government of Azuay, 2020).

1.1.5 DESCRIPTION OF THE PRODUCT

Bamboo bicycles are an ecological product that aims to solve several problems at the same time, due to their alternative use as non-polluting transport and the production of their frames with renewable materials. Bamboo is a resistant product that provides rigidity and comfort, as it absorbs the impact and pressure that the quadrant of any bicycle is subjected to. These factors make bamboo the ideal material to be used in bicycles. In this way, sustainable development is encouraged and created, because 70% of the bicycle components are natural and biodegradable. The production of this bicycle makes it possible to take advantage of the raw material, generating added value.

The product proposed by Bambú Bici is a bicycle with a bamboo frame, vegetable fibers and resins for its gluing. It has 29" rims, with 1x8 gears, 25.4 saddle tube, disc brakes and 24-speed monoplane. What makes it a light, stable and resistant bicycle. The design of each bicycle is unique due to the particular characteristics of each part or log used for its manufacture. The accessories used in the bicycle are from the Shimano brand whose official distributor is located in the city of Ibarra, Imbabura. Below is a picture of the bicycle's design, promoted on the official Bambú Bici Instagram account (Provincial Government of Azuay, 2020).

Figure 1. Bambú Bici

Source : (Bambu Bici, 2020)

1.2 PEST ANALYSIS

1.2.1 ANALYSIS OF ECUADOR AS A PRODUCTION MARKET

The following analysis considers political, economic, social, technological, and environmental factors of Ecuador, and has the purpose of evaluating different indicators that may have a relevant impact on the development of the project in order to identify the possible advantages and disadvantages that can suppose considering all these factors in Ecuador as a country of production (Martinez & Milla, 2012).

1.2.1.1 POLITICAL ANLYSIS OF ECUADOR

The political processes and legislation affect directly, since the support of certain administrations for projects of an environmental nature generates opportunities with high potential. This is the case with the International Organization for Bamboo and Rattan (INBAR),

which is dedicated to promote environmental sustainable development using bamboo and rattan. Ecuador, in addition to being one of its 47 members, has the regional office for Latin America and the Caribbean in the city of Quito. The organization works in conjunction with the Ecuadorian Government, producer organizations, and other local partners, to assist with the design, implementation, and execution of projects financed by international donors. Also, they are in charge of carrying out studies on the different characteristics of bamboo (Izquierdo, 2021).

The Ecuadorian government published the National Bamboo Strategy in 2018. Guidelines for a green and inclusive development, with the collaboration of the Ministry of Agriculture and Livestock, the Bamboo Sector Board and INBAR, as well as other institutions that provided technical support. In the same way, there are projects in the country that have the support of INBAR focused on bamboo and all its processes, from the sowing to the sale of products made with this material.

International cooperation is a very important area since, apart from the financing that can be obtained from different organizations, technical cooperation and knowledge transfer benefits developing countries. As an example, we can cite the cooperation between the United Nations Development Program (UNDP / GEF) and the Ecuadorian government led by the Ministry of the Environment, whose lines of work focus on three main topics; climate change, energy and environmental quality (MAE, 2020).

Besides the programs created for development issues, Ecuador maintains various multilateral free trade agreements. Among the multilateral agreements is the agreement established by the World Trade Organization, the Customs Union of the Andean Community, the free trade

agreement with the European Free Trade Association (EFTA) and the free trade agreement with the European Union. The preferential trade agreements that Ecuador maintains are with Guatemala, Chile, Mexico and by MERCOSUR with Colombia and Venezuela. Likewise, Ecuador maintains a trade agreement signed in May 2019 that is not yet in force with the United Kingdom and potentially, adhesion to the Pacific Alliance is being contemplated (SICE, 2020).

1.2.1.2 ECONOMIC ANALYSIS OF ECUADOR

Like many Latin American countries, Ecuador's economy depends in a great extent on external economic conditions, since it is a primary exporting country and its economy has been based mainly on the exportation of oil and bananas. Its main trading partner is the United States with a value that represents 49.31% of total crude oil exports (TRADE MAP, 2020). Throughout the years Ecuador has experienced moments of bonanza and growth in its economy, however, due to the importance of oil in the economy, it has also suffered with the fall in its prices. Although it is true, the country has made efforts to adapt its economy to the international context by promoting investment that ensures fiscal sustainability, strengthening the foundations of dollarization, promoting private investment and guaranteeing the social protection of the most vulnerable population, all this through a reform program supported by international financial institutions such as the World Bank Group, among others (World Bank, 2020).

Apart from oil, non-oil products have gained importance in the country's Trade Balance in recent years. This is evidenced in the figures given by the Central Bank of Ecuador where during the last three years non-oil exports exceed the export figures of oil exports. In the records of 2018, 2019 and 2020, continuous growth is observed, especially in non-traditional non-oil exports. The products with the highest export value are canned fish followed by natural flowers. These figures are encouraging the country since about 30% of the total value of exports are

non-traditional products that have added value, which opens the way to new challenges that add value to Ecuadorian products. On the other hand, the European Union is the main trading partner for non-oil products with a FOB value of 3,300,643,000 USD, between January and August 2020, with a positive figure of 1,904,331,000 USD in its balance trade (Central Bank of Ecuador, 2020).

The dollar in the Ecuadorian economy plays a fundamental role. In certain cases, owning a currency with the value of the dollar is a disadvantage in terms of competitiveness, this is due to the fact that production costs increase due to the high value of raw materials, salaries and other items that are added to the final product. However, the dollar has served to avoid hyperinflation in the country. As explained in the book "Dollarization: Two Decades Later", after dollarization in 2001, inflation decreased drastically, and since 2003 it has remained with an annual average of 3.5% (Villalba, 2019).

1.2.1.3 SOCIAL ANALYSIS OF ECUADOR

Within the social analysis, an important sociodemographic indicator is employment. In the country the figure of employment in suitable conditions is around 63% for September 2020, 5% less than the figure registered for the same month of 2019. The percentage of people in the underemployed category is around 23 % in September 2020, 3.7% more than in 2019. The number of unemployed people is approximately 6% in September 2020, 2% more than in 2019 (INEC, 2020).

The gender gap is present in the reality of workers, most of the people with formal employment are still men, while the number of people who are not employed is headed by women. In the case of remuneration, the reality is similar, since women earn less than men, however, in recent

years this disparity has been decreasing to a difference of less than fifty cents. Of all the people considered in the different types of employment, the majority are people from the urban area. The average salary of a person who works in urban areas is 1,046.3 USD, as opposed to a person who works in a rural area who receives an average of 567.71 USD (Olmedo, 2018).

Regarding the level of wealth of society, according to data published in the Technical Bulletin by the National Institute of Statistics and Censuses (INEC), the results from 2011 to March 2012, 58.8% of the Ecuadorian population has saving capacity and 41.1% have more expenses than income. The average income in the country is 892.9 USD. The Gini Coefficient figure at the national level for December 2019 is 0.473, which represents a medium level of inequality, where the level of income is not perfectly equitable, but neither is it close to the perfect inequality that concentrates income in few individuals. However, the GDP per capita figure in 2018 was USD 6,362, suggesting a very low standard of living (Expansión, 2020).

1.2.1.4 TECHNOLOGICAL ANALYSIS OF ECUADOR

Technology encourages the creation of innovative products, in the case of Ecuador there are some technological innovations regarding online commerce. Since 2014, the Ecuadorian Chamber of Electronic Commerce (CECE) was created, a non-profit organization whose objective is to promote the use of new technologies for commerce. This organization develops and organizes locally the e-Commerce Day Ecuador, an initiative of the e-Commerce Institute. In addition, it offers studies of the online shopping behavior of Ecuadorians, as well as the possibility of training and obtaining certifications in electronic commerce from the institute. The CECE is part of the Red e-Commerce Institute that develops and supports the digital economy in the Latin American region, for which it has developed a Regional Plan of Action for the preparation of regional studies in order to promote good practices, formation of human

resources and that through this platform knowledge can be shared with other members of the region (eCommerce Institute, 2020).

Regarding the use of the Internet and virtual commerce, the chamber of commerce has carried out a study of the behavior of online shopping in Ecuador during the year 2017. This study analyzes the impact of new technologies in the form of commerce that they facilitate and streamline the purchase and payment method. One of the most important points of analysis is consumer confidence in online purchases as this becomes a barrier to online commerce. According to the registered figures, Ecuadorians make purchases of clothing in the first place and goods and services in second place. Regarding the consumption of credit cards, the largest amounts are dedicated to the payment of university tuition and entertainment. The cities that make the most virtual purchases are Quito, Guayaquil and Cuenca (CECE, 2020).

Another example of progress and promotion of digitization and innovation is the union of the Ecuadorian Chamber of Technological Innovation (CITEC), who offer information to their members so they can create relationships between companies in the same sector, share knowledge and analyze issues of national and international interest. CITEC, supported by the Development Bank of America (DBA), have implemented the project "Strengthening the competitiveness of the technology sector in Ecuador", within which the "Exportation of IT-from Ecuador to the World" program is developed, it has the purpose of collaborating with the different companies in the sector to provide them technical assistance and thus shape their exportable offer through the design and execution of strategic export plans. The participation of at least 30 companies shows a panorama where small and medium-sized companies in Ecuador are increasingly interested in being part of initiatives that introduce them to digital commerce in order to achieve the international market (CITEC, 2020).

1.2.1.5 ENVIRONMENTAL ANALYSIS OF ECUADOR

In relation to the environment, the legislation in Ecuador has incorporated the rights of nature and sumak kawsay into the Constitution since 2008, which, in addition to guaranteeing the rights of people, ensure the autonomy, integrity and effectiveness of nature (Bonilla & Luna, 2011).

For this reason, the Constitution of Ecuador contains different articles in favor of the environment, among which can cite Art.14, Art.15, Art.66: numeral 27, Art. 276: numeral 4, Art. 313, Art. 395, Art 396, Art. 937 second paragraph and finally Art. 398. These articles recognize, among other things, the right of the population to live in a healthy environment without implying affecting nature and also guaranteeing the harmony and the responsible use of resources and technologies in order to cause the least possible impact. In addition, is placed the establishment of prevention and control mechanisms to avoid contamination of spaces and thus not affect the population that lives on them (Constituent Assembly, 2008).

The actions developed by the government are the public incentives established in the Ecuadorian legal system for the conservation and sustainable use of natural resources. These incentives can be of a different nature, such as exemption from the payment of rural property tax for forests that comply with protection standards, authorization for importation of machinery, tax deduction on existing investments or new investments. In addition, among other incentives proposed by the Ministry of the Environment (MAE) are economic incentives that aim to protect forests, moors, native vegetation, such as the Socio Bosque project. These incentives, among others, are found in the MAE's "Updated Compilation of Environmental

Incentives" in order to be disseminated among the Ecuadorian community in general (Ministry of Environment, 2013).

As part of the country's commitment to caring for the environment, Ecuador has signed various international agreements, conventions and treaties that seek to protect and contribute to the proper use of resources. There are records of at least twenty international instruments to which Ecuador is part of. Among them we can mention the United Nations Convention on Climate Change, the Kyoto protocol, later replaced by the Paris Agreement, among others (Ministry of Environment, 2017)

1.2.2 ANALYSIS OF THE UNITED STATES AS A DESTINATION MARKET

As was done in the case of Ecuador, in this section the analysis will be developed taking into account the political, economic, social, technological and environmental factors of the United States as the destination country for the Bambú Bici product. The purpose of this analysis is to evaluate the impact that the result of each indicator may have on the development of the project.

1.2.2.1 POLITICAL ANALYSIS OF UNITED STATES

The United States of America maintains 15 free trade agreements in force, of which about half are with countries in Latin American and Caribbean. The WTO is one of the multilateral agreements to which the United States, like Ecuador, is also a party. The free trade agreement that the United States does not have in force is the one it has with China, signed on January 15, 2020 (SICE, 2020) .

As part of the cooperation between WTO member countries and after having gone through an accreditation system, member countries can access certifications that grant Fair Trade guarantee seals such as WFTO Member, Guaranteed Fair Trade, the seal FAIRTRADE and Naturland Fair, among others. All these stamps guarantee working conditions and adequate wages for producers, non-exploitation of children at work, equality between men and women, care for the environment through respectful practices in the production (Fair Trade, 2020)/

1.2.2.2 ECONOMIC ANALYSIS OF THE UNITED STATES

The United States is one of the main economies in the world by volume of GDP with a figure of 21.48 trillion dollars registered during the fourth quarter of 2020 (BEA, 2021). One of the economic indicators to consider in your economy are the stock indices. US stock markets show an X-ray of the US economy; After the fall at the end of 2018, a recovery was observed at the beginning of 2019 that was quickly affected by the commercial tensions between Iran and the United States of America, to which was added Brexit and the tensions between China and the United States.

Since the beginning of 2020, the slowdown was evidenced due to the confinement in China due to the coronavirus outbreak and with the months and the aggravated situation that became a pandemic, the world stock markets presented even greater losses. The NASDAQ market composite index, which is traded by the major technology groups, was down 2.29% and the Standard & Poor's (S&P 500) index was down 2.77%. By the end of October 2020, more than half of the companies that are part of the S&P registered negative results. In October 2020 the Dow Jones closed with 4.61% fewer points registered in September of the same year, with 26 values down from the 30 that are traded.

The Dollar Index (DXY) measures the value and performance of the US dollar in relation to a basket of foreign currencies comprising the euro, the Japanese yen, the British pound, the Canadian dollar, the Swedish krona and the Swiss franc. These currencies correspond to the main trading partners of the United States. In the analysis carried out for the year 2019, it is observed that in the middle of the second quarter of that year the dollar registered a depreciation against the euro that recovered at the end of the same quarter when China and the United States agreed to stop new tariff actions. Throughout 2019, the dollar appreciated 0.32%. However, during three and a half quarters of 2020 the dollar depreciated 2.5% against the basket of the 6 aforementioned currencies that make up the dollar index. These results represent a decrease in the purchasing power of the US dollar, since as the index decreases, the purchasing power of the US dollar also decreases (BCE, 2020).

1.2.2.3 SOCIAL ANALYSIS OF THE UNITED STATES

The per capita GDP of the United States in 2019 was $ 64,918.35, representing a good standard of living. However, americans are also the inhabitants with a high per capita indebtedness ratio. According to data obtained from the government website United States Census Bureau, the average income in the country is 65,712 USD per year (Census Bureau, 2020). In addition, it is in eighth place in the Doing Business ranking for the ease it offers to do business. Regarding the labor outlook, in the country there is an unemployment rate of 4.1% for the first quarter of 2019, however, with the current crisis this rate has increased its percentage, registering 6.9% in October 2020. In the innovation ranking, it is in sixth position worldwide. Its imports represent 11.98% of GDP (Expansión, 2020).

1.2.2.4 TCHNOLOGICAL ANALYSIS OF UNITED STATES

Technology in general has meant great changes worldwide, specifically in the United States, different moments have been observed in which technological advancement has marked milestones throughout history in matters of transportation, medicine, biology, on economic and even spatial issues. It is for this reason that the country is a benchmark and is leading worldwide in addition to science in technology. Along this path of technological discovery, the United States government exposed its commitment to supporting discovery and innovation in the territory in order to build the workforce of the future.

As part of this commitment to technological development, the 45th president of the United States, Donald Trump, issued an executive order on the reactivation of the National Space Council that makes space policy. He also launched the American Artificial Intelligence Initiative. Among other topics of interest, medicine was taken into account, technology for the benefit of the oceans that promote both protection and maritime control measures, in order to safeguard human health and promote economic prosperity for the country. In addition, a strategy on STEM Education was launched, based on science, technology, engineering and mathematics, whose goal is to build solid foundations that serve North Americans in an inclusive and equitable way in their preparation in topics related to these fields to develop future jobs for the benefit of the country (Droegemeier, 2019).

The office that is in charge of advising on scientific, engineering and technological issues of the economy, national security, health, foreign relations, environment and use of resources is the Office of Politics, Science and Technology. The State Department, for its part, executes public diplomacy programs that promote the value of science and the development of capacities in emerging markets, thus accelerating economic growth and taking care of the country's

foreign policy priorities. The offices that provide support in this area are the Office of Scientific and Technological Cooperation (STC), the Office of the Science and Technology Advisor of the Secretary of State (STAS) and the Office of Space and Advanced Technology (U.S. Departament of State, 2020). In the country, online commerce is representative, since 16% of retail sales are made online, according to Digital Commerce 360 data. Of this figure, at least a third of the E-commerce is done through the Amazon platform.

1.2.2.5 ENVIRONMENTAL ANALYSIS OF UNITED STATES

The United States has the Environmental Protection Agency (EPA), a federal agency that since 1970 has been responsible for protecting human health and the environment. This agency administers and regulates programs that promote the well-being of people while protecting the environment. The different business sectors such as agriculture, automotive, construction, oil and gas, electric utilities and transportation are regulated by this agency. One of the events that led to the creation of this agency was the Cuyahoga River fire to initiate greater control of water pollution. Since its creation and with the authorization of the congress, it has established different quality standards such as air quality, water quality, pesticide management, elimination of leaded gasoline and the control of noise emitted by airplanes, among others (EPA, 2017).

While it is true there is no international instrument of global application that requires countries to comply with their rights and obligations in environmental matters, the same countries, sovereignly complying with their responsibility, create and sign agreements that contribute to caring of the nature. The United States is part of different alliances such as the Environmental Cooperation Agreement between the United States of North America, the United Mexican

States, and Canada, in order to reduce pollution, strengthen environmental governance, conserve biological diversity, and sustainably manage (EPA, 2020).

Likewise, the Office of the United States Trade Representative registers at least eight multilateral environmental agreements that include agreements on the control of hazardous wastes, biodiversity and biosafety, trade in threatened species, negotiation of mercury, protection of the ozone layer, organic pollutants. and the United Nations Environment Program (UNEP) (USTR, s.f.). Despite the various agreements mentioned, President Trump decided to officially withdraw from the Paris Agreement on climate, however, with the election of 46th President of the United States Joseph R. Biden Jr., this decision has been replanted and his Return is imminent after having signed an executive order accepting said agreement, with this the country recommits itself to achieve neutrality of its emissions in the future.

1.3 MARKEY STUDY

This section is intended to determine market conditions at the national and international level, to facilitate efficient decision-making for the introduction of the product in the United States market. Next, we will make a qualitative introduction of the demand and then focus on the quantitative issue.

1.3.1 ANALYSIS OF THE OFFERT

To analyze the product offer the most relevant companies in the sector at an international level will be taken into account. The analysis will consider factors of supply behavior such as the evolution and future prospects of companies that market bicycles with bamboo frames.

1.3.1.1 BEHAVIOUR OF THE OFFERT

At an international level, an example of a successful case in bamboo bicycles is the entrepreneur Benice Dapaah, creator of the Ghana Bamboo Bike initiative. This project serves as an instrument to combat climate change and at the same time it contributes to the reduction of poverty in the localities, by employing young women. Another factor to take into account is that this project addresses some of the United Nations Millennium Development Goals, such as the first: eradication of extreme poverty, the third: promotion of gender equality and the autonomy of women, and also number seven: ensure environmental sustainability (United Nations for Climate Change, 2020)

In 2013, this project received the AFD 100 Innovation for Sustainable Development award, the UNFCCC Momentum for Change Award and the World Business and Development Award in 2012. All these awards have given the project the opportunity to receive funding from different organizations, and also the possibility of training young people in their skills as well as achieving international visibility. In 2016, Ghana Bamboo Bikes carried out the bicycle technology transfer exchange program in a joint effort with the Italian organization Passi da Ciclope, in which Italian youth were trained in the use of bamboo on bicycles. During this program, joint practices were available to the community for technology transfer, taking advantage of their affiliation to the Green Project of the World International Property Organization 'WIPO-Green' (Ghana Bamboo Bikes Initiative, 2016).

The main suppliers of bamboo bikes are My Boo, the brainchild of Maximilian Schay and Jonas Stolzke. This company is positioned as the largest in Europe, currently its products are sold in Germany, Switzerland, Austria, United Kingdom, Belgium, Denmark, Czechia, Italy, Hungary, Slovakia, Sweden, Spain, Luxembourg and Holland. This project carries out the

production of its frames in Ghana, securing jobs and financing the Model School of the Yonso Project so that 206 children can receive education and the allocation of more than 300 scholarships. Both the Yonso project and the My Boo company were awarded the German Sustainability Award.

This business model has a particular form of commercialization since the frames are made in Ghana and later sent to Germany where they are assembled and technified and later to be commercialized. The bikes come in different designs and sizes, and their prices range from $ 1,798 for a sport bike to $ 7,198 for an e-bike. All bicycles are tested in Germany to guarantee their quality and resistance. My Boo offers the possibility to test any of its bikes at no cost in the presence of a dealer at the authorized premises or tests at home for 10 days from 128.58 USD or for 30 days for 258.46 USD. The brand's bicycles meet the requirements of the European Union EN14764 (My Boo, n.d.).

While the bamboo bicycle exporter company Bamboocycles started as a fun activity until in 2008 it was consolidated as a company in Mexico City. In addition to producing bicycles with bamboo frames, they give weekend courses for the construction of the same so that people can learn and build their own bamboo frame. Another activity they carry out is maintenance for bicycles, which includes mechanical service and aesthetic maintenance. Within the catalog that they handle in addition to bicycles, you can find different types of frames, travel bags, and bicycle forks. The price of their bicycles ranges from 775 USD to 1,600 USD depending on the model of the bicycle, the cost of shipping will depend on the region; for example, for Europe the cost can be from 40 USD to 390 USD per bike. The price for the United States is from 10 to 40 USD per bicycle (Bamboocycles, 2020).

1.3.2 ANALYSIS OF THE DEMAND

For the development of this analysis, the characteristics, needs and behavior of the potential consumers of the product will be considered.

1.3.2.1 BEHAVIOUR OF THE DEMAND

Bambú Bici meets the demand of consumers looking for ecological products respectful with the environment. According to PRO-ECUADOR's 2019 US Commercial Guide, consumer trends have been changing over time; the behavior of the North American buyer is directed towards a healthier and more conscious purchase of each product. In addition, looking for organic products over processed ones, following the world trend, the American buyer is interested in sustainable products that respect the environment and have an ethical treatment with their employees. These factors give the opportunity for the product manufactured by Bambú Bici to enter a market made up of selective buyers who prefer an innovative, ecological and quality product regardless of its price, if it shows that it is well invested to provide a decent remuneration to its producers (PROECUADOR, 2019).

Taking as a reference the previously mentioned projects that are dedicated to the production of bicycles with bamboo, the consumers who looks for this type of products are people of different ages, men and women concerned about their health who are also interested in ecological, quality products that contribute to caring the environment. Likewise, the strategies for the sale of different products are online advertising campaigns that facilitate the purchase of bicycles and provide different forms of delivery. The experience they offer is not only identified with satisfying the need for a bicycle that serves the consumer but also raising awareness with the

care of nature and the contribution to social projects and fair trade for producers who are mostly in rural areas.

The demand of this product in the United States of America market is approximately 1% of the purchases made annually. Consumers tend to buy primarily mountain bikes, followed by BMX models and cruisier design bikes among others (Kunst, 2019).

1.3.2.2 IDENTIFICATION OF THE MARKET

The geographic segmentation of the market is aimed at satisfying the needs of customers located in the United States of North America. Regarding the demographic segmentation, the product is designed for people of 15 years and older, which includes adolescents, youth and adults from all economic segments. For the psychographic segmentation, people with a healthy lifestyle, concerned about nature and its conservation, are taken into account. In this segmentation are athletes, environmentalists and activists. The behavioral segmentation identifies the population that uses the bicycle as a means of daily transport, occasional and habitual cyclists such as athletes and urban cyclists.

1.3.2.3 SIZE OF THE MARKET

Taking the statistics analyzed in the United States as a reference, the use of bicycles has experienced an increase since 2014. According to figures recorded in the “Cycling Dossier” of the Statista portal, 12.4% of the population of the United States rides his bicycle regularly. The estimated number of cyclists in the country in 2017 is 47.5 million. The value of the market size of traditional bicycles for the year 2020 is 55.72 million. With the current situation and given the health crisis around the world caused by COVID19, the use of bicycles has increased

in many countries. In cities like New York, they registered a 67% increase in demand during the month of March. In cities like Chicago and Philadelphia the percentage was not only double, but an increase of 470% was recorded (Wagner, 2019).

1.3.3 PRICE ANALYSIS

The local price for the bamboo frame bike is 370 USD. The price established for the commercialization of the Bambú Bici is a value subsidized by the Provincial Government of Azuay. This value is intended to cover only the production costs of the bicycle. As mentioned in previous sections, the value that is taken into account in addition to the monetary one is that of the social contribution to the community.

To determine the sale price in the international market, in addition to the cost of production, other values that manage to cover different items and also generate profits must be considered. Currently, with the economic crisis that is being experienced worldwide and considering the characteristics of the bicycle, the price must be adjusted to the needs of consumers. Although the product is not subject to price control at the national level, it is necessary to consider the prices at which in the international market; Considering this factor, the minimum price for a similar bike is $ 775, excluding home delivery costs.

Table No. 1.

Importer trade Price in US

DESCRIPTION	COSTS
Average price at an importer level	$1.187,50

Source: Bamboocycles, 2020

Elaborated by: The author

For the elaboration of the Market Price table in USD, the reference prices at the importer level were taken into account, for which an average price of those registered for the different products in the distribution stores were calculated.

1.4 ANALYSIS OF THE COMERCIALIZATION OF THE PRODUCT

In the commercialization of the product, two main points will be analyzed, to start the analysis of the brand and finally the distribution channels where the product can be commercialized so that it reaches the final consumer.

1.4.1 ANALYSIS OF THE BRAND CREATION

The name of Bambú Bici was born as the hallmark of this ecological product, easy to read and memorize. The Bambú Bici brand aims to identify the product with its ecological design, with attractive colors for the eyes and a simple and clear design so that it can be associated with the image to be projected. For the printing of T-shirts and other products in the Kit, the different types of logo are used, with different dimensions to facilitate their adaptability to the size of the surface on which the stamping is made.

The logo used for the elaboration of the Bambú Bici arts is as follows.

Figure 2. Bambú Bici logo

Source: (Gobierno Provincial del Azuay, 2020)

Elaborated by: (Gobierno Provincial del Azuay, 2020)

1.4.2 PROMOTION AND DISTRIBUTION CHANNELS

The main distribution channel for Bambú Bici is its Instagram account, which is used to promote the product. In it, they interact with the members of the network and also with their followers through raffles and mentions in the stories. The account has 2,966 followers, including people from all over the country and abroad who have been interested in the idea of the bamboo bicycle. The official bicycle account is the ideal means for its sale since it does not increase costs to the final price of the bicycle more than the shipping cost, which will be determined according to the final destination where the product should arrive

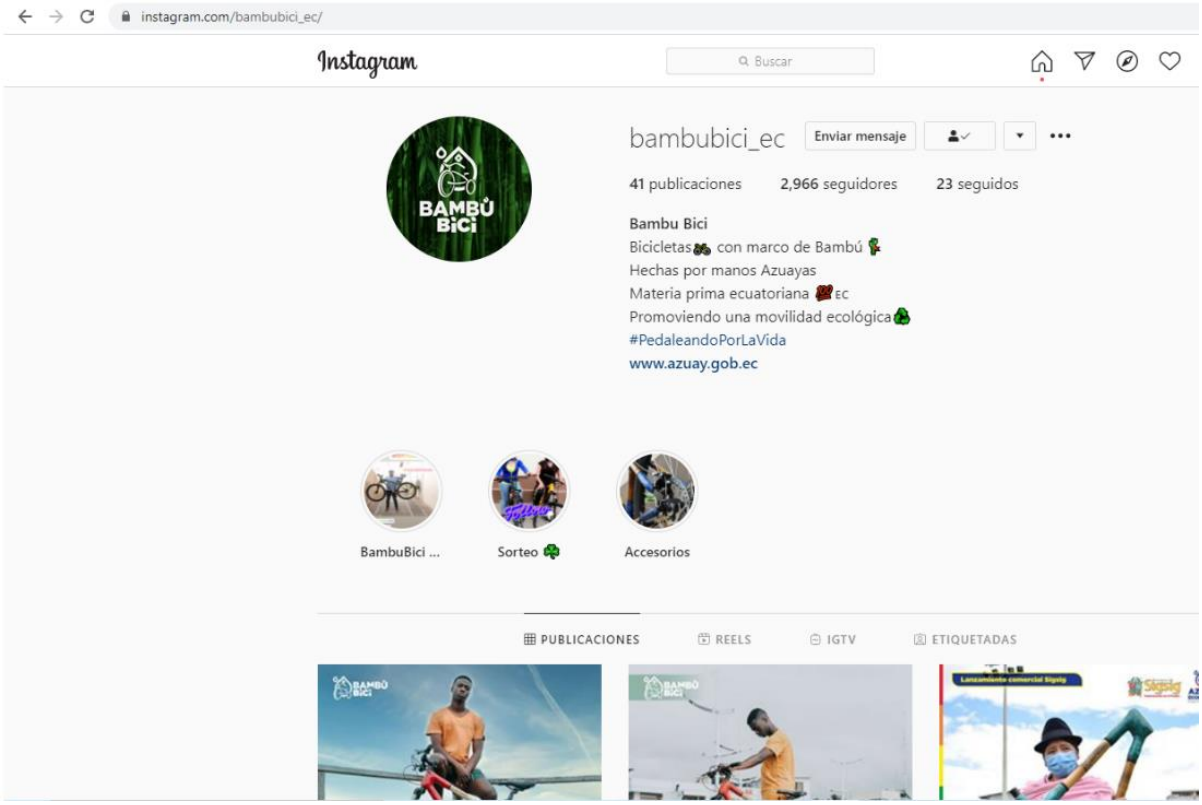

Figure 3. Bambú Bici Instagram Official Account

Source: (Bambu Bici, 2020)

Elaborated by: (Gobierno Provincial del Azuay, 2020)

To achieve a simple sale for both the seller and the consumer, it is possible to introduce the product on a shipping platform that handles the destination market in an agile way, an example of this can be Amazon. The use of this platform facilitates not only the delivery of the product, but also its sale and accessibility because this is a globally recognized company and offers the possibility of selling products with the confidence and support of years of trajectory and also the thousands of products sold. When contracting this distribution channel, it is necessary to pay a fee for each item sold that can range from 5% to 45% of the total price including shipping costs.

1.5 SALES PROJECTION

For the sales projection, is considered the value of imports of bicycles from the United States registered in 2019, which represent 480,000,000 USD public information available on the Statista portal (Wagner, 2019). For the projection, it has been considered that the percentage of the market that can be accessed is approximately 0.1%. The result considered for the second year of sales is calculated with an increase of 6.3%, 4.9% for the third year, 4.2% in the fourth year and 4.4% in the fifth year. The increment values are based on the percentage obtained from the projections of the United States GDP corresponding to the general panorama of the economic outlook from 2021 to 2031 (Congressional Budget Office, 2021).

Table No. 2.

Five year sales projection

DESCRIPTION	Year 1	Year 2	Year 3	Year 4	Year 5
Sales Units	680	714	750	787	827
Price per unit	709	709	744	781	820
Sales in USD	$481.943,20	$506.040,36	$557.909,50	$615.095,22	$678.142,48

Source: (Congressional Budget Office, 2021)

Elaborated by: The author

1.6 CHAPTER CONCLUSSIONS

Considering the abundance of the raw material, Bambú Bici uses this advantage to create a product that makes the most of this resource. What this project seeks is to create new ideas and renew the concept of foreign trade so these products can serve the human being and contribute to the future of humanity. For this, the evaluation process is important since it orders the analysis of the project and allows to easily see the errors and be able to correct them. In the same way, the involvement of entities in projects that benefit the community is important, since they not only provide technical assistance, but also facilitate and contribute to the creation of public proposals for the development of both communities and the environment.

Ecuador is one of the pioneer countries in granting rights to nature, however, in terms of projects that promote its care, there is still a long way to go. In this context, the bamboo bicycle is committed to this use of abundant raw materials and the creation of added value in Ecuadorian products. For this reason, the country as a producer of this type of article does not have the necessary experience to export non-traditional products with this level of processing.

However, in recent years there has been a notable growth in the export of non-traditional products.

It might seem that the United States is a big market for the sale of this type of product, however, due to its characteristics, this market is reduced and focuses on a select and more specific buyer with high potential, who can be adjusted to the offer of Ecuador.

CHAPTER II

STUDY ON INNOVATION AND INTERNATIONZALIZATION OF THE PRODUCT

The second chapter of this work has the purpose of defining the characteristics of the product, the production model and its adaptability to the market. For the development of the first part of the chapter, an analysis will be carried out on innovation and the concepts of circular economy and bioeconomy as production models that are adjusted to products such as the bamboo bicycle. In the second part, the technical study of the project and with the obtained data a study for the internationalization of the product will be done.

2.1 INNOVATION AND CIRCULAR ECONOMY ANALYSIS

Innovation is crucial and necessary in new ventures, as it allows improvement and creates new forms of business. From the perspective of the circular economy, a new conception is proposed for the basic design of the products, in this way, factors such as the environment, culture, production processes, materials, their use and aspects are considered related to post-life processes. The purpose of this new conception is framed in innovation from the creation of the product, starting from the design compatible with nature, with efficient materials that do not generate toxic waste that may affect it. The implementation of this way of creating products allows sustainable economic growth and at the same time obtaining non-polluting durable products (Balboa & Domínguez, 2014). The circular economy is a path to a low-carbon economy that allows the creation of long-lasting products.

For innovation to exist, it is necessary to find a problem that generates the need to create ideas. For Gómez, these ideas involve a process in which solutions are developed and tested in order to know the possible results to be obtained. Finally, and after having verified the results, it can

be applied on a larger scale and disseminated. In the case of eco-design, the idea of creating products that can be easily repaired in which recycled parts or materials are used to reduce the consumption and manufacture of materials is contemplated. Within this concept, the perspective of the collaborative economy is developed where these products are used either in parts or as second-hand items, which leads to better use.

Regarding the end of the useful life of these products, the circular economy considers, in addition to remanufacturing, reuse, recycling in order to recover consumable materials for other uses, defending the idea that in nature nothing is wasted, but that everything is transformed. To achieve this new way of creating, it is necessary to change the linear model of production and consider that waste does not exist because it can be reincorporated into the production process (Gómez, 2016).

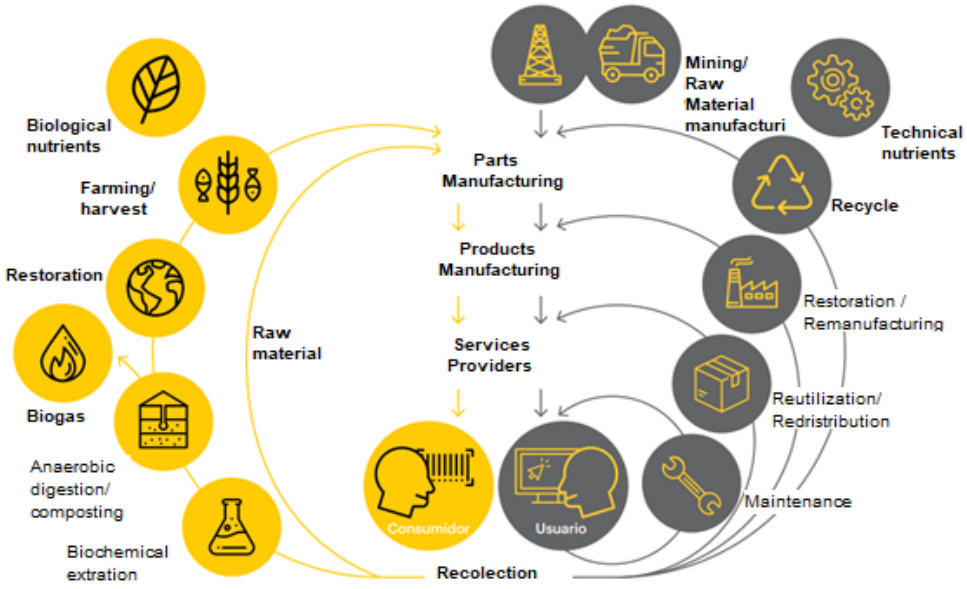

Figure 4. Circular economy system diagram Copyright Ellen MacAethur Foundation 2013

Source: Ellen MacArthur Foundation 2013

Elaborated by: (Graziani, 2018)

In the figure #4 you can see the comparison of biological cycles and technical cycles, and how from the different levels within the technical cycle a product can extend its useful life with maintenance, reuse and remanufacturing, managing to close the cycle with products that after having been used in the economic can be cycle as long as possible. In this case, the image shows the importance of using services to extend the life of products and their parts, which reinforces the idea of applying these criteria from the conception of the design. The image used for the illustration of the circular economy process belongs to the system diagram created by Ellen MacArthur, however, the graphic is a design contained in the book “Circular economy and technological innovation in solid waste: Opportunities in Latin America” by Pietro Graziani (Graziani, 2018).

2.1.1 BIOECONOMICS AND BIOENTREPRENEURSHIPS

The bioeconomy or ecological economy defined by Georgescu – Roegen refers to the harmony between the production of goods and the environment. The maximum use of things and a change in common thinking that he considers not only the useful life of a product but the true need for it, since the waste generated and overproduction directly affect pollution (Georgescu-Roegen, 2014).

As a result of the Global Bioeconomy Summit (GBS2018), held in Berlin in 2018 "Innovation in the global Bioeconomy for Sustainable and Inclusive Transformation and Well-being" established certain recommendations based on factors that drive the bioeconomy. For its socialization several workshops have to be created focused on topics related to interregional collaboration in bioeconomy, innovation related to the environment and taking advantage of opportunities, bioeconomy in industry and its financing. In the same way, the policies and forms of cooperation in bioeconomy training were considered. All this in order to create

cooperation between the different actors worldwide for future projects in favor of sustainable development.

In 2015, the Sustainable Development Goals (SDGs) were created with the purpose of contributing to the 2030 agenda to achieve goals that manage to solve global challenges such as poverty, inequality, climate change, justice and peace. The 17 goals contain themes such as the end of poverty, zero hunger, health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, work and economic growth, industry, innovation and infrastructure, reduction of inequalities, sustainable cities and communities, responsible production and consumption, climate action, underwater life, life in terrestrial ecosystems, peace, justice and strong institutions and partnerships to achieve goals. Summits such as GBS2018, support strategies that take into account the fulfillment of the SDGs, for which international policies are needed that prioritize science and technology that achieve the development of the bioeconomy.

In Ecuador and in the other Latin American countries, the main economic activities are carried out in the countryside and in agriculture. Certainly, in countries with a high level of development in crops and work in the field, the most important protagonist and responsible for the level of optimization is technology. Bio-enterprises take up the concept of the bioeconomy and integrate technology into their processes, which becomes an essential tool that influences not only development but also their creation and dissemination. The idea of these creations is to transform waste into resources, in order to take advantage of what is no longer used in the manufacture of a certain product so that it can be used in something else. This generates a lower environmental impact than would be obtained by creating new products. Another important point in the idea of bio-enterprises is the minimum use of water since this generates waste of

resources In Ecuador and in the other Latin American countries, the main economic activities are carried out in the countryside and in agriculture. Certainly, in countries with a high level of development in crops and work in the field, the main protagonist and responsible for the level of optimization is technology. Bio-enterprises take up the concept of the bioeconomy and integrate technology into their processes, which becomes an essential tool that influences not only development but also their creation and dissemination. The main idea of these creations is to transform waste into resources, in order to take advantage of what is no longer used in the manufacture of a certain product so that it can be used in something else. This generates a lower environmental impact than would be obtained by creating new products. Another important point in the idea of bio-enterprises is the minimum use of water since this generates waste and waste of resources (Jaramillo, Henry, & Trigo, 2019).

2.1.2 ANALYSIS OF THE STRATEGY TO CREATE SHARED VALUE BY MICHAEL PORTER AND MARK R. KRAMER.

The shared value creation strategy was born in December 2006 in the article ‘Strategy and society: the link between competitive advantage and social responsibility’ developed by Michael E. Porter and Mark Kramer in the Harvard Business Review. This idea gives way to products designed to create not only economic value, but also a social value. For this, it is necessary to create skills and knowledge that allow the improvement of productivity bases in which a connection between profit and non-profit entities can be created. It is necessary for the government to get involved in this process, giving way to these synergies. The concept of shared value recognizes social needs and points out that society's weaknesses also create costs that ultimately the company will have to bear. Shared value is not about sharing the value created by companies but about transforming the concept of products and market, redefining productivity in the value chain.

In the end, the weaknesses of society affect the value chain, for this reason companies can create economic value by creating social value. According to Porter and Kramer, there are three ways to create shared value, the first is to reconceive the products and the market, the second is to redefine productivity in the value chain and the third to rebuild support clusters for the sector around the facilities of the business. They ensure that by increasing value in one area the opportunities in other areas increase too. The main focus of value creation is the product, how it is beneficial for the consumer and also for the environment.

Contrary to what was thought, reducing pollution does not increase the costs assumed by companies, it represents not only a positive impact on the environment, but also savings for companies since resources are used in a better way with efficient and higher quality processes. This example, such as recycling, reusing and a better use of technology, among other practices, transform the value chain and create shared value. By increasing their access to inputs, sharing technology, and offering financing, companies can improve supplier productivity and quality (Porter & Kramer, 2011).

2.2. TECHNICAL FEASIBILITY STUDY

The main objective of the technical feasibility study of the project is to present the characteristics of the factory where Bambú Bici is manufactured, the process and production capacity, as well as the operation and costs of the project.

2.2.1. PROJECT ENGINEERING

The factory where the manufacture of bamboo frames for bicycles is developed is located in Paute, it has the necessary adjustments that include the land use and the operating permit

granted by the Paute Fire Department, after being adequate with safety signs. The area of the factory is 3,397.14 square meters. For its distribution, was carried out an analysis of the processes to be developed, in this way the manufacturing time of the frames was optimized, since a sequence of each step in its elaboration was achieved. In addition, there is a designated area for the entry of the raw material, which allows greater speed and comfort.

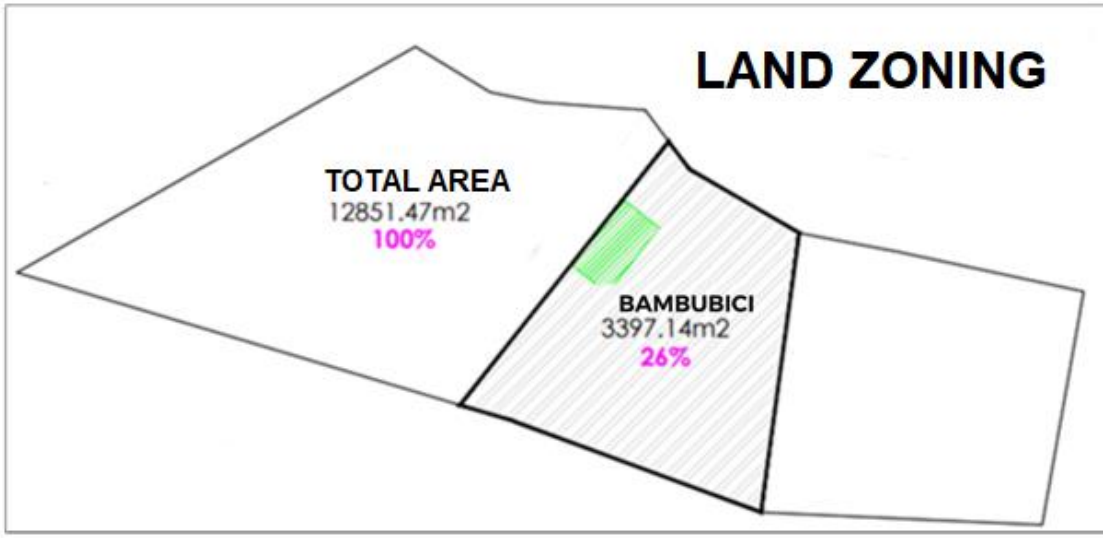

Figure 5. Land zoning

Source: (Gobierno Provincial del Azuay, 2020)

Elaborated by: Gobierno Provincial del Azuay

2.2.1.1 THE BAMBÚ

This material is considered extremely resistant and has been used for years in various activities developed by members of the native people of our Ecuador, the knowledge acquired during the time of use of this plant is part of the intangible heritage of Ecuador. Currently, in our country 46 species of bamboo are identified, of which eleven are endemic. Bamboo is a highly renewable resource and has a great capacity for adaptability both at high temperature and height, an example of this is that it is possible to find bamboo from 0 m.a.s.l. up to approximately 3,000 m.a.s.l. depending on the species, so it becomes an easily obtained

product. Also, bamboo can absorb large amounts of CO2 from the environment and grow in weathered and eroded soils (Ministry of Agriculture and Livestock, Bamboo Sector Board, International Bamboo and Rattan Network, 2018). The Bambú Bici project uses the Phyllostachys aurea species as a result of an evaluation process where moisture content resistance contraction, traction, bending and elasticity tests were carried out. With which it was confirmed that this species has the appropriate characteristics for the construction of artisan frames.

Since 2002, together with INBAR, a plantation of 50 bamboo species was carried out, of which 37 managed to adapt and survive, demonstrating that the Ecuadorian territory is highly favorable for the growth of 74% of the introduced species. As Professor Yang Yuming explains in his report on the survey on bamboo species in Ecuador, these plantations help improve the environment of the sectors where they are found and are also a source of material for the construction of different types of articles such as musical instruments, furniture, pasta, paper and buildings such as houses, among others (Yuming, 2005).

As part of this research developed by INBAR, from the records taken in 2002 there is a growth rate of 150% for the year 2017 of bamboo forests, which represents more than 15,000 hectares of forests of the 600,000 hectares available in the 24 provinces of the territory. In 2018, the Ministry of Agriculture and Livestock created the National Bamboo Development Strategy and Action Plan, with the support of the Bamboo Sector Board and INBAR. This plan also had the technical support of 11 state entities such as the Under-secretariat of Forest Production of the MAG, the Ministry of the Environment, different Decentralized Autonomous Governments, traders, farmers, artisans and bamboo processors, among others. The document contains

information that serves as a roadmap to achieve green development by clearly identifying the elements, processes, territories and knowledge related to bamboo (INBAR, 2020).

Among the advantages of bamboo, one must consider the ease and speed of its reproduction, low cost, and the full use since all parts of the plant are employ; in addition to its commercial performance for all types of products, among which more than 1500 uses are known, including as food due to its high fiber content. Considering that 2% of Ecuador's agricultural exports are bamboo, equivalent to approximately 9 tons. Its primary management generates a multiplier effect in the production of sustainable goods and services. (Ministry of Agriculture and Livestock, Bamboo Sector Board, International Bamboo and Rattan Network, 2018).

Bamboo is not only useful for the already mentioned ones, but because it generates a lower carbon footprint when these products are manufactured. The benefits of bamboo in relation to the environment are diverse. Its ecological role begins with the conservation of soils against erosion, it regulates the flow of underground water, restores degraded lands and contributes biomass to the soil, which improves its structure. This plant is capable of trapping CO2 more efficiently than trees, which allows it to produce a greater amount of biomass. Another advantage of using bamboo in industrial processes is the positive impact generated by planting. It has a great capacity for renewal while helping in the sustainability and balance of flora, microflora and fauna such as a result of its high-yield plant characteristics as C4 plants with 4 carbons.

Given the reports of recent years, the demand for bamboo in the world has a growing trend, as countries tend to replace non-renewable products with renewable and non-polluting ones. For

this reason, products with a high added value and competitive cost are becoming highly relevant and in increasing demand in both the national and international markets.

2.2.1.2 ACQUISITION AND TREATMENT OF RAW MATERIAL

The acquisition of bamboo is carried out from the province of Santo Domingo de los Tsáchilas because the province handles large quantities of bamboo of the Phyllostachys aurea species. In order to achieve a correct preservation of the bamboo, a cutting plan is required that guarantees good management of the raw material and the organization to carry out periodic harvests. To start the process, the branches are pruned or cut to extract the bamboo stems. The right time for harvesting considers factors such as the moon phase, since this influences the pull of gravity that the moon exerts on the earth causing more fluids and sages in the root area of the bamboo. Another factor to take into account are the ideal harvest hours, due to the fact that during the day there is greater solar radiation, which generates greater photosynthetic activity in the bamboo and therefore greater concentration of water and sugar fluid that promote the invasion of fungi and insects. For these reasons, harvest should be done at first time in the morning or late in the afternoon.

After the harvest, the knots of the cane must be drilled, since for the fluttering process an air outlet is needed to prevent the pieces from shredding. With a drying or vinegar time of at least 15 days and a maximum of 60 days where the moisture comes out in the basal part of the pieces, it can finally be subjected to fluttering or exposure to heat in an inclined position so that it can easily expel the remainder of humidity. This process has two parts, the first flamed to remove impurities and the second flamed to achieve the color tone of the reed.

In addition to the heat treatment, the immersion treatment can also be used. It consists of immersing the bamboo for approximately five days in a solution composed of 20 kilograms of borax and 20 kilograms of boric acid per 1,000 liters of water. The immersion time may vary depending on the type of bamboo, the species, age, thickness and required absorption. Another possible treatment is the hot bath, in which the pieces are immersed in a hot preservative solution, after which the bamboo is exposed to room temperature. With this heat procedure, the air inside expands and leaves, then when the pieces are cooled, a partial vacuum is produced that helps the solution to be absorbed.

The last part of the treatment of the raw material is the storage of the pieces which must be kept in a dry, covered and organized place to protect them and ensure their conservation (Gobierno Provincial del Azuay, 2020).

For this project, the preservation method to which the bamboo is the exposure to heat or flaming, without the use of chemicals based on the ancestral knowledge of local communities. This because it fulfills the desired purpose of protecting the raw material from deterioration as a consequence of abiotic factors such as humidity, or biotic factors such as fungi, insects or microorganisms. Like flaming, dipping removes the starch and sugars from the bamboo, which eliminates the main food of fungi and insects. All this added to the harvest at the appropriate time, contribute to facilitate and optimize the work for the preservation of the raw material.

2.2.1.3 ORGANIZATION OF HUMAN RESOURCES

According to the Provincial Government of Azuay, the organization of the personnel in the manufacture of bamboo frames is based on the manufacturing process of the bicycle. To achieve a good performance throughout the process, a plant manager was hired, who is an official of the Provincial Government of Azuay and is in charge of the supervision and

collaboration in the development for the manufacture of the frames, the position that occupies is a technician. The other people that make up the work team are 6 members of the Uzhupud community who are average workers whose salary is taken into account in the budget item for Workshops. For the assembly of the bicycle in the facilities from the Provincial Government of Azuay an official was appointed who is in charge of the process and one collaborator, both technicians are in charge of the final construction of the bicycle.

2.2.1.4 PRODUCTION PROCESS

Next, the artisan production process of the frames is detailed with their respective photographs for further illustration.

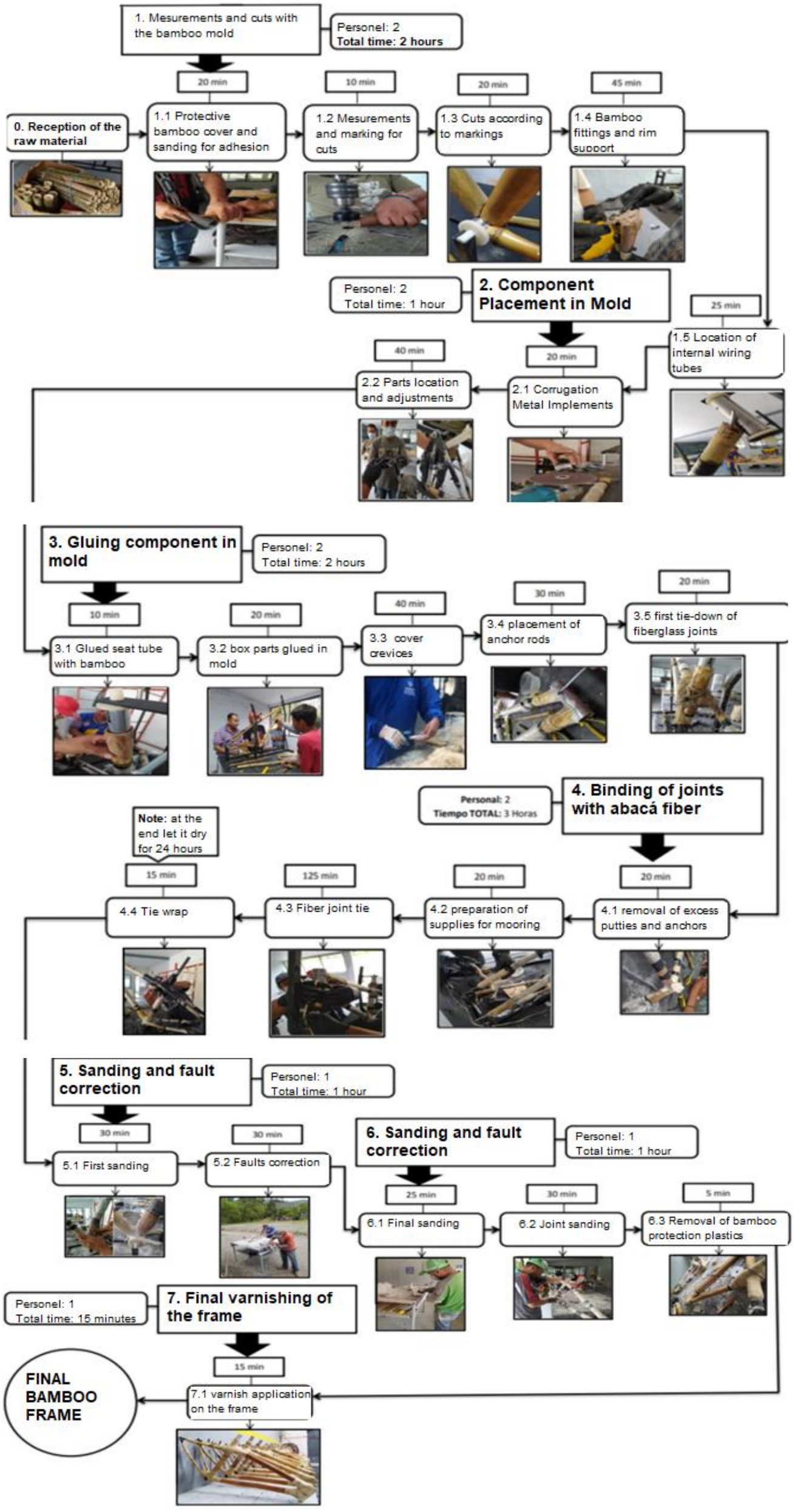

Figure 6. Production process flow chart

Source: (Gobierno Provincial del Azuay, 2020)

Elaborated by: The author

For the manufacture of the frames, the raw material arrives in green logs with uniform cuts for later drying with heat. In the heat preservation process, each piece of bamboo is flamed with a gas torch twice to remove impurities and achieve a uniform golden color.

The frame manufacturing process is divided into 7 phases that require the work of two people per frame. The first phase is the measurement and cutting of the bamboo with the mold. First, the bamboo pieces are covered with adhesive plastic to avoid damage during handling. Second, the pieces are prepared to cut so that they fit into the mold (see point 1.3 of the Flow Chart). Third, adjustments are made to the bamboo pieces and the rim support.

The time used in this phase of the process is two hours. The second phase is the location of the components in the mold, which requires one hour. In this phase, the aluminum tubes and internal wiring are located; once ready the arrangements of the logs are placed according to the metal implements. For the third phase, the gluing of components in the mold takes two hours, in which the seat tube is glued with bamboo, the pieces are squared to stick them in the mold, the cracks are covered, the rods are placed anchoring with wires and the first fiberglass bonding is made. The tie is important so that the bamboo pieces do not give way under pressure (see point 3.5 of the Flowchart). In the fourth phase, the joints are tied with abaca fiber, the total time to be used is three hours. In this process, the excess putty and anchors are removed and the supplies are prepared for tying the joints with abacá fibers. Next, the ties are wrapped with insulating tape (taipe).

The fifth and sixth phases are sanding; the fifth phase takes 1 hour with a person who sands and corrects the faults found after tying and gluing. The first sanding should achieve uniformity in all parts of the tie. In the next step, fault correction, holes are paired with fast drying epoxy

resin and fibril. The sixth phase of sanding and polishing of joints takes one hour and is the final sanding, here the polishing of joints and the finishes prior to varnishing are carried out. Finally, the plastic protections of the bamboo pieces are removed for the seventh and last phase of the process, which is the final varnishing of the frame; which takes about 15 minutes to apply varnish.

Next is presented the flow chart of the process of assembling the bicycles.

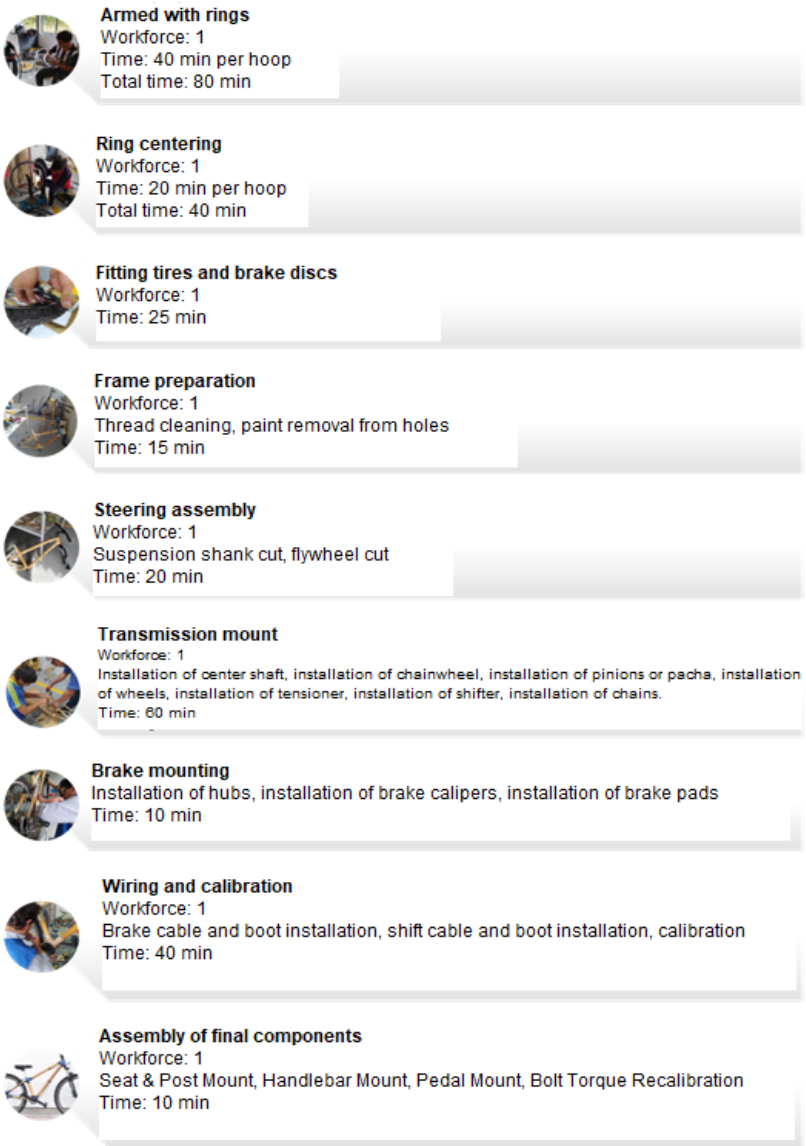

Figure 7. Bicycle assembly flow chart

Fuente: (Gobierno Provincial del Azuay, 2020)

Elaborado por: La autora

The process of assembling the bicycles is divided into nine steps developed by one person, which begin with the assembly of rings which takes 40 minutes for each ring, followed by centering the rings, with an estimated time of 20 minutes per ring. The next step is the mounting of tires and brake discs. To prepare the frame, the threads are cleaned and the paint is removed from the holes. To complete the previous step, we proceed to the assembly of the address, which takes about 20 minutes. Next, the brake assembly is carried out with the installation of the brake caliper and the brake pads. Next, the wiring and calibration of the brake cover and the shift cover is done. Finally, the assembly of the final components such as the seat and post, the assembly of the handlebars, the pedals and the tightening of the bolts is carried out. The total time that is used in the assembly of a bicycle is 5 hours.

The Technological Innovation Center of the University Politécnica Salesiana Cía. Ltda., provide assistance, advisory, orientation and operational services related to methods to improve productivity and reduce production costs. This production consultancy included the safety standards and the INEN-ISO-4210 certification for the assembly of ecological bicycles with bamboo frames. The stages proposed for the development of the work carried out with the CITUPS were four, in which first the diagnosis and evaluation of the frame production process is analyzed. In the second stage, the raw materials and inputs of the framework that contribute to the optimization of the product design are analyzed. For the third stage, the construction and design of a template for the assembly of parts is proposed.

Finally, in the fourth stage, the corresponding tests are carried out to obtain the certification that test the bicycle components such as brakes, the different torques, durability of the pedals, operation and load capacity of the system push, saddle and support among others.

In order to test the resistance of the bamboo frame, it was subjected to different tests, the results obtained are found in the table presented below.

Table No. 3.

NTE INEN-ISO-4210 Bamboo Frame Test Results

TEST	DESCRIPTION OF THE TEST	INTERNAL TEST	OBTAINED RESULT		Environment temp (°C)	UNCERTAINTY
			STANDARD	RESULT		
4.6.1	Mass descending to the quadrant	CITUPS-ME-07	Deformation at 40 mm	7 mm	18.5	0.1 mm
4.6.2	Fork frame assembly drop test	CITUPS-ME-08	NO DAMAGE	WITH DAMAGE	18.5	N/A

Source: (Gobierno Provincial del Azuay, 2020)

Elaborated by: CITUPS

The test figures show successful results in the quadrant descending mass test, and with respect to the fork frame assembly drop, minimal cracks are perceived, which make it a nationally marketed artisanal bicycle for urban travel suitable for the use for which it was created, which however does not comply with current regulations for certification. With the correction and changes contemplated according to the recommendations based on the results of the tests, a bicycle with INEN-ISO-4210 certification for export is obtained.

2.3 COSTS ANALYSIS

In the next section, the cost analysis will be carried out with two approaches to consider. Firstly, production costs and secondly export costs will be calculated

2.3.1 PRODUCTION COSTS

To obtain the manufacturing costs of each bicycle, the items that consider labor, raw material, inputs used during the process, transportation and marketing costs, as well as the different permits and patents, amortization costs are added and the packaging of each product. In the case of accessories costs, it should be noted that these vary according to the number of parts purchased since they are imported products, which directly influences production costs and makes the cost of the bicycle also vary.

Table No. 4.

Bicycle fabrication costs Rin 29

COSTS	VALUE
DIRECT LABOUR	$24,38
INDIRECT LABOUR	$15,69
RAW MATERIAL FRAME	$74,00
RAW MATERIAL ACCESORIES	$321,36
SUPPLIES	$2,03
DEP TOOLS	$1,32
TRANSPORTATION	$1,13
AMORTIZATION	$0,01
MARKETING	$2,25
MIN MINES PERMITS	$2,28
TOOL MAINTENANCE	$0,20
PACKING	0,51
PATENTS MAINTENANCE	$0,01
TOTAL	$445,17

Note: This table shows the unit manufacturing cost.

Source: Gobierno Provincial del Azuay

Elaborated by: Gobierno Provincial del Azuay

Ecological bamboo bicycles are an artisan product manufactured by hand in all of its processes, for this reason its productive capacity is 20 bicycles a week since its assembly requires 5 hours per bicycle. As explained above, the bicycle manufacturing process is made up of several phases, among which time is also used to dry the parts, which increases the production time to achieve the final product taking on account every detail. Although ecological bamboo bicycles are not a mass-produced product, they guarantee that all the people involved in their manufacture have a job and receive a decent remuneration.

The table of production costs for one year is presented below:

Table No. 5.

Production costs

PERIOD	YEAR 1												
MONTHS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL YEAR 1**
NUMBER OF BICYCLES RIN 29''	64	64	80	80	80	80	80	80	80	80	80	80	928
PRODUCTION COSTS RIN 29''	$28.954,35	$28.954,35	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$413.117,76
INCOMES	$28.954,35	$28.954,35	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$413.117,76
RAW MATERIAL													
Raw material adult frame	$4.736,00	$4.736,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$5.920,00	$68.672,00
Raw material accessories	$20.567,02	$20.567,02	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$25.708,80	$298.222,08
SUBTOTAL	$25.303,02	$25.303,02	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$31.628,80	$366.894,04
WORKFORCE													
Direct workforce	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$1.800,00	$22.624,64
Indirect workforce	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$1.158,40	$14.560,32
SUBTOTAL	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$2.958,40	$37.184,96
MAINTENANCE													
Maintenance of Mining Ministry patents	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$1,04	$12,48
Maintenance parts and spare parts	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$15,00	$180,00
SUBTOTAL	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$16,04	$192,48
SALES COSTS													
Packing	32,64	32,64	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	473,28
Stamped marketing	$144,00	$144,00	$180,00	$180,00	$180,00	$180,00	$180,00	$180,00	$180,00	$180,00	$180,00	$180,00	$2.088,00
SUBTOTAL	$176,64	$176,64	$220,80	$220,80	$220,80	$220,80	$220,80	$220,80	$220,80	$220,80	$220,80	$220,80	$2.561,28
OTHER COSTS													
Supplies	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$150,00	$1.800,00
Transport	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$83,33	$1.048,64
Amortization	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$0,76	$9,12
Depreciation	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$97,62	$1.171,44
Mining Ministry permit and INEN4210	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$168,54	$2.022,48
SUBTOTAL	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$500,25	$6.003,00
GENERAL TOTAL	$28.954,35	$28.954,35	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$35.324,29	$413.117,76

Source : (Gobierno Provincial del Azuay, 2020)

Elaborated by: The author

In the table above the cost of production of 64 bicycles during the first two months can be seen. After the training of the workers, the production capacity was improved, which generated an increase of 16 bicycles that gives a total of 80 bicycles from the third month onwards. The costs taken into account include raw materials, labor, maintenance, marketing and others such as permits and patents, however the costs of imported items are those of a purchase at the national level, because the import is not carried out of these parts for the product.

For the first year of production, a total of 928 Rin 29 bicycles are expected to be manufactured. The annual production cost is 413,117.76 USD, which represents a semester cost of 206,558.88 USD. Likewise, this table also considers the value of the depreciation of capital assets. It is necessary to take into account that the income is obtained from the budget item included in the POA of the Community Economy Directorate of the Provincial Government of Azuay.

2.3.2 EXPORTATION COSTS

The costs that can be generated in the export process are diverse, they depend on the Incoterm that is negotiated and the different processes to be carried out for the shipment of the merchandise. For this project, the CFR value (Cost and Freight) will be used in which the exporter is responsible for delivering the merchandise at the destination port and pays for the international freight costs. However, the risks are assumed by the importer as well as the costs of nationalizing the goods, while the responsibility for international transport is in charge of the shipping company.

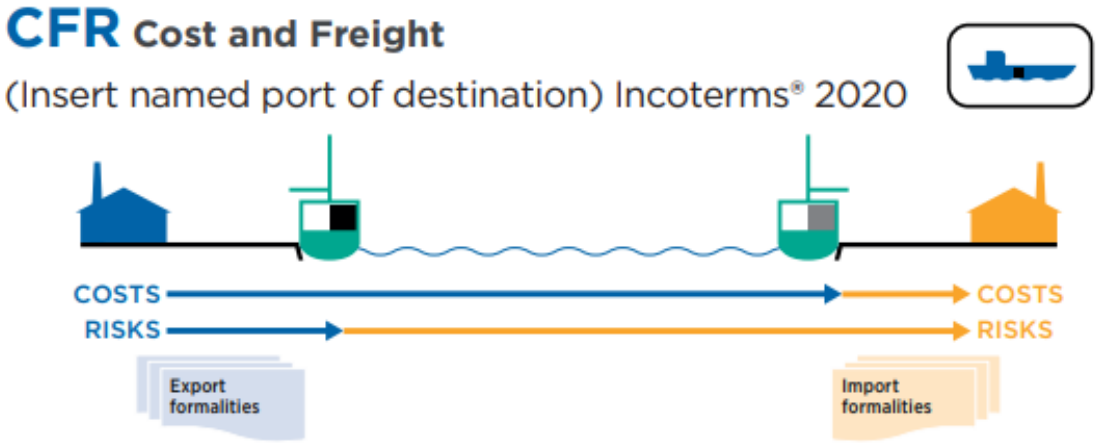

Figure 8. Negotiated incoterm.

Source: (INTERNATIONAL CHAMBER OF COMMERCE, 2020)

Elaborated by: (INTERNATIONAL CHAMBER OF COMMERCE, 2020)

For the exportation of the bicycles and considering the alliance to be made with Amazon, it is necessary to send them to the company's warehouses in the city of Miami, so from that point they can dispatch and sold through the platform. The rental of the 40ft container has a value of approximately 2,000 USD, however, this price can vary according to the season, and can reach a maximum of around 5,000 USD.

Table No. 6.

Inland Ecuadorian costs

DESCRIPTION	COSTS
Container	$2.000,00
Container storage in special patios	$4,86
Automatic container disinfection	$6,36
Container labeling / un labeling (not including cargo)	$38,46
Container inspection operation	$102,60
Container weighing	$45,00
Container porting	$45,00
Provision and placement of seal	$9,50
Container reception / dispatch	$45,90
Transportation CUE-GYE	600
Customs broker services	$250,00
TOTAL	**$3.147,68**

Source: DP World Posorja. S. A

Elaborated by: The author

In addition to the costs presented in the preceding table, additional costs can be generated, such as in the case of a counter-narcotics inspection, the price varies between 60 and 90 USD. This process is carried out by an assistant, who also generates an increase in the cost. The value established in the description of container storage in special yards contemplates the amount per day of storage

2.4 CHAPTER CONCLUSIONS

The conclusions left by this chapter are divided into two parts, the first one is the analysis of innovation that is done considering new parameters of product creation with modern ideas that seek not only to satisfy needs but also to create solutions to problems related to overproduction and contamination. These new theories open the way to ventures that pose a challenge to traditional businesses.

The second part of the analysis in this section highlights the technical feasibility study that is responsible for validating ideas and shaping reality. With enough information on the main product for bicycle production, efficient forms of production can be created that achieve favorable results for the project.

The studies carried out on the bicycle give greater reliability not only to the production process but to the final product, these studies show the corrections that must be made to achieve a product suitable for exportation, which meets the minimum required standards.

The quantitative analysis presented in this section shows a projection of the expected costs, based on projected figures that can help to understand the values that must be covered and thus contribute to decision-making to manage these items.

CHAPTER III

OPERATIONAL AND FINANCIAL ANALYSIS FOR ENTERING THE TARGET MARKET

The purpose of this chapter is to define the technical and financial processes for entering the target market. First, technical processes encompass formal requirements for export and customs procedures that must be carried out. Second, the financial processes consider the economic study of the project and in the same way the profitability analysis that allows good economic planning.

3.1 FORMAL REQUIREMENTS FOR THE EXPORT AND IMPORT OF THE PRODUCT

The necessary requirements for the customs regime that allows the final exit of goods outside the national customs territory may vary depending on the product and even on the importer and the country where it is located. To export products, it is necessary to obtain an exporter registration, for which the single taxpayer registry (RUC) must be created, the electronic signature through the Central Bank of Ecuador or Security Data and be registered in the ECUAPASS portal. In this portal the export process begins with the electronic transmission of the Export Customs Declaration (DAE), which contains the information of the exporter or declarant, the description of merchandise with the invoice, the consignor's data, the destination of the cargo, quantities, weight and other data related to the merchandise.

In the specific case of bamboo bicycles, there are no special requirements other than those that can be requested for a traditional bicycle. According to the Product Complexity Index (PCI), bicycles rank 511 out of 773 products, this makes these articles a high intensity in knowledge and handling of the product. The tariff that applies to this product is 8712.00.00.00 of the Harmonized Merchandise Designation and Coding System (SA), which corresponds to Bicycles and other cycles (including delivery tricycles), without motor.

Table No. 7.

Tariff code description.

87	**Motor vehicles, tractors, cycles and other land vehicles; its parts and accessories.**
8712	Bicycles and other cycles (including delivery tricycles), without motor.
871200	Bicycles and other cycles (including delivery tricycles), not motorized.

Source: (WTO, 2020)

Elaborated by: The author

The tariff code used to import bicycles into the United States from Ecuador is 4.40%, in the same way, the agreement on which this commercialization is based is that of the Generalized System of Preferences (GSP) of the United States. As they are not a dual-use product, bamboo bicycles do not need an export license, for this reason they are not on the trade control lists of the Bureau of Industry and Security of the United States Department of Commerce (OEC, 2018).

The documents commonly used for the exportation of the product are the proforma, the original commercial invoice, the packing list that must include the gross weight and the net weight, the bill of lading and the customs export declaration (DAE) that has the

purpose of creating a legal link and obligations to comply with the Customs Service of Ecuador (SENAE). It is possible that in some cases prior authorizations or certificates granted by certain institutions may be required. With this documentation and once the transmission is made to customs where the DAE is accepted, the merchandise enters the Primary Zone of the district or temporary warehouses where it is registered and stored until the moment of its exportation. During this process, it is necessary to confirm the DAE in a time not exceeding 30 days, where changes can be made as necessary.

Prior to the exportation of the goods, the exporter is notified of the designated type of inspection. This can be in the first place automatic gauging, generated when the load enters the primary zone; second, documentary, in which an official is in charge of reviewing electronic data and digitized documentation; third, the intrusive physical gauging in which, in addition to the documentary review, a physical inspection of the cargo is carried out to corroborate the information contained in the DAE. Finally, and once the DAE is closed, the status changes to authorized exit and the container is shipped (SENAE, 2017).

3.2 COST ANALYSIS OF DISTRIBUTION AND CUSTOMIZATION OF THE PRODUCT IN THE TARGET MARKET

Within the distribution costs, the Amazon subscription fee is considered, which is USD 39.99, the cost of fees to sell on Amazon applied to the sale of bicycles is USD 0.30 per unit sold. The additional cost that is considered for the monthly inventory storage is USD 0.48 per cubic foot corresponding to the large size during the months of January to September, and USD 1.20 per cubic foot for the months of October to December (Amazon, 2021).

The process of customs clearance or nationalization of the merchandise is carried out by an authorized agent in the United States of America, although the final recipient is Amazon. This is due to the conditions of the negotiated CFR Incoterm. In the case of this project, the responsibility of the exporter ends when the merchandise is on board the ship, however, the costs to be covered by the exporter include international transport. Documents such as the technical data sheet of the bicycle may be required and must be provided to the authorized agent. When the merchandise is close to arriving in the United States, the forwarder sends the importer an arrival notice that includes the estimated date of arrival, the container number, loads, stamps, freight and other general information.

After this moment, the importer must have the original documents such as the entry manifest or any form of release of merchandise required by the port, the packing list, proforma invoice and the other documents mentioned in paragraph 3.1 of this chapter. With this documentation, a customs agent, an authorized agent or the importer can carry out the nationalization process with the corresponding import declaration, and thus generate the settlement of taxes and the capacity channel to verify that everything is in order and the merchandise can be mobilized. Tax payments can be made using any type of electronic technology or charge card authorized by the United States Customs and Border Protection Commission (CBP).

In the case of merchandise entering the country by sea, it is necessary to present the importer's security declaration, which must be sent online with advance cargo information to CBP. The capacity can be of two types, the documentary on the one hand that is made by a server of the customs, who checks that the documentation is in order and; on the

other hand, the physical capacity channel in which the merchandise is transferred to a centralized examination station (CES) of the CBP. A CES is a privately operated facility where physical gauging is carried out by a Commission official. The review process is free, however, there are values associated with this process such as payment to the CES for storage services, transportation costs of the merchandise, and loading and unloading costs. Once the entire procedure has been carried out, the authorized departure is given, the merchandise can be moved from the port to the warehouse from where it will be distributed to the final consumer (U.S. Customs and Border Protection, 2021).

3.3 INCOME AND EXPENDITURE BUDGETS, PROJECTED CASH FLOW

The project income and expenditure budget present the projected income figures and expenditure estimates for a 5-year period. To prepare the projected cash flow, the unit production cost of each bicycle has been calculated taking into account the possible increases. With these figures, the unit cost of the bicycle for each year is obtained.

Table No. 8.

Bicycle manufacturing cost projection rim 29

PERIOD	AÑO 1	AÑO 2	AÑO 3	AÑO 4	AÑO 5
DIRECT LABOR	$24,38	24,62	24,87	25,12	25,37
INDIRECT LABOR	$15,69	15,85	16,01	16,17	16,33
FRAME RAW MATERIAL	$74,00	74,74	75,49	76,24	77,00
RAW MATERIAL ACCESSORIES	$321,36	324,57	327,82	331,10	334,41
SUPPLIES	$2,03	2,05	2,07	2,09	2,11
DEP TOOLS	$1,32	$1,32	$1,32	$1,32	$1,32
RAW MATERIAL TRANSPORT	$1,13	1,14	1,15	1,16	1,18
AMORTIZATION	$0,01	0,01	0,01	0,01	0,01
MARKETING	$2,25	2,27	2,30	2,32	2,34
MINING PERMITS	$2,28	2,30	2,33	2,35	2,37
MAINTENANCE TOOLS	$0,20	0,20	0,20	0,21	0,21

PACKING	0,51	0,52	0,52	0,53	0,53
MAINTENANCE PATENTS	$0,01	0,01	0,01	0,01	0,01
TOTAL	$445,17	$449,61	$454,09	$458,62	$463,19

Source: (Provincial Government of Azuay, 2020)

Elaborated by: The author

The forecast for the data recorded in this table is made based on the current situation in the country. All these factors can generate consequences that must be considered when calculating the costs presented after the second year. According to the projections made in relation to inflation in Ecuador, results that vary from 0.27% to 2.32% are obtained as of 2022. For this reason, the value taken for the calculation is 1% corresponding to the average of the predicted inflationary index (Pasquali, 2020).

The following table shows the cash flow projection:

Table No. 9.

Cash flow.

CONCEPT	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
INGRESOS						
INVESTMENT	-$416.265,44					
FARIENG MARKET SALES		$482.120,00	$489.978,56	$518.103,76	$654.894,81	$688.048,86
NATIONAL MARKET SALES		$111.506,18	$107.584,64	$99.687,55	$23.325,87	$13.293,91
TOTAL INCOMES		$593.626,18	$597.563,20	$617.791,31	$678.220,69	$701.342,77
EXPENSES						
TOTAL PRODUCTION COSTS		$413.117,76	$417.236,69	$421.396,81	$425.598,52	$429.842,26
EXPORTATION COSTS		$5.147,68	$5.662,45	$6.228,69	$6.851,56	$7.536,72

TOTAL COSTS	$418.265,44	$422.899,14	$427.625,50	$432.450,09	$437.378,98
NET CASH FLOW	-$416.265,44	$175.360,74	$174.664,06	$190.165,81	$245.770,60	$263.963,79

Source: (Provincial Government of Azuay, 2020)

Elaborated by: The author

In the cash flow, the income was calculated with the national and international sales and the expenses that record the production and export costs respectively. The annual increase recorded in table 9 is based mainly on three factors, the first of which is the inflation in Ecuador, which is applied to the production costs of the product and to the export costs. Regarding project sales, the second and third factors are inflation in the United States and market growth. To finalize the horizon of the project it is considered five years and in the end no salvage value is recorded, all this based on the consideration that it is an artisan activity and both the maturity and the liquidation of the project have characteristics of a microenterprise investment.

3.4 FINANCIAL ANALYSIS

The financial analysis is intended to conclude the evaluation of the project and determine its economic feasibility. For this, the calculations of the internal rate of return (IRR) and the net present value (NPV) will be carried out, which will demonstrate with figures the money that is earned and that can be reinvested in the same project to continue obtaining profitability. In addition, to achieve a more complete analysis, the investment recovery period (PRI), the return on investment (ROI), the projected income statement and the

minimum acceptable rate of return (TMAR) that will be compared with the IRR result to evaluate both results.

3.4.1 TMAR ANALYSIS

The cost of capital or minimum acceptable rate of return refers to the minimum rate of profit that you are willing to obtain on the initial investment. To fix this rate, the bank rate of return is generally taken as a reference, however, Baca Urbina suggests that the rate to be considered is that of the inflationary index since this is always higher than the bank return. With the information given, the calculation of the MARR is carried out with the following formula (Baca, 2010).

$$TMAR = i + f + if; i = risk\ award; f = inflation$$

The risk premium used in the project is 10%. For the calculation of the TMAR, the average of the inflationary index predicted for five years is used, taken from the official website of the Central Bank of Ecuador, which is 1% (BCE, 2021).

Table No. 10.

TMAR Calculation

YEAR	INFLATION
2021	1,05%
2022	2,32%
2023	1,38%
2024	1,00%
2025	1,00%
i =	10%
f =	1,35%
TMAR= 10%+1,35%+13,5	=24,85%

Source: (BCE, 2021).

Elaborated by: The author

Taking into consideration that in our environment there are no official risk analysis indexes by sector, we opted for the result obtained from the TMAR of 24.85%, the risk premium used for this calculation is medium, although it is a relatively new product on the market. This is due to the perspective considered by the public sector, which puts economic benefit before aspects such as social contribution, coherence with the development plans proposed by the Ecuadorian government, job creation and socioeconomic impact (Córdoba, 2006).

3.4.2 NET PRESENT VALUE (NPV) AND INTERNAL RATE OF RETURN ANALYSES

The net present value (NPV) is the sum of the flows discounted in the present and the subtraction of the initial investment that is equivalent to comparing all the expected profits against all the expenditures necessary to produce those profits, in terms of their equivalent value in this zero moment or time. On the other hand, the calculation of the internal rate of return (IRR) shows the real value of the return on the money invested in the project. As defined in Gabriel Baca Urbina's book, the IRR is the discount rate by which the NPV is equal to zero and which equals the sum of the discounted flows to the initial investment (Baca, 2010).

The formula used to calculate NPV is the following:

$$\text{VAN} = -P + \frac{FNE_1}{(1+i)^1} + \frac{FNE_2}{(1+i)^2} + \frac{FNE_3}{(1+i)^3} + \frac{FNE_4}{(1+i)^4} + \frac{FNE_5}{(1+i)^5}$$

The value that P represents is the initial investment that is shown in negative as it is a disbursement. The values of FNE are those of the net cash flow. The value of NPV is inversely proportional to the value of i. This value is easy to interpret, which makes it a

useful tool when analyzing the profitability of a project (Baca, 2010). When replacing the values with the project's figures, the formula is the following:

$$\text{VAN} = -418.265{,}44 + \frac{175.360{,}74}{(1+0{,}07)^1} + \frac{174.664{,}06}{(1+0{,}07)^2} + \frac{190.165{,}81}{(1+0{,}07)^3} + \frac{245.770{,}60}{(1+0{,}07)^4} + \frac{263.963{,}79}{(1+0{,}07)^5}$$

$$\text{VAN} = -418.265{,}44 + 847.378{,}59$$

$$\text{VAN} = 429.113{,}15$$

The result of VAN is 429.113,15 USD.

The formula used to calculate the IRR is presented below.

$$P = -\frac{FNE_1}{(1+i)^1} + \frac{FNE_2}{(1+i)^2} + \frac{FNE_3}{(1+i)^3} + \frac{FNE_4}{(1+i)^4} + \frac{FNE_5}{(1+i)^5}$$

The FNE correspond to the net cash flows of each year, from the first to the fifth year. The negative sign found in the equation represents the initial investment and the rest of the coefficients with a positive sign represent the earnings obtained in each period. As explained in Baca Urbina's book, obtaining the root of the polynomial finds a single value of IRR, because there is only one sign change and the five values of FNE are positive, therefore, the meaning can be analyzed the economic meaning of this result (Baca, 2010).

Al reemplazar los valores la fórmula de la TIR es la siguiente:

$$-418.265{,}44 = -\frac{175.360{,}74}{(1+TIR)^1} + \frac{174.664{,}06}{(1+TIR)^2} + \frac{190.165{,}81}{(1+TIR)^3} + \frac{245.770{,}60}{(1+TIR)^4} + \frac{263.963{,}79}{(1+TIR)^5}$$

$$-418.265{,}44 = -175.360{,}74(1 + TIR)^5 + 174.664{,}06(1 + TIR)^4 + 190.165{,}81(1 + TIR)^3 + 245.770{,}60(1 + TIR)^2 + 263.963{,}79$$

TIR = 37,15%

The result that satisfies the equation is 37,15% equivalent to TIR.

With the values taken for the calculation of NPV and IRR, the table below is shown.

Table No. 11.

Calculation of IRR and NPV

CONCEPT	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
NET CASH FLOW	$-418.265,44	$175.360,74	$174.664,06	$190.165,81	$245.770,60	$263.963,79
VAN (DISCOUNT RATE 7%)		$429.113,15				
TIR		37,15%				

Source: (Provincial Government of Azuay, 2020)

Elaborated by: The author

To calculate the NPV, as mentioned above, a discount rate of 7% was considered, which is a higher figure than the average yield for policies and savings in the financial system. By adding all the cash flows from the first to the fifth year, a capitalized value of USD 847,378.59 was obtained. After calculating the NPV with its respective discount rate, the resulting value is 429,113.15 USD, (NPV> 0) which means that the investment will produce profits above the required profitability and the project can be accepted (Córdoba, 2006).

The result obtained from the IRR allows us to assess the percentage of profitability of the project, the value that satisfies the equation is 37.15%. With this result, it can be considered that the commercialization of bamboo bicycles is a profitable business, since a higher profitability could be obtained than the TMAR of table 10, whose result was 24.85%.

3.4.3 ANALYSIS OF THE INVESTMENT RECOVERY PERIOD (PRI)

To calculate the payback period (PRI), the future cash flows for each year are added until the initial cost of capital is covered. The result will be the amount of time it takes to recover the original amount. The formula used for this calculation is presented below (Córdoba, 2006).

$$PRI = \frac{Initial\ investment}{Average\ investment}$$

Formula when replacing values:

$$PRI = \frac{418.265{,}44}{206.760{,}96}$$

$$PRI = 2{,}02$$

By replacing securities, it is obtained that the initial investment is 418,265.44 USD and the result of the calculation of the average income is 206,760.96 USD, the division of these values gives a total of 2.02 years. This means that the time it takes to recover the investment is two years, three months and twenty-one days.

3.4.4 RETURN ON INVESTMENT ANALYSIS (ROI)

The return on investment or ROI calculation uses the net income and the cost of the investment to obtain the value of the benefit that can be obtained without taking into account the time (Corporate Finance Institute). The following is the ROI formula.

$$ROI = \left(\frac{Net\ incomes - Costs}{Costs} \right) x100$$

Replacing the values gives the following formula:

$$ROI = \left(\frac{3.188.544{,}14 - 2.138.619{,}14}{2.138.619{,}14} \right) x100$$

$$ROI = \left(\frac{1.049.925{,}00}{2.138.619{,}14} \right) x100$$

$$ROI = 49{,}09\%$$

The total income in the fifth year is 3,188,544.14 USD and the total expenses in the fifth year are 2,138,619.14 USD, when performing the calculation, a result of 49.09% profitability is obtained.

3.4.5 PROJECTED STATEMENT OF RESULTS ANALYSIS

In order to compare the results obtained in different periods and the profitability that it could generate, the Projected Income Statement is calculated. The information taken for the calculation takes into account useful concepts with a level of detail that promote an efficient calculation that provides concrete results that can be easily analyzed and managed. The analysis of the income statement reveals the initial status of the project, and how it ends in the fifth year.

Table No. 12.

Projected income statement

CONCEPT	YEAR 1	YEAR 5
SALES	$593.626,18	$701.342,77
- RETURN ON SALES	$0,00	$0,00
NET SALES	$593.626,18	$701.342,77
COST OF SALES	$413.117,76	$429.842,26
GROSS PROFIT	$180.508,42	$271.500,51
OPERATING EXPENSES	$5.147,68	$7.536,72
PROFIT	$175.360,74	$263.963,79

Note: The table declarations are not calculated due to the nature of the project, which does not include profits but social value

Source: (Provincial Government of Azuay, 2020)

Elaborated by: The author.

The initial value of the sales is 593,626.18 USD in the first year and 701,342.77 USD in the fifth year, where the sales in the United States are calculated and also the sales with the prices considered for the national market including the increase generated by inflation. The operational costs correspond to those generated by the export and distribution of the product, which subtracted from the gross profit yields a result of 180,508.42 USD for the first year and 271,500.51 USD in the fifth year corresponding to the utilization of each year. These data show an increase of 50.53% in the profit generated at the end of the project horizon.

3.5 CHAPTER CONCLUSSIONS

The operational analysis shows the parts of the export process necessary to dispatch the product at the place of destination and the requirements necessary to nationalize the merchandise at the place of destination. A necessary step is the correct identification of

the tariff heading, it is important to do it properly since a bad tariff classification can hinder the export process and affect the economic part of the project.

In the financial analysis, the cash flow calculation was carried out, which allowed us to know with a certain level of detail the figures that the project can generate. The IRR, NPV, ROI and TMAR analyses are intended to give a more specific view of the viability of the project with which the feasibility of the project can be verified. Given the results obtained in the first three and the comparison made between the IRR and the TMAR, it can be deduced that the project is viable and also capable of providing greater benefits than the low-risk investments offered by financial institutions.

The calculation of the PRI allows observing the profitability of the project over time and the analysis of the projected income statement provides information on the percentage of increase in profits at the end of the project, with which it is possible to clearly appreciate the moment in which profits are generated. These results reflect that the production of bamboo bicycles is not only an economically profitable business, but it is also a beneficial project for the community in the social aspect, such as the creation of jobs, so it can satisfactorily fulfill the purpose for which it was created.

CONCLUSSION OF THE WORK

The conclusion of the project is related to the added value of the product, which manages to take advantage of the abundance of raw material to create a bicycle with an alternative production concept that considers the environment. This idea of creating products for everyday use that are friendly to the environment becomes the ventures of the future that integrate the care of nature into foreign trade and not a system of overproduction that causes environmental damage.

Despite the advances that innovative ventures like this represent in Ecuador there are still many things to do. Adding value to Ecuadorian products is one of the main aspects to consider and improve. Without a doubt, the beginning of this road ahead is to have projects like Bambú Bici that provide alternative, innovative and feasible proposals, considering new parameters for the creation of products that generate a positive impact on the decisions of new entrepreneurs.

The characteristics of the market of the United States of America selected for the sale of this product have shown great competitiveness. In addition, with the analysis of the results, it has been observed that it is also a highly profitable market in which environmentally responsible products are very well received.

Regarding the production process, being a handmade product, bamboo bicycles become a product with a low level of contamination, which fits perfectly with the concept of circular economy. With this production model, it is possible to achieve innovation and competitiveness of products and at the same time reduce the environmental impact that is sustainable in the long term. For this reason, the project, in addition to having an attractive

profitability for the investor, also has an additional attraction that considers the circular economy and the efficient use of resources that in turn contributes to the generation of employment and allows economic development.

The financial analysis shows that environmentally responsible projects are possible, and can generate profits in addition to contributing to local development and being beneficial for the community in the social aspect. This information is supported by the results obtained from comparing the IRR with the percentage obtained from the TMAR, which shows that the project has a profitability of more than 12.3% with respect to the minimum acceptable rate. Likewise, the investment recovery time is two years, three months and twenty-one days, which represents an acceptable period considering the characteristics of the project, since the social interest prevails over the economic one.

RECOMENDATIONS

After the analysis obtained in the development of this work, the following recommendations are made:

Considering that some parts for the manufacture of bicycles arrive in the country, are assembled and later sent abroad again, tariffs should be paid at the time of importation, however, in order not to incur unnecessary expenses, the return conditioned regime can be used on taxes not to make imported parts and pieces more expensive, making the final product less competitive in the destination market.

In the same way, it is necessary to establish standard negotiation lots to obtain a stable price that avoids fluctuations in production costs and thus affect the final sale price.

Strict compliance with the NTE INEN-ISO 4210 standards is necessary for the production of the bicycle, since this, in addition to providing the safety and performance requirements for its design and assembly, ensures the saving of resources such as economic and labor which benefit producers and also the circular economy model that seeks to protect nature.

Another important conclusion for the project is the need for greater investment in research and development of new value-added products in non-traditional markets, which allow us to have greater competitiveness for our exports.

When evaluating the project, an award should be considered for initiatives that are friendly to the environment, in order to encourage innovation in the creation of sustainable ideas that efficiently transform the economy.

Finally, based on the conclusions and results of the project, its management and execution are recommended.

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6. ANNEXES

Incoterms® 2020 by the International Chamber of Commerce (ICC)

TRANSPORT OBLIGATIONS, COSTS AND RISKS

Blue indicates seller's **Gold** indicates buyer's **Green** indicates mixed or shared

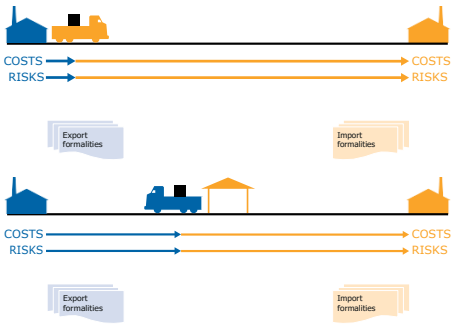
RULES FOR ANY MODE OR MODES OF TRANSPORT

EXW Ex Works

(Insert named place of delivery) Incoterms® 2020

FCA Free Carrier

(Insert named place of delivery) Incoterms® 2020

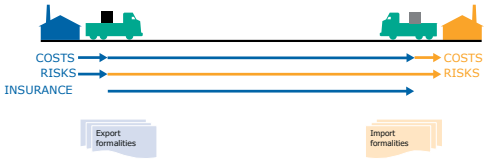


CPT Carriage Paid To

(Insert named place of destination) Incoterms® 2020

CIP Carriage and Insurance Paid To

(Insert named place of destination) Incoterms® 2020

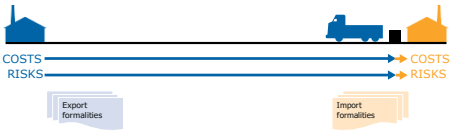


DAP Delivered at Place

(Insert named place of destination) Incoterms® 2020

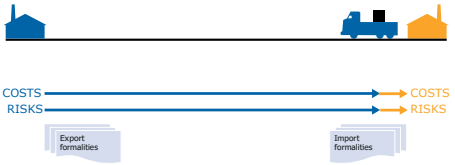
DPU Delivered at Place Unloaded

(Insert named place of destination) Incoterms® 2020



DDP Delivered Duty Paid

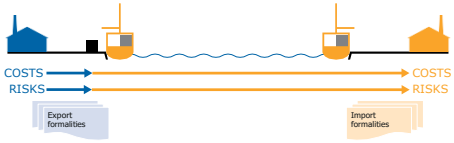
(Insert named place of destination) Incoterms® 2020



RULES FOR SEA AND INLAND WATERWAY TRANSPORT

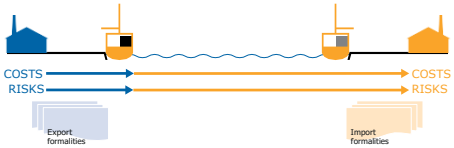
FAS Free Alongside Ship

(Insert named port of loading) Incoterms® 2020



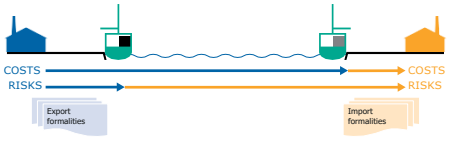
FOB Free on Board

(Insert named port of loading) Incoterms® 2020



CFR Cost and Freight

(Insert named port of destination) Incoterms® 2020



CIF Cost, Insurance and Freight

(Insert named port of destination) Incoterms® 2020