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A comparative assessment of national policies for valuing Non-wood Forest Products in Latin America

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Abbreviations and acronyms

CEPAL	Comisión Económica para América Latina y el Caribe (Economic Commission for Latin America and the Caribbean)
CIAT	Centro Inter-Americano de Administraciones Tributarias (Inter-American Center of Tax Administrations)
Conab	Companhia Nacional de Abastecimento (National Supply Company)
FAO	Food and Agriculture Organization of the United Nations
FAO RLC	FAO Regional Office for Latin America and the Caribbean
IBGE	Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics)
IBCE	Instituto Boliviano de Comercio Exterior (Bolivian Institute of Foreign Trade)
IICA	Instituto Interamericano de Cooperação para a Agricultura (Inter-American Institute for Cooperation on Agriculture)
INE	Instituto Nacional de Estadisticas (National Institute of Statistics)
LOHAS	Lifestyles of Health and Sustainability
NWFP	Non-wood forest products
SDG	Sustainable Development Goals

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Summary

The potential of the bioeconomy based on non-wood forest products (NWFP) to sustain new development paths, especially for tropical countries, is being widely discussed. The increase in demand for NWFP from different market sectors has been significantly increasing their relevance for national economies, as well as driving changes in social and ecological dynamics. However, the contributions from NWFP to national economies are still largely unknown and frequently underrated, hindering the development of better-informed policy frameworks and market strategies. Furthermore, several policies developed over the last two decades connect NWFP development with forests conservation, economic growth and diversification, rural development, among other sectors. This research aims to describe the economic importance of three NWFP (Açaí, Palm heart and Brazil nut) in Brazil, Bolivia and Peru, as well as further characterize their value chains and identify the main elements in the national policies' objectives and instruments from the three mentioned countries that can promote the development of these value chains. The results obtained describe the high economic importance mainly from açaí in the case of Brazil and from Brazil nuts for Bolivia and Peru. The most common element among the selected policies is the support to producers and harvesters through different instruments (such as providing technical capacities and access to credit), while other elements such as supporting the processing of NWFP until its finished products is much less frequently addressed.

1. Introduction

This chapter introduces the topics addressed by the thesis and sets the research background besides reporting the research problem, questions and objectives.

1.1 Background

Latin America holds several of the world's biodiversity hotspots (Myers *et al.*, 2000), with a large variety of non-wood forest products (NWFP) and with several local communities which hold the knowledge on how to use and manage these resources. Strengthening sustainable value chains of NWFP provides economic alternatives for local communities, representing a diversification of income sources, and, when connected to social innovation strategies, can also build valuable social capital, promote social inclusion and rural development.

Moreover, market changes have raised opportunities for NWFP supply chains, as an increase in demand for these resources has been occurring. The growing consumer demand for "wild products" in certain market segments (e.g. LOHAS, Lifestyle of Health and Sustainability), and from food, pharmaceutical and cosmetics industries, makes NWFP a promising sector for countries' sustainable development, placing tropical countries in a potentially advantageous position. Consequently, it can represent a strong incentive to national and local governments to take action against deforestation and forest degradation, as the sustainable use of biodiversity is a pillar of sustainable development and the implementation of a forest-based bioeconomy.

The bioeconomy is a growing sector that can reduce negative social and environmental impacts of economic growth and generate innovative solutions for contemporaneous problems, as natural resources are recognized as valuable, and integrated into national development efforts (IUFRO, 2022). It can contribute to overcoming the challenges of the structural change entailed by the new development logic, letting go of the outdated dichotomies between forests, agriculture and industry, diversifying production and reducing dependency on non-renewable resources (Rodríguez *et al.*, 2019). In this scenario, forest raw materials including timber and beyond¸ such as resin, rubber and gum, are in the spotlight for new alternatives for the industries (Prokofieva *et al.*, 2017).

Therefore, biodiversity-rich countries would benefit greatly from having structured, reliable, up-to-date and complete information on NWFP production and trade, and more transparent markets, enabling better informed decision-making by different actors (governmental institutions, market players, investors, civil society, consumers, etc). Furthermore, transparent and structured markets allow for more equal distribution of benefits along the value chain's actors (Pettenella *et al.,* 2019). International markets, such as the EU one, are increasing the requirements for traceability of products being imported

(Prokofieva *et al*., 2017). The upcoming EU policy on “deforestation-free products”, which is currently being discussed in the European Council, defines strict rules for the imports of some commodities and products deriving from them, such as cocoa and rubber, related to, among other things, preventing ecosystems’ conversion and respecting traditional communities’ rights. Such requirements might be extended to other NWFP in the future, for which enhancing transparency would be extremely relevant.

Moreover, these countries have the opportunity of, more than exporting raw forest products, moving towards a bioeconomy development and foment bioeconomy-oriented industries and technologies internally, in a way of achieving more solid and sustainable economic growth.

In this context, and encouraged by the United Nations Sustainable Development Goal (SDG) Target 15.9 (“*By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts*”), several countries in Latin America have developed public policies related to the management of such resources, promotion of their sustainable production/extractivism and commercialization, along with the conservation of associated traditional knowledge. However, it is important to assess the effectiveness of these policies into the development of the NWFP’ value chains over the last decades, and their potentials for further developments.

Policy initiatives can set the conditions that enable value adding for NWFP’ (Pettenella *et al.*, 2019); increase demand for the products; offer technical training, subsidies or credit to actors in the value chain; support the organization of each link in the chain; etc.

Furthermore, important tools for commercial success of these value chains require high organizational efforts, cooperative attitude, and market research and promotion, and in many cases are only possible in the presence of public institutions' assistance (Pettenella *et al*., 2007). Among these tools are an integrated vertical supply chain; innovative strategies of communication with consumers and of collaboration among local producers; creation of standards and labels that increase visibility and liability. They can raise aggregated values, while increasing competitiveness of local communities as suppliers (Pettenella *et al*., 2019).

Policies to enhance the NWFP market must be consistent across scales and domains (forests, tourism, agriculture, etc.), making alliances with other sectors, such as health, bioengineering, etc. (Prokofieva *et al.*, 2017). Well-designed policies should acknowledge territorial needs and strategic vocations; foster innovation all along the value chain, and participation of all relevant actors; promote training, networking, and cooperation among them; raise awareness among civil society about the importance and opportunities of these products (Prokofieva *et al.*, 2017), as well as consumers about their security and sustainability, supporting the creation of market demand (Rodríguez *et al.*, 2019). However, NWFP matters frequently fall into institutional and sectoral rifts, as there is little political will to address these products properly, for being perceived as of minor importance (Laird *et al*., 2011).

To support the inclusion of biological resources in national economies, facilitating their access to existing markets or creating new ones, it is fundamental that their economic potential is quantified and accounted for. Initiatives by regional institutions, to concentrate and articulate systematized information, would greatly support bioeconomy, generating favorable conditions to support market efficiency and scale amplification (Rodríguez *et al.*, 2019). Some intraregional organisms in Latin America are CEPAL (*Comisión Económica para América Latina y el Caribe*), FAO RLC (*FAO Regional Office for Latin America and the Caribbean*), CIAT (*Centro Inter-Americano de Administraciones Tributarias*) and IICA (*Instituto Interamericano de Cooperação para a Agricultura*).

Moreover, regional policies guiding the management, use and trade of shared commercially traded species (Laird *et al.*, 2011) would enhance its efficiency and effectiveness. A systematic database on production and trade of NWFP, overcoming the referred data gap, is essential to support the creation and improvement of such policies and market strategies, as a clear and consistent database is necessary for better informed and effective policy frameworks (Laird *et al.*, 2011).

1.2 Problem statement

Literature regarding the economic importance of NWFP is mostly focused on the household level, since NWFP play an important role in local economies, in addition to their cultural and social value. Nevertheless, their role for national economies is frequently underrated, for being frequently under the form of informal economies. A better understanding of this would be valuable for better informing of management and policy choices at various scales.

However, systematic production and trade data on national/international scale is scarce or scattered. This difficulty to aggregate NWFP data at higher levels can be explained, among many reasons, by the enormous variety of NWFP, the complicated classification and definition (as they are frequently classified as agricultural products in trade data), and by being frequently traded in informal markets, often lacking transparency (Wahlén, 2017). Additionally, the methodological disparity among studies' data collection and reporting, and the conceptual challenges regarding multiple terminologies and definitions (Muir *et al.*, 2020), makes the information, even when available, hardly comparable across countries or over time (Sorrenti, 2017).

These data gaps imply that the economic contributions of NWFP to national economies remain unclear and, consequently, under-valued and unfinanced, with the sector being left in marginal positions for decision makers (Amici *et al*., 2020). The lack of data hinders the prioritization of NWFP in national policies, development plans and even forest strategies (Wahlén, 2017). Besides, if forests' monetary values can't be accounted for beyond timber, a great potential for social and economic development is compromised.

1.3 Objectives and research questions

This study aims to draw an overview of the market context of NWFP and policy framework in Latin America, identifying gaps, challenges and opportunities for future development of their value chains.

Stemming from this context, data on trade and policies will be collected, pursuing the following specific objectives:
1. To quantitatively describe the economic contribution, expressed by production and trade values, of three important NWFP in three selected Latin American countries.
2. To assess the general effectiveness of national policies and programs directly related to NWFP in supporting value chains in the three countries, identifying and comparing their main opportunities and constraints.

The study will contribute to answer the following research questions:
1. What is the absolute economic contribution of NWFP value chains in the selected Latin American countries?
2. How effective are the national policies and programs in the selected countries in supporting NWFP's value chains to achieve higher economic performances? More specifically, what are the factors driving this support, and/or the constraints limiting it?

2. Theoretical background

This chapter gives important definitions for concepts frequently used in this research.

2.1 Definitions

Considering the lack of a common definition for NWFP, this thesis will use the one stated in Muir *et al*. (2020, p. 111): “goods derived from forests and other wooded land that are tangible and physical objects of biological origin other than wood”.

Another important definition for this research is for the concept of ‘extractivism’. It can be defined as a human activity characterized by a set of socioeconomic, agronomical and environmental factors (da Silva & de Andrade Miguel, 2014). The Brazilian Institute of Geography and Statistics (IBGE, 2019b) defines plant ‘extractivism’ as the “*process of exploitation of native plant resources that comprises the collection or gathering of products, such as wood, latex, seeds, fibers, fruits and roots, among others, in a rational way, allowing the obtainment of sustained productions over time, or in a primitive and itinerant way, generally allowing only a single production*”. In other words, it is a general concept that is associated with a low-impact or low management of forest resources, most frequently of NWFP and undertaken by local communities. The fact that it is frequently associated with sustainable management practices will be discussed further in the text.

A term which is frequently used, mostly in Brazil’s references, is ‘sociobiodiversity’. It is described in Forest Trends (2022a) as the goods and services “*generated by biodiversity resources and aimed at the generation of productive chains of interest to traditional peoples and communities and family farmers*”. Furthermore, indigenous people and local communities “*promote the maintenance and valorization of [traditional] practices and knowledge*”, as a result “*generating income and promoting the improvement of the quality of life and of the environment in which they live*”.

3. Research methodology

This chapter presents the approach undertaken to achieve the research objectives and seek answers for the stated questions, as well as defines the target NWPF and countries to be assessed.

3.1 Research approach

To better understand how national policies in Latin America act upon certain NWFP' value chains, assessing their potential to foster them and support the development of a sustainable bioeconomy, three NWFP were investigated under three different countries.

To characterize the economic and social importance of these products, over time, in each country, two main types of information were required: a general description of the value chains, using secondary data obtained from a literature review; production, export and import data for each product, in each country, were collected through official statistics databases and the literature.

Subsequently, a review of four selected policies from each country was made, to analyse the elements contained that can support the value chains' development.

The general characterization of the value chains and market development made it possible to allocate each of the products into one of the phases of the extractivism path described by Homma (2014), while the assessment of the national policies allows for a better understanding of how the elements found have been supporting these value chains and how this can be improved.

Therefore, the study employs literature review and case studies analysis.

3.2 Target countries

Three countries were selected based on their relative importance in the Latin American context, in terms of population, economy and biodiversity: Bolivia, Brazil and Peru. The three countries are among the most biodiverse countries in the world, and in which NWFP have a traditional importance on local livelihoods. Data availability was also considered for the countries' selection, as these countries have more structured and accessible databases for trade data than other countries in the region.

Moreover, as the three countries share borders, they also share common species, which makes it more interesting to compare its uses and importance. Being part of the Mercado Común del Sur (Mercosur) process, i.e. the Southern Common Market, the three countries have economic and political relations that favour trade among them.

3.3 Target products

In the Amazon there are hundreds of native fruits with a high extractivist potential, but many, if not most, of them are considered “invisible extractive products”, as they do not have a well-established economic importance (Homma, 2014). In this research, three characteristics were considered for the selection of the products to be analysed: relevance for food security, economic development and biodiversity conservation.

Targeted products selected in this thesis work are açaí (*Euterpe* spp.), palm heart (*Euterpe spp*. and *Bactris gasipaes*) and Brazil nuts (*Bertholletia excelsa*). Açaí was selected mostly due to its importance for food security and economic relevance, while Brazil nut was selected for its economic relevance and palm heart for its ecological importance in biodiversity conservation. Of course, the level of importance of each of these products vary according to the country and the scale of analysis, and this will be analysed in the discussion section.

3.4 Targeted policies

To address the question of how national policies are supporting the development of NWFP value chains, six policy elements relevant for this support were set, based on the elements described in the background section. The elements are:

1. Explicitly supporting the processing of NWFP until its finished products,
2. Promoting conservation and good management practices of the resources involved in determined NWFP value chains,
3. Fostering improvement of the social organization of the value chain’s actors, such as in associative models,
4. Supporting suppliers in its various needs for entering or staying in the markets (technical capacities, technology development, access to credit, access to market, etc.),
5. Improving the engagement of the national market, such as enhancing the society’s interest for NWFP,
6. Creating new markets to absorb the NWFP production.

While the two first elements address more general aspects of the NWFP and its supply chains, the second elements refer to the supply-side improvement and the last two to improvements in the demand-side of the value chains.

These elements were used to select the national policies to be analysed. Each policy includes at least one of these elements. Four policies from each target country were chosen, aiming to achieve a set of twelve policies that would cover all the six elements.

3.5 Data collection

The methodology applied was based on literature review over the target NWFP, their value chains and historical development, as well as document research

regarding data published by international and national statistics databases, and of the legal documents referring to the target policies.

3.5.1 International statistics database

For obtaining country-level data on exports and imports values, the United Nations Comtrade database was used. Nevertheless, this database does not contain information on açaí trade values, for which national databases were used. The Harmonised System (HS) tariff codes referring to the products researched are the following:

- In shell Brazil nuts, fresh or dried: 080121
- Shelled Brazil nuts, fresh or dried: 080122
- Palm hearts, prepared or preserved, whether or not containing added sugar, other sweetening matter or spirit: 200891

In addition, the FAOSTAT database was used for obtaining production data of in shell Brazil nuts (product code, 01377). The section searched was the “Crops and livestock products”, within the “Production” section. The element selected for the search was “Production quantity”.

3.5.2 National official statistics database

National official databases were used for complementing data on exports and imports from açaí and for the production data from all three products.

For Brazil, the databases used were the ones from IBGE (Instituto Brasileiro de Geografia e Estatística), Conab (Companhia Nacional de Abastecimento), SFB (Serviço Florestal Brasileiro) and ComexStat (Comercio e Estatística).

For Bolivia, the IBCE (Instituto Boliviano de Comercio Exterior) and INE (Instituto Nacional de Estatística) databases were used.

For Peru, the database used was the INEI (Instituto Nacional de Estatistica y Informatica).

In addition, official statistical information from Bolivia was obtained via email exchanges with IBCE, during June and August of 2022.

For the conversion of the national currencies into US$, the Treasury - UN Operational Rates of Exchange was used. As for the correction of nominal values to the real present value (referring to 2022 prices), the Consumer Price Index (CPI) was obtained from the United States Bureau of Labour Statistics (U.S.A., 2022).

3.5.3 Classification systems and product descriptions

Table 1 provides a summary of product classification systems used for each of the three targeted countries and with reference to target products generally described in 3.3 and reported in detail in Table 2.

Table 1: Classification systems present in each target country. Own elaboration.

Country	Classification System used
Brazil	Mercosur Common Nomenclature (NCM) / Harmonized System (HS)
Bolivia	Nomenclatura Común Andina (NANDINA) / Harmonized System
Peru	Nomenclatura Común Andina (NANDINA) / Harmonized System

Table 2: Summary of target products' commercial specificities in each target country. Own elaboration.

Product	Country	Code	Description	Local name	Species utilized
Açaí	Brazil	2007.99.21	Purê de açaí (*Euterpe oleracea*)	Açaí Açaí-solteiro	*Euterpe oleracea; Euterpe edulis; Euterpe precatoria*
	Bolivia	No code	-	Asaí; Naidí	*Euterpe oleracea; Euterpe precatoria*
	Peru	No code	-	Huasaí, Asaí, Acaí	*Euterpe oleracea; Euterpe precatoria*
Palm heart	Brazil	200.891.00	Palmitos preparados ou conservados	Palmito; Pupunha; Jussara; Juçara	*Euterpe edulis; Euterpe oleracea; Bactris gasipaes*
	Bolivia	200.891.000 0	Palm hearts, prepared or preserved, whether or not containing added sugar, other sweetening matter or spirit	Palmito; Pejibaye	*Euterpe precatoria; Euterpe oleracea; Bactris gasipaes*

Product	Country	Code	Description	Local name	Species utilized
	Peru	200.891.000 0	Palm hearts, prepared or preserved, whether or not containing added sugar, other sweetening matter or spirit	Palmito, Chonta, Corazón, Jabato	*Euterpe precatoria; Euterpe oleracea; Bactris gasipaes.*
Brazil nut	Brazil	080.122.00 / 080.122.00	Castanha do Pará, fresca ou seca, com casca / Castanha do Pará, fresca ou seca, sem casca	Castanha do Pará; Castanha do Brasil	*Bertholletia excelsa*
	Bolivia	080.121.000 0 / 080.122.000 0	Nueces del Brasil, con cascara, frescos o secos / Nueces del Brasil, sin cascara, frescos o secos	Castaña; Nuez de Brasil; Almendra	*Bertholletia excelsa*
	Peru	001003002	Nueces del Brasil, con cascara, frescos o secos / Nueces del Brasil, sin cascara, frescos o secos	Castaña	*Bertholletia excelsa*

3.5.4 Literature review

A literature review was performed using publications from official institutions, scientific journal articles and gray literature. The “nesting” method of research for literature was implemented. The bibliographic database used was the Web of Science, in addition to Google research.

3.6 Data analysis

The data was qualitatively analyzed using the Homma (2014) model as a theoretical framework.

4. Results

In this chapter the results of the collected data are presented. In section 4.1, a description of açaí and the social organization of its value chain is provided; section 4.2 describes the palm heart and its value chain social organization; section 4.3 describes the Brazil nut and its value chain social organization. Section 4.2 describes the production and trade values found for açaí, palm heart and Brazil nut in the three target countries. Section 4.5 summarizes the national policies selected for each target country.

4.1 Açaí description

Palms are among the most used plant families for NWFP in the tropics for their morphological attributes which offer great versatility of uses (Isaza *et al*., 2017; Matos & Watkinson, 1998), providing fruits, fiber, oils and palm heart. The fruit of the species *Euterpe oleracea* Mart. and *E. precatoria* Mart., palm trees native to the Amazon forests, are called *açaí* in Brazil, *asaí* in Bolivia and Perú, where it is also called *azai* or *huasai*.

Euterpe oleracea Mart. is a multi-stemmed plant that occurs abundantly in estuarine forests, particularly in the Brazilian Amazon, reaches 25 meters high and is adapted to daily floods (Heinrich *et al*., 2011). *Euterpe precatoria* Mart., instead, is single-stemmed and grows also in Peru and Bolivia (Kahn, 1991). In Bolivia, it occurs from the district of Pando to the north of La Paz, Beni and Santa Cruz (Lorini, 2017).

Its deep purple fruits are the size of a grape, from which the seeds occupy the biggest share of its volume. Harvest seasons vary according to the region - in Pará (main producer State from Brazil), it goes from August to November (Conab, 2019a). Like countless other plants from tropical forests, açaí has been evolving through the centuries with human selection and cultivation in agroforestry systems. They have been historically reported as an important source of food for the Amazonian populations (McCann, 1999), with records of being responsible for up to 41% of total food intake in some locations (Murrieta *et al*., 1999). Not only in rural areas, but also in capital cities of Brazilian Amazon, such as Belem do Pará, a cold soup of açaí mixed with manioc flour or tapioca is a staple food, frequently served together with fish or shrimps (Muñiz-Muret *et al*., 1996). For its high energetic value and refreshing feature, açaí juice and ice cream became popular among surfers and has spread as a beach beverage (Heinrich *et al*., 2011).

In Peru and Bolivia, the açaí harvest tradition is less consolidated than in Brazil. *E. precatoria* has been used mainly for construction purposes (thatch and house-posts), household utensils and medicinal uses, by indigenous and *mestizo* communities (Bussmann & Zambrana, 2012). *E. precatoria*'s roots were reported to be used as medicine for several parasitic and viral diseases, such as malaria, hepatitis and yellow fever, as well as to treat pain and urinary infections (Bussmann & Zambrana, 2012). Nevertheless, Bussmann & Zambrana (2012) found that younger generations are more familiar with food uses of the palm, such as palm heart and for producing beverages, but also that

collection is intended for sale, not for self-consumption. *E. oleracea*, instead, is little known in Western Amazonia, as it has been introduced relatively recently in the region, as a consequence of the açaí market boom. It has been reported to be used for its palm heart and for preparing beverages only by *mestizo* communities (Bussmann & Zambrana, 2012).

Açaí has a high concentration of anthocyanin (de Freitas *et al.*, 2021). There is large literature evidence that both *E. oleracea* and *E. precatoria* have high antioxidant and anti-inflammatory properties (Kang *et al*., 2012), which may reduce the risks of cardiovascular diseases and some types of cancer, as well as have the potential to improve cholesterol levels and modulate hunger (Heinrich *et al.*, 2011). It has been traditionally used by Amazonian populations as medicine to prevent flus, treat diarrhea, fever, skin ulcers, digestive disorders and parasitic infections (Heinrich *et al*., 2011). Moreover, there is evidence that the antioxidant capacity of the Bolivian açaí is higher than the Brazilian one, since it has a much higher level of ORAC (Oxygen Radical Absorbance Capacity) (Tonore-Freitas *et al.*, 2019).

Moreover, during the 70's and 80's, *E. oleracea* was extensively harvested for its palm heart, but the dissemination of information around its fruit's benefits for health and the growing concerns about the impacts of palm heart extraction, increased exponentially the consumption of açaí fruits in the 90's (Conab, 2019a) initially within the country and later reaching the global market. It is considered a "*superfood"* - i.e. a market term without a single definition, used generally to describe highly nutritionally dense foods and which provide multiple health benefits. Therefore, it became increasingly popular, its image being publicized worldwide as a "*functional"* food.

Although the fruiting period occurs all year long, açaí harvesting period is mainly from July to December, but it varies according to the region. There are three main schemes related to the initial value chain organization in Brazil (Forest Trends, 2022b).

The most common one is given by the middlemen that pay the harvesters when they collect the fruits, which gives harvesters little margin for negotiation, since they must sell the products as soon as possible. As the price paid by the middlemen is considered excessively low, harvesters have little incentive to invest human and financial resources to reach far harvesting areas, which ends up constraining their activities in areas near to their residences (Forest Trends, 2022b).

According to Forest Trends (2022b), another possibility is that middlemen or the pulping facilities contract a group of people that are responsible for going to different localities and harvest the açaí, paying to the owners or occupants of the lands values that correspond to those paid in the first mentioned system, according to the volumes harvested. This scheme has the highest potential ecological damage, since these groups aim to collect the largest amount of fruits in the shortest possible time and have no personal relation with the places, which makes them prompter to, for example, cut down some palm trees to collect the fruits more easily.

A third possibility is that the landowner makes an anticipated deal with the middlemen selling all the future harvest, which will set a date and bring a group of harvesters. The price is previously negotiated and is usually lower than what would be earned in the other two schemes. This usually happens when landowners are in need of immediate money. This, however, can cause relevant impacts to their food security, as they are prevented from collecting açaí even for family consumption (Forest Trends, 2022b).

After harvested, açaí is bought by the middlemen and transported *in natura* to be processed, which must be quickly done, since açaí is highly perishable - it must be either consumed or frozen within 24 hours after harvest (Tonon *et al*., 2009). The first processing step is the pulping of the fruits, which are macerated together with water to extract the pulp from the seeds. The amount of water used will determine the thickness of the product, which will then be classified accordingly. After that, açaí pulp is packed into plastic bags and frozen. According to Forest Trends (2022b), this initial processing phase happens either in small enterprises that will directly feed the local markets or in primary processing industries. The latter will sell their production either to wholesalers or to industries of secondary processing. Wholesalers sell the açaí pulp to retailers that feed the regional markets, such as the "Ver-o-Peso" market in the capital of Pará, Belém (Brazil). Secondary and tertiary processing industries are responsible for steps such as the addition of guarana syrup, which sweetens the pulp and, after other processing steps, makes the açaí ice cream which is more commonly found in other regions in Brazil than the açaí wine or puree. In these industries, açaí might also be dried and powdered, mainly for exportation. Different transport means are used along the value chain, such as trucks, cars, motorcycles, canoes, boats, animals or by foot (Ipea, 2015).

Considering that seeds represent around 75% of the açaí fruits, for each ton of açaí collected 750 kg of seeds are generated as a by-product of processing industries and they have different destinations (Forest Trends, 2022b). Seeds from pulped fruits are still able to germinate and can be spread to enrich local abundance of the species (Trevisan *et al*., 2015). They are also used as charcoal and biomass for producing energy to regional industries or transformed into fertilizers.

4.1.1 Social organization of the açaí value chain

Açaí, being an Amazonian traditional NWFP, is subjected to the particular situation of land tenure, use and management from this region (Veloz, 2020). It is important to analyze these factors in more detail as they determine the levels of decision making of each actor and the degree of autonomy they have over resource management (Brondízio, 2008).

Floodplain areas are mostly constituted of smallholders, traditional dwellers that have occupied the land for generations (Homma et al., 2006). Moreover, local dwellers frequently lack tenure documentation or are sharecroppers, rendering them vulnerable to speculation, land grabbing or eviction, since the rising value of açaí increases the value of land in which it occurs. This juridical insecurity of

land tenure frequently reflects in the lack of interest of extractivists to use sustainable management practices (Ipam, 2018).

Brondizio (2008) has developed one of the most detailed studies on the açaí value chain, highlighting some key aspects. Land tenure arrangements specifically associated with the açaí value chain can be organized according to the size of landholding. Smallholders, characterized by lands of a maximum of 50 hectares, exclusively use the land for subsistence and market production, and use is restricted to family and kinship members. Medium owners' properties range from 50 to 200 hectares and large owners are those who have properties larger than 200 hectares. There are also corporate owners, whose properties frequently exceed 1,000 hectares. These are usually fruit processing companies that seek to control the supply level. The last three types of landowners depend on wage labour or sharecropping for the açaí production.

Sharecropper category aggregates people under a wide range of agreements in place in the region, in terms of right to resource use, degree of autonomy and time of occupation. Primarily, there are long-term sharecroppers, which generally inherit the position that is perpetuated through family ties. There are several forms of social relations between landowners and sharecroppers, such as god-fathering, children adoption, or support with specific needs, such as health. On the other hand, there are seasonal sharecroppers, who are workers with contracts that last for a season and do not establish fixed residence on the place. Some sharecroppers are allowed to harvest exclusively açaí and not any other resource, while in other cases they can benefit from the multiplicity of resources present in the area, such as fruits, fish, fuel, etc., providing for their subsistence needs and, in some cases, even giving access to other markets. In some cases, they receive a specific share of the profits generated by açaí production, while in others they are paid based on contracted labour.

While small landowners can independently make decisions regarding resource management, sharecroppers are usually constricted to what determines the landowner. Moreover, sharecroppers are usually subjugated to informal contracts, which deprives them of legal land rights. However, there are attractive benefits in the system that are weighted against this insecurity situation. The most relevant one is that it provides immediate financial return as, depending on the season, there can be fruiting açaí palms in the land that can be immediately harvested, which is also important for households' food security, being a basic element of regional diet. There is also access to products from other fruits or lumber that they may also be able to market.

Moreover, Forest Trends (2022b) describes the matter of value lost along the açai value chain, which makes the prices received by the extractivists excessively low. According to the study, the isolation of açai harvesting communities and the common lack of electricity hinders investments in açaí processing facilities nearby the extraction sites. It states that the costs involved so that açaí can be processed within the necessary time frame increases its selling price, in some cases even surpassing it, since transportation must be done in cold storage (Souza *et al*., 2013). These costs are borne by intermediaries and induce them to pay lower prices to the extractivists. Moreover, "*the greater the distance between the production sites and the*

market, the lower the value paid to the extractivist tends to be" (Forest Trends, 2022b).

According to Conab (2021a), the average price received by açaí producers in Brazil varies according to the Federal State, the proximity to ports and industries and, most importantly, to the time of the year when açaí is harvested and traded. The average price received by producers for the açaí fruits (with seeds) in 2020, was R$ 1.41 (US$ 0.3 in 2022 prices) per Kg. According to this source, the limiting factor to the rise of this price is the lost values along the chain with infrastructure and logistic costs.

This value is the same as the established minimum price to be paid for açaí in 2020, defined within the scope of the Minimum Price Guarantee Policy – which gives a reference price to be paid for several products throughout the country, as will be explained further in the text. For 2019, the price was R$ 1.63 per Kg (US$ 0.48 in 2022 prices). For 2021 and 2022, prices were R$ 1.41 (US$ 0.91 in 2022 prices) and R$ 1.63 (US$ 0.34), respectively.

Specifically in Amazonas, in 2019 açaí was priced at R$ 1.64 (US$ 0.48 in 2022 prices), and R$ 2.13 (US$ 0.62 in 2022 prices) in case of organic or agroecological production (Conab, 2019[b]).

4.2 Palm heart description

Palm heart is a product obtained from the apical meristem of different palm species (Arecaceae), the most common ones being *Euterpe edulis* Mart., *Euterpe oleracea* Mart., *Euterpe precatoria* Mart., *Bactris gasipaes* Kunth, *Archontophoenix spp.,* and *Prestoea acuminata*. It is a soft, white, cylindric mass found in the internals of the palm's stem, and is sold fresh, canned or in jars (Orlande *et al.*, 1996). In Brazil the used species are *E. edulis* and *E. oleracea*, in the Atlantic and Amazonian forests, respectively. In Bolivia and Peru, the species used for obtaining this product is *E. precatoria*.

Also known as *green palm*, *peach palm*, *white palm*, *sweet palm*, *jussaí*, *jussara* and *juçara*, *E. edulis* is a dominant species of the middle stratum from the Atlantic Forest (Carvalho *et al*., 2022). It occurs in Argentina, Paraguay and in the south, southeast and central regions of Brazil, from sea level to 1,000m elevation (Matos & Watkinson, 1998) and presents concentrated patterns of occurrence in the forest, called "palmitais" (Orlande *et al*., 1996). The species reproduces better in well-conserved environmental surroundings and its seeds need relative shadow to germinate (Orlande *et al*., 1996). *E. edulis* can reach 15m high, but as cutting age for palm heart harvest is normally when the palm is from 5 to 10 years old (Orlande *et al.*, 1996), it rarely reaches this height, being cut down earlier. Having one single stem (Matos & Watkinson, 1998), the palm heart harvest kills the plant.

E. edulis's fruiting happens for an extended period, at the end of the rainy season and into the drier months, and an average of 1,500 fruits is produced (Matos & Watkinson, 1998). They can, under favorable conditions, produce

something from 216 to 528 bunches per hectare, a total of 6 to 8 kg of fruit per year (Carvalho *et al*., 2022).

Euterpe oleracea Mart. is also used for palm heart extraction. According to Galeano & Bernal (2010, *apud* Vallejo *et al*., 2014, p. 275), it is found along the Pacific coast from Panama to Ecuador, estuaries of Trinidad, Venezuela, Guianas, Colombia and Brazil (Amazon estuary). Seeds dispersion is done by birds, mammals (Moegenburg & Levey, 2003) or even by tidal floods (Moegenburg, 2002). It has the advantage of being multisteemed, so cutting selected stems while leaving one or two intact, allows the plant to regenerate and be cut again in posterior years (Orlande *et al.*, 1996; Matos & Watkinson, 1998), the cut cycle being of around five years (Sousa *et al*., 2011). On the other hand, its taste quality is considered inferior to that of *E. edulis* (Orlande *et al.*, 1996). Despite the usually preferred use for *E. oleracea* being for açaí production, due to its higher market prices, its palm heart is usually harnessed when açaí harvesters perform thinning of some of the stems to enhance açaí production to the remaining stems and to facilitate its handling. The palm heart from the thinned stems is usually used for family's self-consumption (Ipam, 2018).

Known as *assai* in the Bolivian Amazon, *Euterpe precatoria* Mart. is a single-stem palm that may reach up to 20-25 meters high. It occurs both in seasonally flooded and in well-drained forest soils, in elevations of up to 2,000 meters, and is sparsely distributed from Bolivia to Belize (Stoian, 2004[b]). *E. precatoria* is ready for palm heart extraction when it is between 5 and 15 years old, ultimately resulting in its death (Stoian, 2004[b]). In the Bolivian Amazon, apart from palm heart harvest, leaves are used for ceiling, fruits for producing pulp and juices, roots for medicine, and the stems for building (Stoian, 2004[b]).

Bactris gasipaes Kunth, known as *pupunha*, *pejibaye*, *pijuayo*, *chontaduro*, and *peach palm* is also an Amazonian plant. Its starchy fruits were traditionally eaten by indigenous populations, cooked, fermented or processed into flour (Clement & Leeuwen, 2004). It can reach 15 to 20 meters (Clement & Leeuwen, 2004). Flowering happens at the end of the rainy season and pollination is made by beetles, with fruits coming three months later (Clement & Leeuwen, 2004). Fruits weigh between 10 and 250g, while bunches from 1 to 27kg. Differently from previously presented palms, palm heart production from *B. gasipaes* is rarely from natural populations, but instead from cultivated ones, as it is now a domesticated plant (Clement & Leeuwen, 2004). It has qualities that are considered advantageous to the previous two, such as fast growing, having multiple and larger stems. *B. gasipaes* palm heart can be harvested from when it is two years old, with annual harvests afterwards (Sousa *et al*., 2011). However, in terms of taste quality, *B. gasipaes* is considered inferior to both *E. edulis* and *E. oleracea*.

From a nutritional point of view, palm heart has no remarkable features, and it has historically been reported as an "accessory" food item for rural or indigenous people in Latin America. However, it has an important complementary role in this people's diet, with higher importance in times of food scarcity, especially in colonial times (Mourão, 2010).

A general view has settled in that palm heart extractivism is an unsustainable activity, and frequently consumers that are concerned about their ecological footprint stopped purchasing such product (Pollak *et al*., 1996). However, Pollak *et al.* (1996) demonstrated how palm heart (in that case, from *E. oleracea*) can be produced sustainably and represents a valuable opportunity for sustainable development of Amazonian economies and a meaningful economic alternative for the people who live there, especially in rural areas.

4.2.1 Social organization of the palm heart value chain

Palm heart extraction from *E. edulis* is illegal in Brazil, unless it is sourced from planted areas or a management plan is approved by the environmental State agencies for private lands.

The palm heart harvesters in Brazil, called "*palmiteiros*" in Brazil, are among the poorest people residing in the Atlantic Forest. Harvesters may be full-time or occasional workers during inactive periods of other activities, such as working in banana plantations in the case of the Vale do Ribeira region (São Paulo State, Brazil), one of the most relevant areas in the palm heart extraction (Galletti & Fernandez, 1998). Palm heart from *E. edulis* has provided up to 90% of smallholders' income in Vale do Ribeira during the 20th century (Ball and Brancalion, 2016).

Palmiteiros perform an extremely hard labor, which frequently starts at young ages and involves heavy lifting and handling dangerous working tools. Furthermore, the harvest of wild *E. edulis* populations is mostly done in legally protected areas, such as State Parks, since they contain most of the species' remnant populations due to the overharvest in the past decades (Brancalion *et al*., 2012). The poaching activities in protected areas requires *palmiteiros* to work mostly at night and under threats of violent confrontations with the police (Orlande *et al*., 1996).

Due to the illegality of these activities, processing frequently happens in informal "home factories", under poor sanitation conditions, and it is one of the reasons why the juçara palm heart extractivism is mostly done without any type of collective organizations and is extremely difficult to have estimations of the prices received for the products (dos Reis et al., 2000). Frequently, all steps are done by the same actors or their relatives, from harvesting, to processing and selling (usually in local markets or at roadsides). Nevertheless, most of the production of palm heart in all three countries comes from cultivation in private lands, as will be discussed further in the text.

Moreover, due to the low rates of plantations of *E. edulis* and *E. oleracea* for palm heart extraction, the reference list of prices for the Amazonas State (Brazil) presented by Conab (2019b) includes only one palm heart species, the pupunha (*B. gasipaes*). The stated price for one Kg is R$ 4.01 (US$ 1.17 in 2022 prices) or R$ 5.21 (US$ 1.52 in 2022 prices) for organic or agroecological products.

4.3 Brazil nut description

Brazil nuts are the seeds of the *Bertholletia excelsa* Humb. & Bonpl, from the *Lecythidaceae* family. As the term “nut”, in botany, refers to fruits, it is a misleading name. They are produced inside a capsular woody fruit, containing 10 to 25 seeds (Mori & Prance, 1990). *B. excelsa* trees produce an average of 29 fruits per year (Chaves, 2007), which means around 290 to 725 seeds. During the rainy season, mature fruits fall to the ground but do not break, the seeds remaining within (Mori & Prance, 1990). The seeds are dispersed by agoutis - i.e. any of several rodent species of the genus *Dasyprocta,* the only animals apart from humans which are able to open the woody pericarp (Mori & Prance, 1990). According to Müller (1981) a well-defined dry season, of three to five months, is needed for the development of the species.

B. excelsa is pollinated by bees, which explains the requirement of a well conserved surrounding environment for the species to reproduce. Fruits take as long as 15 months to fully develop (Moritz, 1984). The large trees, reaching 50 meters heigh, may achieve an average of 400 years (Caetano Andrade *et al*., 2019). It occurs naturally in non-flooded forests from Guiana, Venezuela, Amazonian Colombia, Peru, Bolivia and Brazil, frequently in stands of 50 to 100 individuals, called “*manchales*” in Peru, and “*castanhais*” in Brazil (Mori & Prance, 1990).

This patchy distribution has raised the hypothesis that the stands might be a consequence of ancient Amazonian peoples' cultivations (Shepard & Ramirez, 2018). Although there are no final conclusive proofs for the so called “anthropogenic hypothesis”, there is substantial evidence corroborating it, starting from the morphology of its fruits and dispersal ecology of the species, highly dependent on humans and agoutis; genetic studies suggesting low degrees of interpopulation genetic diversity; and linguistic analysis of indigenous names for the nut (Shepard & Ramirez, 2011). Moreover, it is known that Brazil nuts were first exported to Europe in the 18th century by Dutch traders (Mori & Prance, 1990).

They can be consumed in natura, roasted, pressed to produce a milk-like liquid, or as ingredients of products such as granolas, ice-creams, nut bars, and others (Angulo *et al.*, 2021). They are also used for oil extraction and preparation of flour (Mori & Prance, 1990). Oil is also appreciated for cooking and in the cosmetics industry, for lotions, hair products and others; its second extraction can be used for soaps; the residues from the oil extraction can be used for animal feed (Mori & Prance, 1990).

It is an excellent source of energy, containing high amounts of lipids, micronutrients, vitamins, fibers and proteins, being highly recommended as a dietary complement especially in vegetarian diets (Yang, 2009; Freitas *et al*., 2012). It has been shown to have antioxidant and antiproliferative activities which can potentially slow organism aging processes, stimulate the immune system, prevent heart diseases and some types of cancer (Yang, 2009).

Differently from other Amazonian economically important species, such as açaí, cacao (*Theobroma cacao* L.) and rubber (*Hevea brasiliensis* Willd. ex A. de Juss), that are grown intensively as crops, Brazil nuts remains mainly gathered

from naturally occurring trees (Mori & Prance, 1990). This puts this product in a position of great potential instrument for economic growth for riverine communities and higher socioeconomic equality, as it favors local and small producers, instead of large cultivation sites.

To harvest the Brazil nut, indigenous people, peasants and seasonal workers move deep into the forest after the rainy season and look for fallen pods in the ground (Coslovsky, 2014). Pods are split open and carried in woven baskets, which, when full, are brought back to intermediaries that sell the cargo to a processing plant (Coslovsky, 2014). The collection and processing of Brazilian nuts can be a dangerous work, as the fruits, weighting from 0.5 to 2.5 kg, fall from as high as 50 meters, which can cause serious accidents; opening requires precision, consisting of splitting the capsule with a machete (Mori & Prance, 1990). Other hazards are common to most NWFP collectors, such as snake bites, malaria, and violence in remote forest areas (Mori & Prance, 1990).

In the processing plants, in-shell nuts are selected, cleaned, dehydrated, sometimes shelled, and packed. There are two forms of selling the product: kernels and in-shells (Coslovsky, 2014). Kernels are ready to be eaten and are sold as snacks, added to mixed nut packages, or used in confectionary products, while in-shells must be peeled by the final consumer and are rarer to find in other regions of the country (Coslovsky, 2014). From there, kernels' possible destinations include: being sent to regional, national or international markets, where they are bought by wholesalers and retailers before reaching the final consumers, or being processed in industries of the food and cosmetic sectors (Forest Trends, 2022a). In-shells predominantly stay in the regional market and are mostly found in street markets, while kernels cross the country in trucks to the Southeast region where they are distributed in the national commercial net.

Brazil nuts value chain, like açaí, has an important subproduct: its shells. They are used as biomass for electricity generation. According to McAllister (1998, *apud* Stoian, 2004a, p.99), a town in northern Bolivia, called Riberalta, had 40% of its electricity coming from the 50 tons of shells per day burned as fuel.

4.3.1 Social organization of the Brazil nut value chain

Although there are no studies about the social organization of Brazil nut value chain at national level, there are studies developed at the local scale. For example, according to Sousa Silva *et al.* (2019), the majority of the *castanhais* in the Municipality of Tefé, one of the biggest producers of Brazil nuts in the state of Amazonas, are located in private land. In this research, 44% of the people stated that harvesting happens in private lands, 33% in areas which belong to the State ("*terras devolutas*") and 23% are not aware who the land in which they harvest the nuts belong to. Many of the people living in these lands for generations do not have the land title, which is frequently a basic requirement to access government programmes, benefits and credit.

In Brazil, Brazil nut is mainly an activity undertaken by local communities, not attracting foreigners from the cities and seasonal workers, as happens with açaí (Sousa Silva *et al.*, 2019). Nevertheless, it is common that the *castanhais* are located in areas far from where the extractivist communities live. The result is that frequently the effort to undertake these routes daily is not reasonable and families move temporarily to the *castanhais*, where they settle camps for weeks for harvesting (Forest Trends, 2022a).

According to Vos (2017), in Bolivia more than 20 thousand people migrate to harvesting sites to, together with local communities, collect the nuts (Vos, 2017). Despite the broad land redistribution that resulted from social movements in the 90's, many families don't have equal access the *castañales* (*castanhais*).

Sousa Silva *et al.* (2019) found that 89% of the extractivists in Tefé had parents in the same activity, while 11% had only grandparents with this occupation. Furthermore, it was observed a high average age of the extractivist, with 65% of them being over 40 years old and only 12% was under 30 years old. The research also showed that 17% of the extractivists of the region are illiterate, corresponding to the double of the national rate of illiteracy, with 48% having concluded the basic series of schooling and only 3% have completed all levels of the school cycle.

Regarding the commercial organization of Brazil nut harvesters, they are, as in most NWFP value chains in the Amazon, vulnerable actors in terms of price negotiation. As they mostly commercialize their products in an individual manner, they are subject to the price determinations of who is willing to pay for the products. In Tefé, around 45% of the harvesters make deals with the middlemen to provide them with a payment advance, in cash or food, in exchange for a part of the harvests. The consequence is that there is little margin for price negotiation of the prices to be paid (Sousa e Silva *et al.*, 2019).

The prices stated as a reference for in-shell Brazil nuts in Brazil by Conab (2019b) specifically for the State of Amazonas was R$ 4.02 per Kg (US$ 1.17 in 2022 prices), or R$ 5.23 (US$ 1.53 in 2022 prices) for organic or agroecological products. The shelled Brazilian nut, on the other hand, was included with a price of R$ 38.92 (US$ 11.35 in 2022 prices) per Kg or R$ 50.60 (US$ 14.76 in 2022 prices) when from organic or agroecological sources.

4.4 Production and trade values

4.4.1 Production and trade values for açaí

Brazil is the biggest açaí producer in the world, and the largest part of this production - 90% of the collected fruits and 99% of the cultivated ones - comes from the country's northern region, being 90% of the total production sourced in the federal state of Pará (IBGE, 2020b Conab, 2021). According to IBGE (2021a), the biggest share of açaí currently produced in Brazil comes from the high intensity management areas and cultivation of *Euterpe oleracea*.

Differently from Brazil, nearly all the açaí fruits harvested in Bolivia and Peru derive from non-cultivated *Euterpe precatoria*. The açaí market is relatively new in Bolivia, starting after 2010. However, there are registers of more than ten organizations of açaí harvesters in different parts of the country and a few pulping sites have been installed at national level since 2010 (Lorini, 2017).

In Brazil, it is a consolidated market, as its consumption and commercialization have a long tradition in the country. According to IBGE's Plant Extraction and Silviculture Production (PEVS) publications from several years (from 2017 to 2021), açaí is the most important extractivist NWFP in the food group in Brazil, in terms of production value. From 1998 to 2020, the extractivist production almost doubled (from 120 thousand tons to 220.5 thousand tons, a raise of 84%), but the price per ton has decayed in this period, from US$ 1303 per ton in 1998 (US$ 2368.7 in real 2022 prices) to US$ 580,2 per ton in 2020 (US$ 666.9 in real 2022 prices) (Brasil, 2022). As a result, the total value collected decayed from US$ 157.2 million (or US$ 285.8 million in real 2022 prices) to US$ 130.6 million (or US$ 150.2 million in real 2022 prices) in 2020 (Brasil, 2022).

In 2016 açaí represented 33% of the value of total extractivist NWFP production in Brazil in that year (US$ 826,488,040 in 2022 prices), and 59% among the food group (IBGE, 2016). **Figure 1** refers to açaí coming exclusively from extractivism in Brazil. The quantity of extractivist açaí produced between 2016 and 2020 increased by 2%, however the value of production has decreased by 15% in the same period (IBGE, 2016).

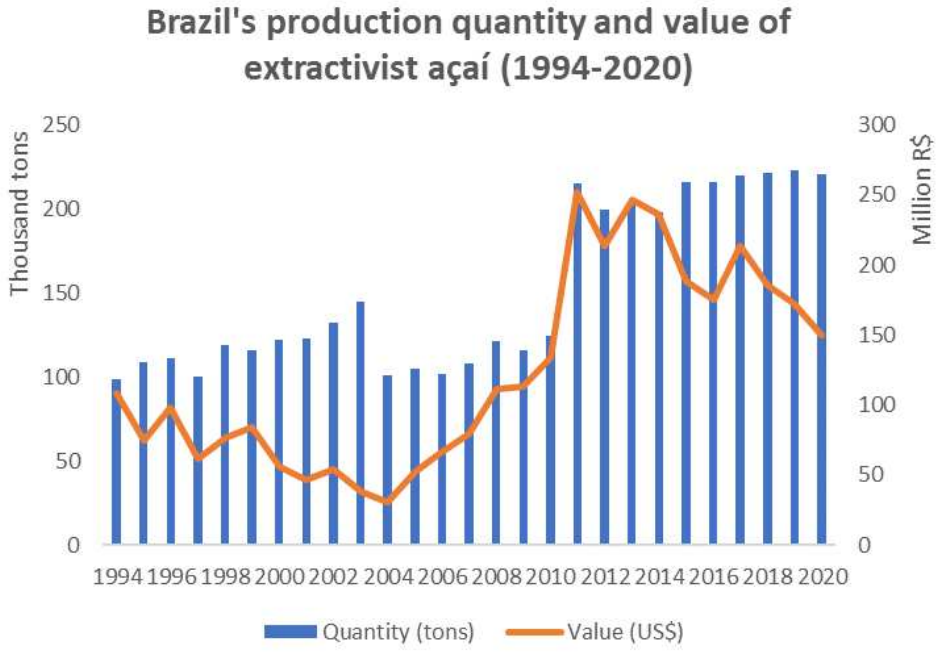

Figure 1. Historical series of production quantity (tons) and value (US$ in 2022 prices) of açaí in Brazil, from 1994 to 2020. Own elaboration from IBGE (2022d).

The continuous growth of the açaí production in Brazil over the past two decades (and especially over the last one) comes mainly from the improvement of management techniques applied to non-cultivated areas, allowing for higher

productivity, such as the thinning of competitor species, and the breakneck growth of açaí plantations (Conab, 2019a), mainly in non-flooded areas.

In 2020, 87% of the açaí production in Brazil was sourced from cultivated or high-intensity management areas (Forest Trends, 2022a), giving açaí a status of forest-based commodity. According to IBGE (2022c), açaí was the third main production from the North region in 2021, after soy and corn, and followed by manioc and cocoa. In 2017, açaí occupied the first position and in 2020 the second one (IBGE, 2021b). Also in 2017, açaí was the third fruit most produced in the country, after oranges and bananas (IBGE, 2018b).

The most relevant factors determining the açaí prices in Brazil, apart from the timing (higher prices at the beginning of harvest season and lower at its peak) are proximity to ports and industries and the commercial relations with regional trading centers (Brasil, 2022). Considering that plantation happens usually much closer to commercial centers than extractivist sites, together with the fact that monoculture practices generally increase productivity, cultivated açaí tends to have lower prices than extractivist ones. Therefore, the increase in the percentage of cultivated açaí in the past decades can explain the lower value of production, despite the increasing quantity produced. Moreover, the lower prices from cultivated açaí also forces extractive açaí to reduce its price, to be able to compete in the market.

The Brazilian Ministry of Agriculture estimated that more than half a million people earn an income from the sale of açaí (Brasil, 2022). According to Forest Trends (2022b), estimates are that 120 thousand families and more than 200 enterprises (of extractivists and smallholders) earn economic benefits from the açaí value chain. In 2016, the national census had registered, only in the state of Pará, 12,804 properties in which açaí was cultivated and 10 thousand artisanal processors ("*batedores*", responsible for the maceration process) (Oliveira & Tavares, 2016). In remote areas such as Guaporé and Mamoré river valleys - at the frontier between Brazil (Rondonia State) and Bolivia - açaí is processed artisanally and primarily consumed as part of the staple diet, with only occasional surpluses being commercialized in local markets or to small factories for pulp production (Conab, 2021a). According to Conab (2015, apud Bentes & Homma, 2017, p.4) the importance of açaí extractivism to riverine people's income is extremely high, representing up to 70% of household's income in some areas.

Figure 2 refers to the total açaí produced in Brazil between 2016 and 2019 - including extractivism, managed forests and plantations - and exported quantities. The decrease in total production in 2019 was due to the reduction of the rain volumes registered in this year (Conab, 2019a). The reduced availability of açai in the local markets of the Northern region of Brazil, with a consequent price rise, has led to protests of middlemen. The situation was called the "açaí crisis", and concern was raised about the need to prioritize local consumption, where the fruit is a fundamental part of the diet, rather than the exports.

According to Conab (2021a), Brazil exported a total of 10,219 tons between 2016 and 2020. The rise in exports volumes were proportional to the production increase. **Figure 2** also shows how production from 2017 to 2018 increased

while exports decreased, which may have made possible the higher increase rate between 2018 and 2019, despite the production decrease. **Figure 3** shows how the export rate in relation to the total produced each year grew along with the increase in production, from 2016 to 2019.

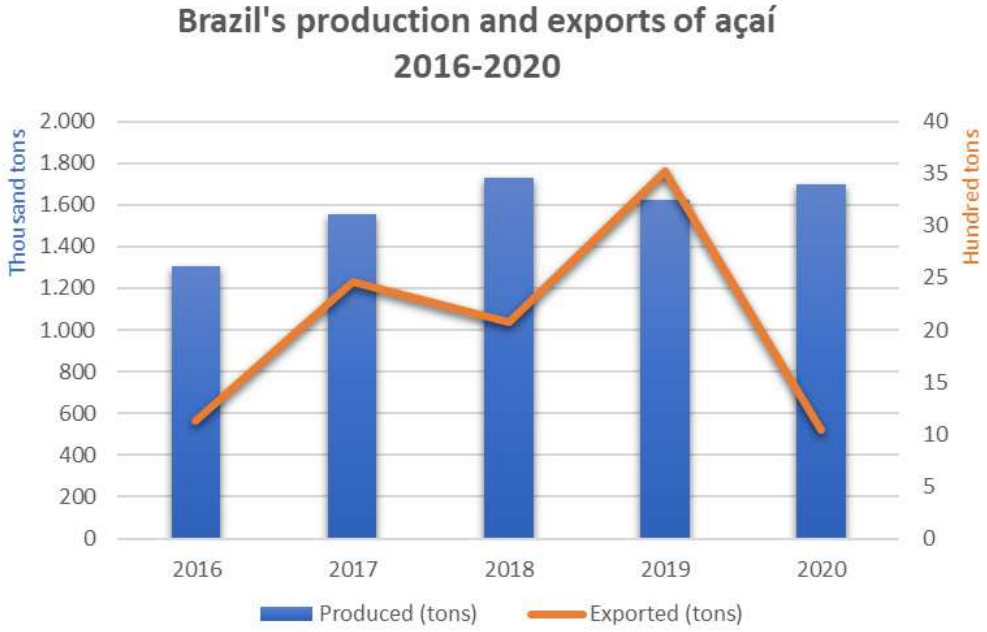

Figure 2. Brazilian açaí annual production (extractivist and cultivated) and exports (tons). Own elaboration from Conab (2021a).

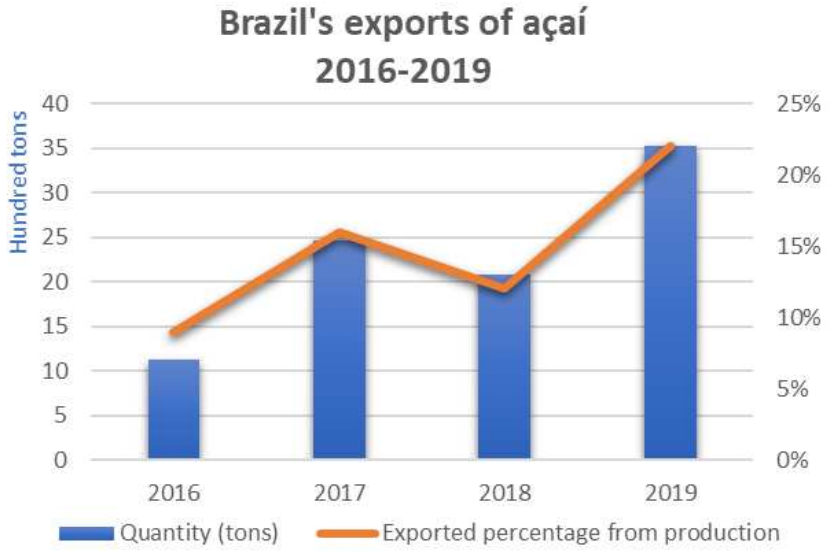

Figure 3. Annual quantity of açaí exported (tons) and percentage of exports in relation to national production. Own elaboration from Conab (2021a).

Moreover, according to the National Company of Supplies (Conab, 2021a), the exported volume between 2010 and 2019 increased by ten times, from 314 to 3,500 tons. Around 60% of the production from the federal state of Pará stays

within the state, 35% goes to other states - mainly São Paulo, Rio de Janeiro and Minas Gerais, and only 5% is exported to other countries (Conab, 2021a). In 2014, Pará earned around R$ 225.7 million, the equivalent to US$ 126 million in adjusted values to 2022 prices, from the sales of açaí pulp to other states and countries (Oliveira & Tavares, 2016).

In 2020 the United States of America (USA) imported 66% of açaí exports from Pará State, EU 21% (i.e., Portugal 6%, France 6%, Germany 4%, others 5%), Japan 3%, Australia 3%, and other countries summed 7% (**Figure 4**) (Conab, 2021[a]).

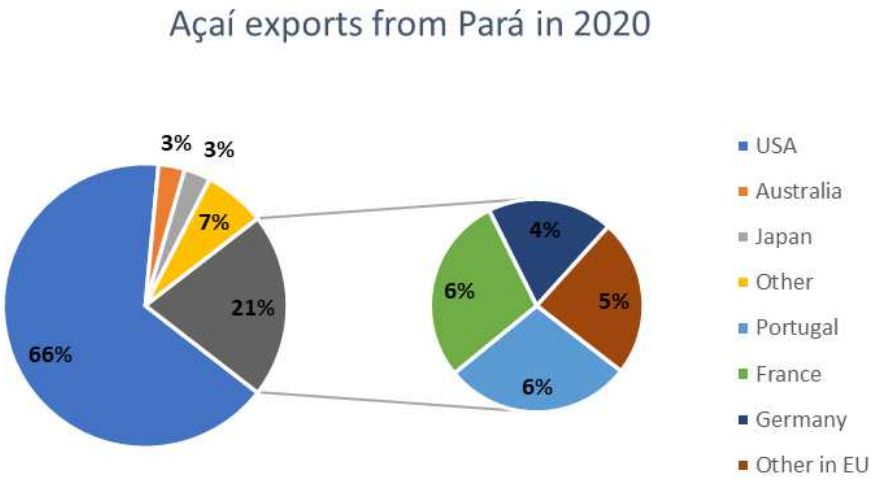

Figure 4. Main destinations of açaí from Pará (Brazil) in 2020. Own elaboration from Conab (2021a).

The USA is, by far, the main importer of Brazilian açaí. There, the pulp is processed into products with higher value, such as juices, energetic drinks and ice-creams, making the USA the largest producer and exporter of these products (Bentes & Homma, 2017). The USA has become a major açaí processor, developing a large variety of products derived from the fruit with much higher aggregate value (Conab, 2019a). In Brazil, besides basing the açaí exports on the raw product, a large portion of the potential profits is lost along the way from harvest to sale due to transport and logistics issues (Conab, 2021a).

Pulp is the main form of export from Brazilian açaí, which consists of a low level of processing, or semi-processed. The verticalization of the production would not only increase the total value earned by the commercialization of açaí derived products, but also increase the number and quality of jobs in the producing States. This requires policies focused on the structuring of the value chains, investments on infrastructure in remote areas, technologies to develop processing systems, capacity-building programs, and more access to credit for enterprises.

Before 2016 the official records of açaí pulp exports were made together with pulp and juices of other fruits, scattered in different codes, making it hard to have precise data on it (Bentes & Homma, 2017). However, in December 2016 a code was created in the Mercosur Common Nomenclature (NCM) for "açaí puree (*Euterpe oleracea*)", and thus disaggregated data is found for this product since 2018 on the platform for trade statistics, ComexStat, as shown in **Figure 5**.

Figure 5. Brazil's annual exports of açaí puree (liquid ton) and FOB value (US$ in 2022 prices). Own elaboration, from Brasil (2022).

Despite the historical dominance of Brazil in the açaí market, Bolivia has also become an international provider of freeze-dried açaí in the last decade (Lorini, 2017). **Figure 6** shows açaí production in Bolivia between 2006 and 2020. National production was gradually increasing, passing from 124 tons in 2006 to 466 in 2013 and 1,238 in 2015 (INE, 2022). Nevertheless, in 2016 production suddenly rose to 280,897 tons and to 308,421 tons in 2017, after which it has fallen back to previous levels - 1,132 tons in 2018 and 130 in 2020. This could have been caused by a labor reorientation of the Brazil nuts harvesters due to the significant drop in the production of Brazil nuts in 2016, which has put some Municipalities, such as Riberalta and Pando, into a state of alarm (Vos, 2017).

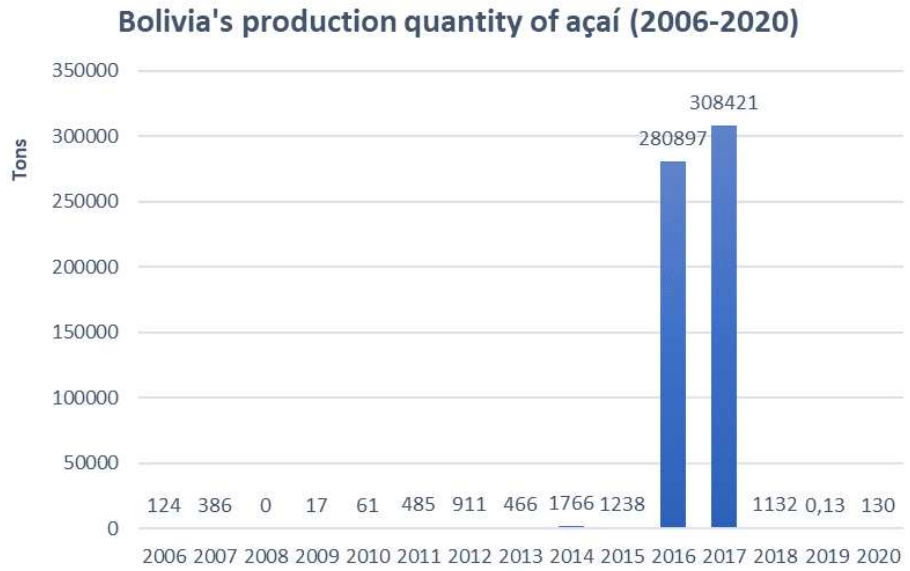

Figure 6. Bolivia's annual production of açaí (tons). Own elaboration from INE (2022).

Only recently, in 2021, the first official standard (NB36009:2021) for açaí pulp production was approved in Bolivia, by the Standardization Governing Council - CONNOR (Consejo Rector de Normalización). Before then, Bolivia adopted as a reference the standards from Brazil and Colombia, for its regulation and sanitary register (IBNORCA, 2021). This will strengthen the açai value chain, which is starting to be an alternative for income diversification for many families that currently depend solely on the Brazil nuts value chain (IBNORCA, 2021).

Exported volumes are still relatively low in Bolivia, as its production corresponds to less than 0.1% of Brazilian production, and Brazil is the main importer of Bolivia's açaí - 75% of it was bought by Brazilian companies in 2015 (Lorini, 2017).

Market surveys showed there is a large unmet demand for açaí in Bolivia, with volumes being insufficient to keep the offer constant all year long (Lorini, 2016 and 2017). Lorini (2017) estimates around 300 tons of unmet demand for açaí pulp per year. The bottlenecks identified by the author were related to the fact that this is not a traditional practice as it is in Brazil - traditionally, *E. precatoria* was felled for the extraction of palm heart or collection of its fruits for family consumption. Therefore, not enough people have the required skills to climb the palm tree for harvesting its fruits without feeling it (the estimate was of around 300 people working in this activity in 2017); local people distribute their time among different activities for their livelihoods, and frequently açaí harvest is not prioritized; the actors of the açaí value chain are not well connected, in a way that even though both providers and buyers have interests in the development of this activity, progress is hindered.

The unstructured productive chain of açaí in Bolivia reflects the lack of official statistical data for it. As informed by representatives from IBCE through mail correspondence, there is no tariff nomenclature for açaí in Bolivia, consequently, no record is made for production or international trade. According

to Lorini (2017), volumes of harvest are hard to estimate since most trades are done informally with companies. Moreover, literature on açai production and trade in Bolivia is limited.

Nevertheless, Lorini (2017) argues that there are great opportunities for açaí productive chain to develop, as demand is high and growing and existing wild populations of *E. precatoria* in Bolivian forests are large enough to attend this demand, if measures are taken to leverage the value chain, supporting producers, promoting national knowledge on the product and connecting different actors. In 2017, CIPCA (Centro de Investigación y Promoción del Campesinado Regional Norte Amazónico) developed a study that estimated the economic and productive potential of the açaí value chain in Bolivia, by estimating the densities of açaí palm trees, their productive potential, and its sales prices (Tonore-Freitas *et al*., 2019), which amounted to a total production of 670.7 tons of açaí fruits per year, corresponding to 1.4 billion Bs (*Bolivianos*) - equivalent to US$ 246.6 million in 2022 prices.

Regarding the inclusion of açaí production into the livelihoods of Bolivian rural populations, Lorini (2017) argues that it could be well combined with their other main activities, as the most abundant months for açaí harvest in the country, from April to August, happen at the end of Brazil nut season (which is prioritized by producers, for being a product of high economic value and having a well-established market), and also when agricultural practices are less intense. This would complement rural people's income and represent a more integrated management of native forests with its multiple uses. To maintain certain levels of supply after *E. precatoria* fruiting season, around September to November, and extend the productive period of the pulping factories, Lorini (2017) suggests the harvest of cultivated *E. oleracea*.

In Brazil, federal and Para state's governments have been aligning to generate benefits to the açaí value chains. Among them, the Brazilian Bank had a business strategy program, called Regional Sustainable Development Strategy (Banco do Brasil, 2010), to financially support açaí productive activities. Furthermore, initiatives for allowing the traceability of açaí are being implemented, such as the Plant Transit Guide for açaí (GTV - *Guia de Trânsito Vegetal* in Portuguese) from Pará, in 2020. It allows for better management of the value chain, compliance with legal requirements, ensuring quality and differentiating products on the market, which results in higher aggregate value (Conab, 2021a).

Much research has been developed in order to enhance productivity of açaí, in particular by Embrapa, the Brazilian Company of Research, Agriculture and Livestock, to enhance productivity by developing methods and technologies. This necessity was a result not only from an increased expansion of consumption, but also from a diversification of its uses. Indeed, açaí has been used in an increasing variety of products from the food industry, and recently also for natural colorants (Bentes & Homma, 2017). While productivity in extractivist sites revolves around 4.2 tons/hectare, managed sites – which can be selectively cut to leave only the açaí palms that are of easy access and produce higher quantities of fruits, while cutting the other palms for its palm heart and other less valuable species that compete for light and nutrients – can

provide for 8.4 tons/hectare and irrigated systems for 15 tons/hectare (Santos *et al*., 2012, *apud* Tavares & Homma, 2015, p.2).

The improvement of cultivation techniques of products that were previously wild harvested also represents a risk of appropriation by other countries where the plant may adapt well, which means a risk of market loss for the country of origin. In the case of Brazil, this happened many times with Amazonian plants, such as the rubber tree, the cocoa and guaraná (Homma *et al*., 2006). This situation can also happen within the country, with the cultivation of açaí advancing over the dry lands of the Atlantic Forest, much closer to the large consumption hubs, reducing the final price (Homma *et al*., 2006).

Açaí cultivations are usually monocultures in non-wetlands ("*terra firme*", in Portuguese) requiring high levels of irrigation and use of chemical fertilizers and pest controls (Forest Trends, 2022b). Freitas *et al*. (2021) evidence that, as açaí clump density increases, forest consistently loses tree abundance and species richness at local scale, while its structure is affected by understory, canopy and emergent tree species impoverishment. Without adequate planning more areas will continuously be cleared for the açaí production, which is not only an issue for environmental conservation but can also aggravate land disputes, with land concentration.

Moreover, the lower prices and increased productivity of cultivated açaí makes it considerably more competitive than açaí from extractivism (Ipam, 2018). This threatens the viability of extractivist practices and can severely impact communities that rely on this income. In addition, families might be tempted to sell all the available açaí to compensate for the low prices received, using the money earned for, among other things, to buy other foods which may have much lower nutritional value (Forest Trends, 2022b). This would result, in addition to the economic factor, in an impact on communities' health, food security and culture. This means that the expansion of açaí cultivation might be a factor leading the açaí value chain to, in practice, not support social justice and environmental conservation. The report of Ipam (2018) points out that firm land cultivations of açaí, associated with the practices of monoculture, fertilization, pest control systems, cultivar breeding and other techniques risks creating social exclusion and wealth and land concentration.

Therefore, production increase must be done in accordance with coordinated planning and appropriate policies in order to achieve its potential to be a source of income for many more families and support forest conservation. Açaí plantations can be designed to enhance connectivity between forest patches in areas with a higher degree of anthropization, by enriching or reforesting areas previously deforested or degraded. They also have the benefit of reducing the pressure over natural populations in flooded areas, since despite the individual survival of palms, an overharvest of fruits would locally preclude the species reproduction.

The establishment of ethical commercial relations between companies and extractivist communities' organizations, such as associations and cooperatives, is essential to ensure the right payment to extractivists. The verticalization of the value chain, in a way that extractivists could, within 36 hours and inside the communities, pulp, freeze and store the açaí, would allow them to stand over

much better conditions for negotiating prices with downstream buyers, especially in the between-harvests season, when availability is lower (Forest Trends, 2022[b]). Another opportunity to be incentivized is the cultivation of açaí in agroforestry systems, in which the consortium with other species of economic and/or nutritional valuable species proportionate a steady flow of income and food for the communities (Forest Trends, 2022[b]).

In some regions of Amazonas and Acre federal states of Brazil, açaí is harvested from the palm *Euterpe precatoria*, instead of *E. oleracea*. For being less common in the Brazilian market, *E. precatoria* has lower acceptance from consumers and tends to get lower prices. It is frequently used in a complementary way to the high demand for *E. oleracea* and increases the disparity of economic benefits received by producers from Pará and other producing states (Conab, 2021[a]).

Moreover, a new opportunity is growing for some southern Brazilian States. The "Jussara" or "Juçara" palm tree, *E. edulis*, is a native palm tree from the Atlantic Forest, as previously detailed. Similar to the açaí from *E. oleracea,* pulp or juice are made from its fruits, called "*jussaí"*. Cakes, jams, bread, ice cream are some of the products made by the "quilombola" and the "caiçara" communities in this region. Similar to açaí, jussaí stands out for its health and nutritional benefits that help prevent many diseases with its high antioxidant activity, as its fruits present four times the quantity of anthocyanins found in *E. oleracea*, higher phenolic compounds, anthocyanins, and antioxidant activity than in this species (Carvalho *et al*., 2022).

The fruits commercial value is usually around R$ 0.70/kg to R$ 1.00/kg (or US$ 0.58/kg to US$ 0.83/kg), with the processed açaí sold for around R$ 5.00/kg to R$ 10.00/kg (US$ 4.1/kg to US$ 8.3/kg) (adjusted to 2022 prices) (Bourscheid *et al*., 2011). Its consumption has a high potential for diffusion as the areas of harvest are, in general, much closer from the final markets than in the case of *E. oleracea*. In fact, this value chain has started developing only in the last decade but it's having great success in entering the markets of the South and Southeast, drawing on the growing demand for açaí pulp and borrowing its already consolidated fame (Trevisan *et al*., 2015), which are advantages that new products entering the market usually do not have. Other competitive advantages of jussaí are the regional infrastructure, including the roads for draining the production and existing social capital (Trevisan *et al*., 2015).

Moreover, there is also the opportunity to learn from the history of the açaí production chain, from productive management techniques to market innovations. On the other hand, the lack of experience with this product and its commercialization (considering that *E. edulis* had traditionally only been used for the palm heart extraction), in comparison to the expertise of the people who work with açaí in the North, is a challenge to be overcame by the jussaí value chain. In addition, the endangered status of *E. edulis* makes it harder for commercial licensing, and extractivist activities in the Atlantic Forest face many more legal obstacles than it does in the Amazon. This is due to the Atlantic Forest Law (Nº 11.428/2006), the regulation for forest management in this biome, being considerably more restrictive than the National Forest Code, which is the legal base in place in the Amazon. For example, managing

secondary forests to reduce other species competitiveness is prohibited by the Atlantic Forest Law.

The açai harvest has historically been in a rivalry situation with the palm heart extraction, as *E. oleracea* is also a source of this product, but in this case some stems are put down, which lowers fruit availability and may harm or kill the plant if overly done. In the late 80's, the high demand for palm heart and high prices paid, stimulated the high rate of *E. oleracea* cut down (Bentes & Homma, 2017). However, the situation was reversed in the 90's and the demand for açaí became higher than that of palm heart, which, together with the diffusion of *E. oleracea* and *Bactris gasipaes* Kunth plantations, mitigated the rivalry (Bentes & Homma, 2017).

4.4.2 Production and trade values for palm heart

In Brazil, the palm heart industry started in the 50's, introducing this product in the international market. For decades Brazil has been the world's main provider of palm heart (Pollak, 1996). Production was in the Southern and Southeast federal states of Santa Catarina, Paraná and São Paulo (Corso, 2003), which are situated in the Atlantic Forest biome, where *E. edulis* was abundant. However, this industrialization process was intensified in the 60's, when exports were at their peak and market prices were high (Corso, 2003). In fact, the palm heart from *E. edulis* was called the "white gold from the Atlantic Forest", for its harvest being a very lucrative activity (Orlande *et al*., 1994). However, the intensive extraction behind this commercial growth almost completely depleted the *E. edulis* populations from the region, and in the late 70's Brazilian palm heart production was transferred to the Northern states, especially Para, and extraction shifted from *E. edulis* to *E. oleracea*, which was abundant in the Amazonian estuarine forests and, for being multi-stemmed, were expected to represent a permanent source for the industries (Mourão, 2011). The vast majority of Brazil's palm heart production was then derived from these sources, with around 96% of the national production coming from *E. oleracea* in Pará by the end of the 90's (IBGE, 1975, *apud* Pollak *et al*., 1996, p.6).

Nevertheless, the overexploitation story of *E. edulis* repeated itself and compromised the populations of *E. oleracea* in the region (Mourão, 2010; Pollak *et al*., 1996). This, however, affected not only the palm heart industry, but also compromised the supply of açaí fruits to produce pulp (Mourão, 2010), an important item of the regional market in terms of local income, traditional diet and contribution to the regional economy. This generated serious conflicts between palm heart and açaí harvesters. Moreover, the international growing interest for the açaí pulp and consequent rising prices of this product, made the industry more prone to leaving *E. oleracea* for the harvest of its fruits and finding other alternatives for palm heart production (Yokomizo & Farias Neto, 2021). With the growing açaí market and lower availability of both *E. edulis* and *E. oleracea*, the palm heart industry faced a downfall from the 80's to the 90's - as can be seen in **Figure 7**. The decline was intensified by the wave of botulism cases caused by palm heart consumption in the country, which were vastly

publicized in the news (Corso, 2003) and downgraded even more the image of palm heart industry.

Figure 7. Historical series of extractivist production of palm heart in Brazil, from 1986 to 2020. Own elaboration from IBGE (2022d).

At the beginning of the 2000's, production started to rise again, mostly due to cultivation areas, especially of *Bactris gasipaes*, and mainly in the States of São Paulo, Bahia and Pará (Rodrigues, 2007). In addition to the lack of availability of the *Euterpe* palms, this shift was motivated by different other factors: the entrance of *E. edulis* and *E. oleracea* in the international market was restricted by laws and agreements aiming to reduce the degradation of tropical forests (Corso, 2003). Moreover, the international market became more demanding in terms of more homogeneous quality of products and regularity of provision, which are inherent challenges for the wild products extractivism (Corso, 2003).

Despite the product corresponding to merely 1% of the total value produced by NWFP from extractivism in 2016 (which was of 826.5 million US$ in 2022 prices), according to data provided by IBGE (2016), palm heart extractivism is still considerable (**Figure 8**).

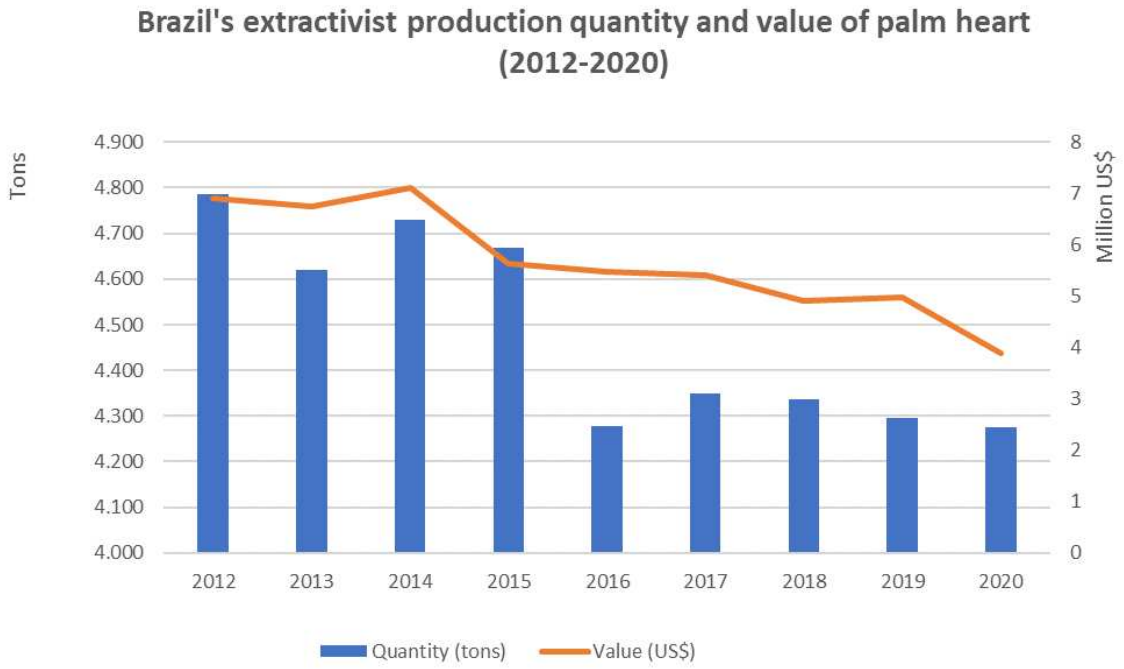

Figure 8. Brazil's annual production quantity (tons) and value (US$ adjusted to 2022 prices) of palm heart from extractivist sources. Own elaboration from IBGE (2022d).

From the beginning of the century palm heart production in Brazil has been losing its extractivist feature, and nowadays it is mostly based on cultivation (**Figures 9** and **10**). Wild harvests of *Euterpe* palms by rural families are gradually substituted by the agribusiness model of large monocultures of *B. gasipaes*. Its cultivation has been diffused through many Latin American countries (Sousa *et al.*, 2011), due to its continuous production, easy harvesting, intensive cultivation, rusticity, and the diffuse image of being more sustainable than wild harvest (IBCE, 2010). *Archontophoenix spp*. (palmeira-real) is also cultivated in Brazil, at a lower scale, mainly in Southern States (Corso, 2003).

According to IBGE (2022b), Brazil has produced a total of 110,005 tons of cultivated palm heart in 2020, amounting to R$ 282,223,000, equivalent to US$ 60,712,364 in 2022 prices.

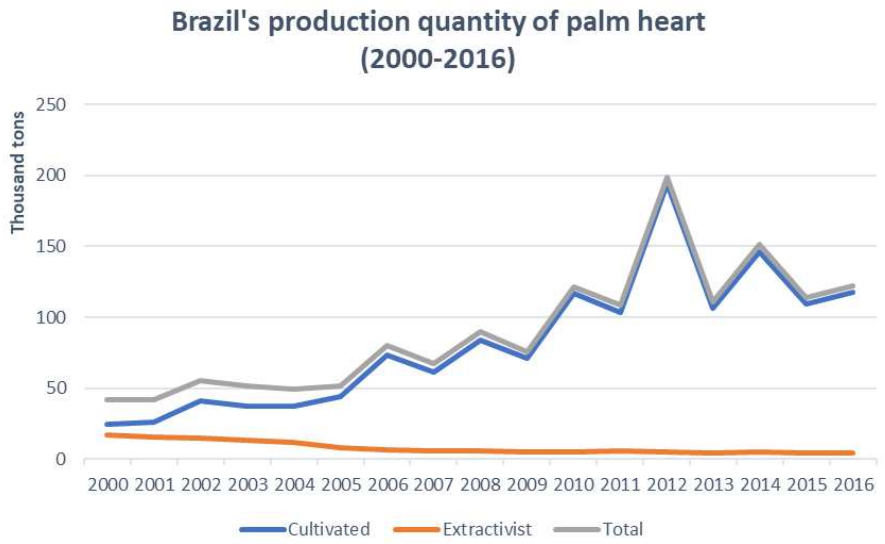

Figure 9. Brazil's annual production quantity (tons) of palm heart from cultivation and extractivist sources. Own elaboration from IBGE (various years).

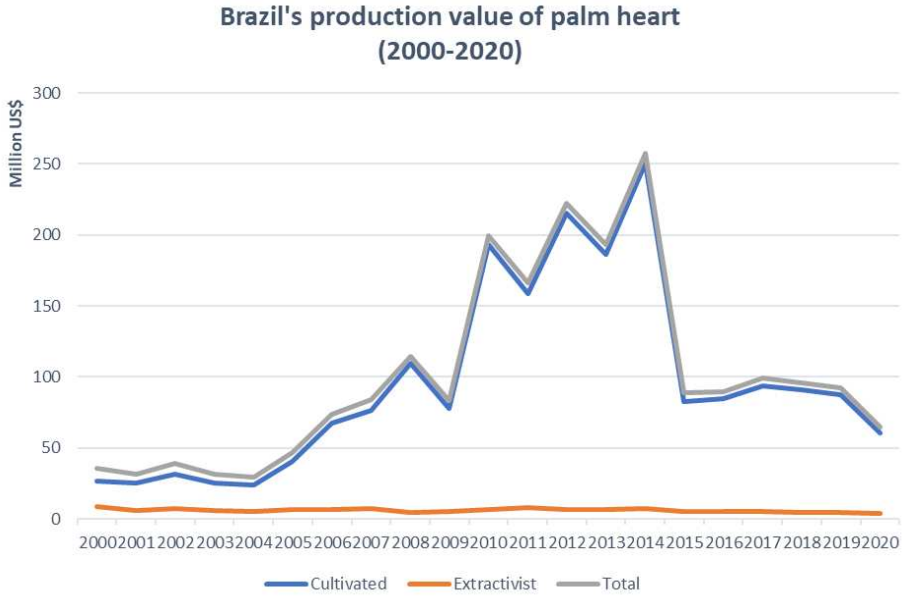

Figure 10. Brazil's annual production value (US$ adjusted to 2022 prices) of palm heart from cultivation and extractivist sources. Own elaboration from IBGE (various years).

Despite the large national production, Brazil's exports are not as significant as other Latin American countries, as only a very small (and decreasing) portion of Brazilian production is destined to the international market (**Figures 11** and **12**).

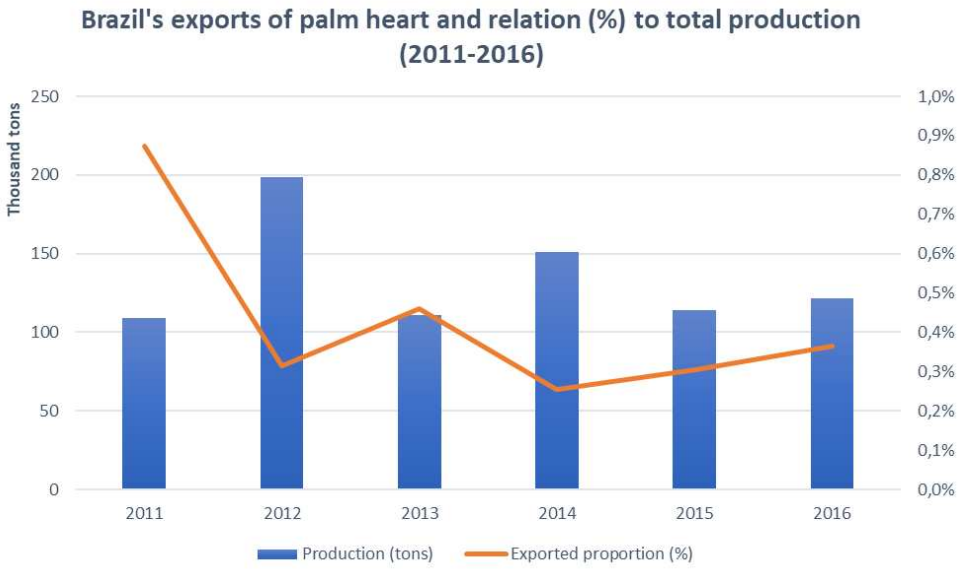

Figure 11. Brazil's annual production (tons) of palm heart and the percentage (%) which was exported. Own elaboration from IBGE (various years) and ComexStat (2022).

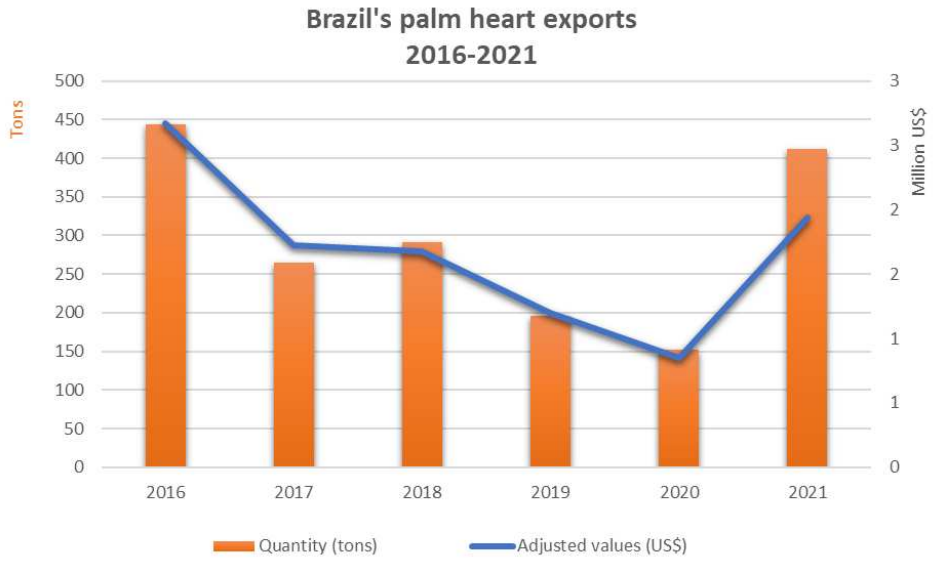

Figure 12. Brazil's annual exports quantity (tons) and value (US$ adjusted to 2022 prices) of palm heart. Own elaboration from ComexStat (2022).

The world's total exports of palm heart between 2016 and 2021 amounted to 286,860 tons (Comtrade, 2022). Brazil exported 1,760 tons of palm heart in the given period, which represents less than 1% of the world's exports.

Ecuador and Costa Rica are the main palm heart exporters in the world, with a production based on *Bactris gasipaes* large scale plantations, lower prices and a steadier production (Sousa *et al*., 2011). In 2021, Ecuador was the main exporter in the world, with almost 29 thousand tons and 65.7 million US$, while Brazil was in the 7th position in terms of quantity exported, with 411 tons and

1.78 million US$. Other important exporters are Bolivia, Colombia, Peru, and Venezuela.

In Bolivia, the palm heart industry started in the late 60's, but it was only in the 90's that the production turned into large-scale (Stoian, 2004b). This production was mostly based on *Euterpe precatoria*, but in the last two decades the proportion coming from *Bactris gasipaes* has been growing significantly (IBCE, 2010). Similarly, to what will be detailed further about the Brazil nuts in Bolivia, palm heart extractivism replaced the rubber (*Hevea brasiliensis*) extractivism at the end of the 80's, when this sector collapsed (Stoian, 2004b), giving an alternative to local communities.

The production and exports of palm hearts in Bolivia reached its peak in the 90's, but started to decay dramatically in the following decade, mostly due to market forces (Stoian, 2004b). According to Stoian (2004b), despite the overexploitation of *E. precatoria*, this contraction of the palm heart market was, instead, a consequence of the cut of imports of Brazil, which was the main importer of Bolivian palm heart at the time. This happened because of a crisis in the Brazilian economy and national currency devaluation, which considerably reduced palm heart consumption, being this a luxury good; and because of botulism cases related to consumption of palm heart coming from Bolivia, which made the Brazilian government banish its imports. In this context, while exports to Brazil were ranging US$ 5.9 million in 1998 (US$ 10.7 million in 2022 prices), in 1999 it fell to US$ 0.5 million (US$ 0.89 million in 2022 prices) and close to zero in 2000 (Stoian, 2004b). After that, Argentina became the main importer of Bolivian palm heart and helped this market start to recover, but also experienced an economic crisis which forced the reduction of palm heart imports. Later, the main factor affecting the Bolivian palm heart exports was the competitive markets of Ecuador and Costa Rica, mainly based on *Bactris gasipaes* cultivation (Stoian, 2004b). With that, exports of palm heart in the years 2000's were remarkably low, but increased again in the years 2010's, reaching a new peak in 2013 (**Figure 13**).

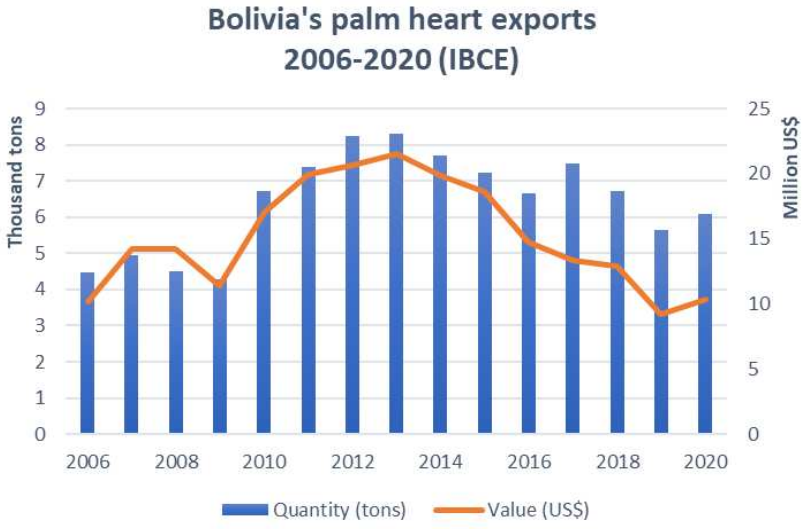

Figure 13. Historical series of Bolivia's palm heart exports quantity (tons) and value (US$ adjusted to 2022 prices), from 2006 to 2020. Own elaboration from IBCE (2020).

From 2006 to 2020, more than 96 thousand tons were exported from Bolivia, a total of around US$ 228.4 million (in 2022 prices), according to data provided by the Bolivian Institute of Foreign Trade (IBCE, 2020). According to Moraes *et al*. (2014), both in Bolivia and Peru most palm heart produced comes from *Bactris gasipaes* cultivation, even though there is still extraction of *E. precatoria* from natural populations.

In the last six years (2016 to 2021), Bolivia exported a total of 32.6 thousand tons of palm heart, an equivalent of US$ 60.6 million (in 2022 prices) (IBCE, 2020). This represents 11% of the total quantity of palm heart exported in the world in this period, which amounted to 286.9 thousand tons (Comtrade, 2022). Only in 2021, Bolivia exported 5,221 tons of palm heart, which represents 14% of the world's palm heart exports in that year (**Figure 14**), putting Bolivia in the position of second main exporter, after Ecuador (Comtrade, 2022). In this year, Bolivia exported to 10 countries (Comtrade, 2022).

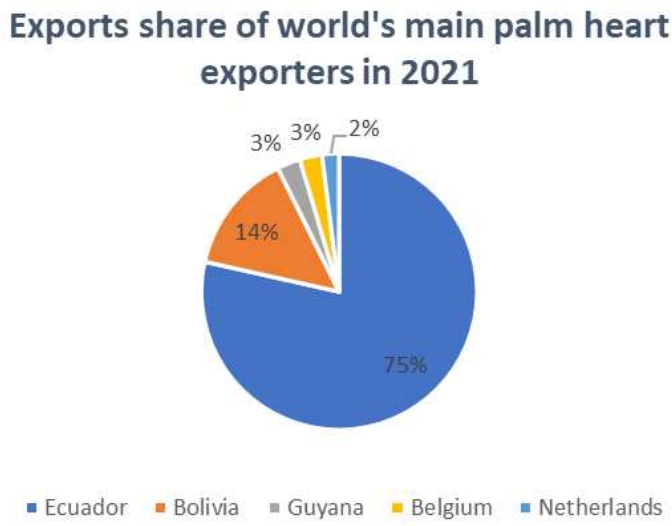

Figure 14. Palm heart exports quantity from world's main exporters of palm heart in relation to total exported worldwide in 2021. Own elaboration from Comtrade (2022).

Argentina and Chile are the main importers of Bolivia's palm heart. Argentina imported 44% of this total in quantity (corresponding to 41% of the exported value), while Chile imported 35% (37% of the exported value) (**Figure 15**) (Comtrade, 2022). Uruguay, the USA and Paraguay were the next most important importers in the given period.

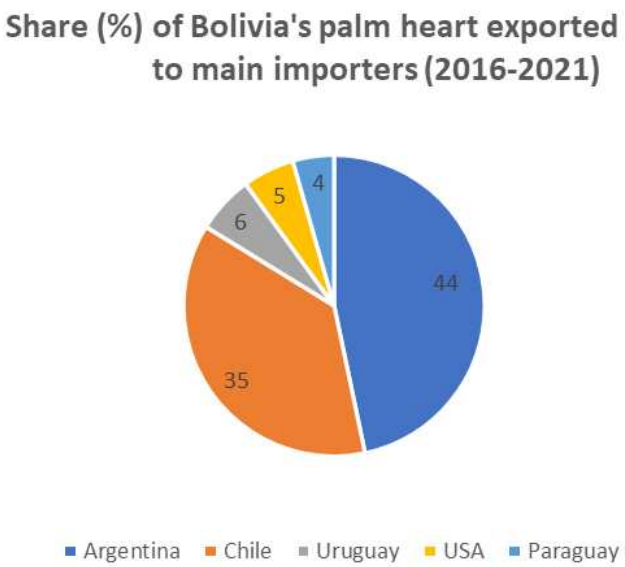

Figure 15. Bolivia's palm heart exports quantity percentage to the main importers, from 2016 to 2021. Own elaboration from Comtrade (2022).

As for Peru, its palm heart exports have been increasing along the past decades (**Figure 16**). It reached its peak, both in terms of quantity and value, in 2019, with 3,758 tons, corresponding to US$ 9.96 million (in 2022 prices) (Comtrade, 2022). The main importers of Peru's palm heart between 2018 and 2020, were France, the Netherlands, the USA and Spain (**Figure 17**).

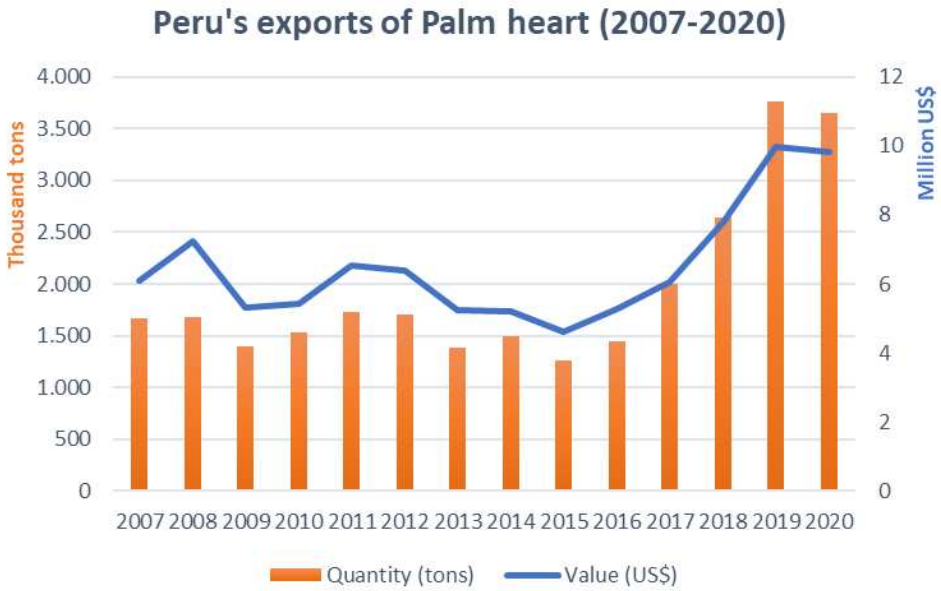

Figure 16. Peru's palm heart exports, in quantity (tons) and value (US$ adjusted to 2022 prices), from 2007 to 2020. Own elaboration from Comtrade (2022).

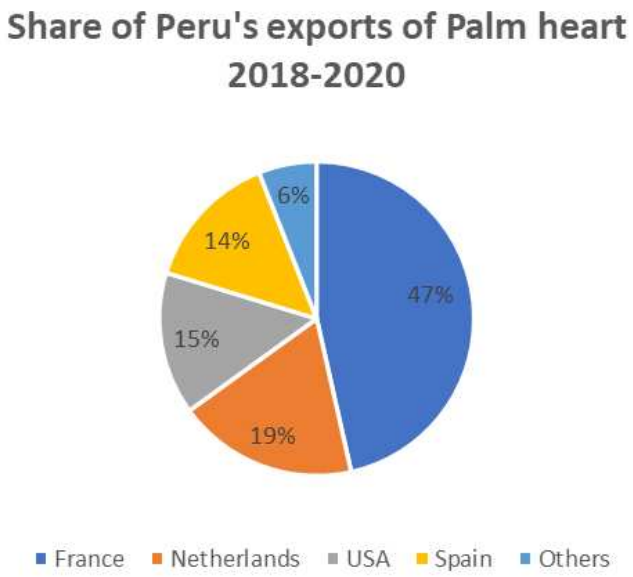

Figure 17. Peru's share (%) of exports of palm heart to its main importer countries, in terms of quantity (tons), between 2018 and 2020. Own elaboration from Comtrade (2022).

Brazil and Peru also imported palm heart in small quantities in the last decades. Between 2007 and 2020, Peru imported 69 Kg in 2014, corresponding to US$ 379 (adjusted to 2022 prices), which came from Israel, and 12 tons (US$ 29,137) from Ecuador (Comtrade, 2022). Brazil imported mainly from Paraguay, Ecuador, Peru, and Costa Rica (**Figure 18**). **Figure 19** shows a comparison of the imports and exports of palm heart in Brazil between 2016 and 2021.

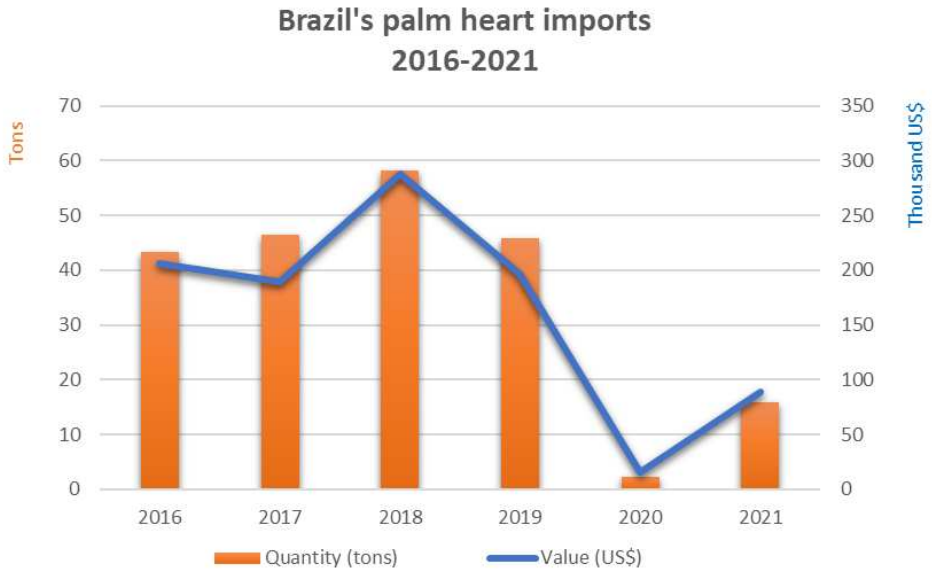

Figure 18. Brazil's annual imports quantity (tons) and value (US$ adjusted to 2022 prices) of palm heart. Own elaboration from Comtrade (2022).

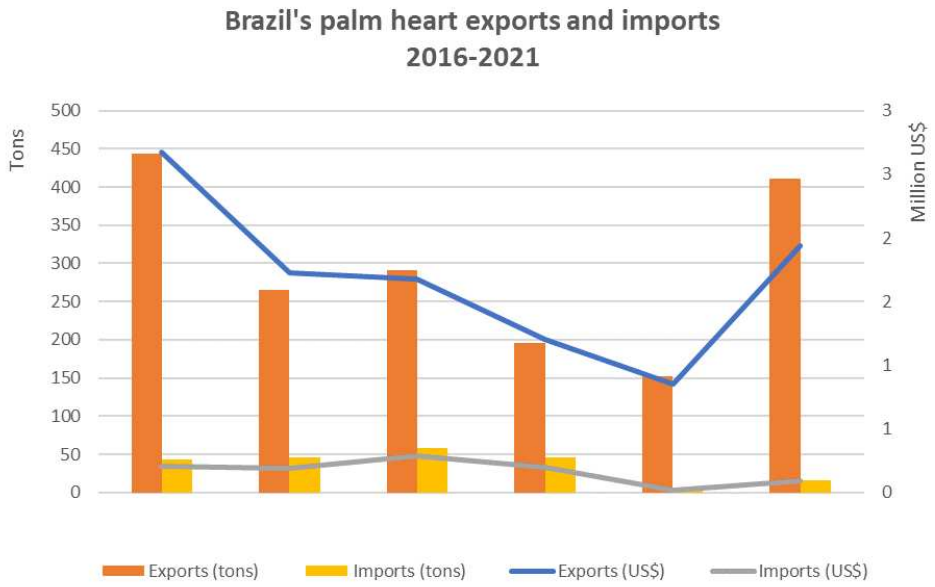

Figure 19. Brazil's annual exports and imports quantity (tons) and value (US$ adjusted to 2022 prices) of palm heart. Own elaboration, from Comtrade (2022) and ComexStat (2022).

4.4.3 Production and trade values for Brazil nut

Brazil is currently the main producer of Brazil nuts worldwide (Forest Trends, 2022a) and has historically dominated the market for this commodity, to the point of it being named after the country. Nevertheless, this dominant scenario has considerably changed, and this product has high importance in the Bolivian and Peruvian markets as well. According to Stoian (2004a) Brazil nuts have become the most important forest product in Bolivia since the collapse of the rubber industry, at the beginning of the 1990's, turning into one of the most relevant sources of employment and income in the North of the country. *Bertholletia excelsa* trees are less abundant in Peru, being mostly distributed in Madre de Dios district, but is one of the most important NWFP in the country, due to the high socio-economic value it presents to Amazonian communities selling this product (SERFOR, 2019).

In 2020, the production in Brazil amounted to 33,118 tons. Brazilian production has had an overall decay in the last six decades, with the highest production in FAOSTAT records being 104,487 tons in 1970 (**Figure 20**). This decay was the result of the reduction of the species' populations, due to felling for timber harvesting, to roads construction and new settlements, and forest fires, but also resulted from the competitive disadvantages in relation to Bolivia's production.

On the other hand, the value of Brazil nuts significantly increased over the last three decades in Brazil but has been decaying since 2011 (**Figure 21**).

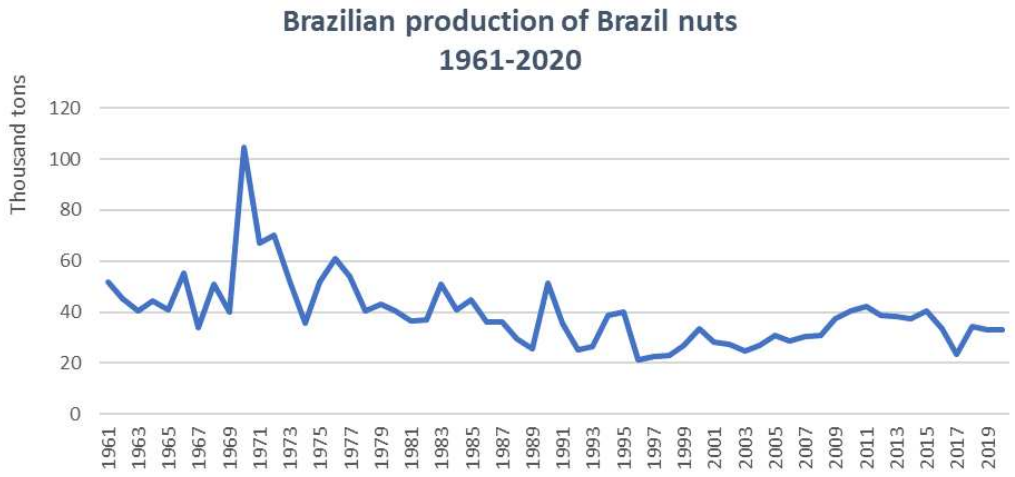

Figure 20. Historical series of the quantity (tons) of Brazil nuts produced in Brazil, between 1961 and 2020. Own elaboration from FAOSTAT (2022).

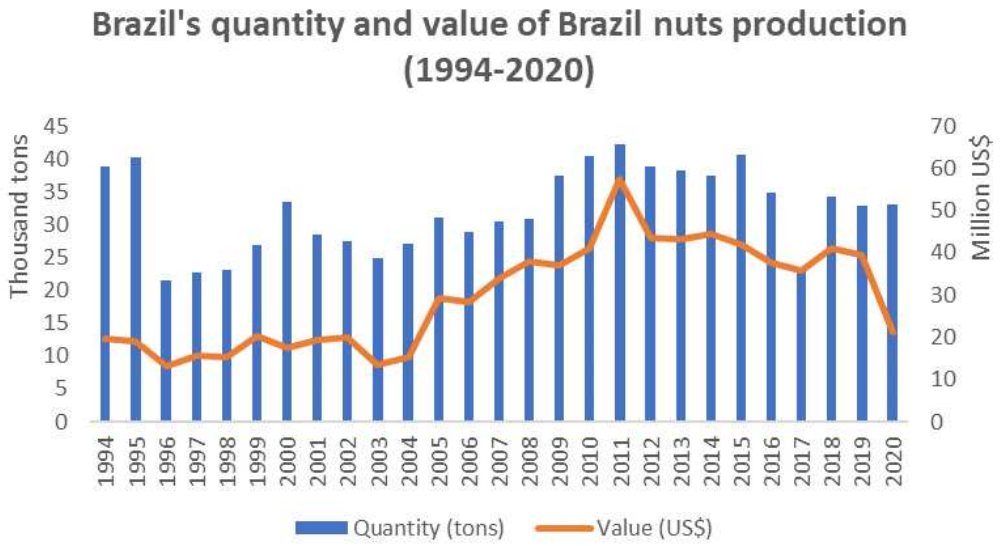

Figure 21. Historical series of the quantity (tons) and value (US$ in 2022 prices) of Brazil nuts produced in Brazil, from 1994 to 2020. Own elaboration from IBGE (2022)d.

According to data from IBGE (2016), in 2016 Brazil nuts represented 7% of the total value of extractivist NWFP produced in Brazil in that year, which was US$ 826 million (value adjusted to 2022 prices). Most of Brazil nuts production come from extractivist sources (**Figure 22**).

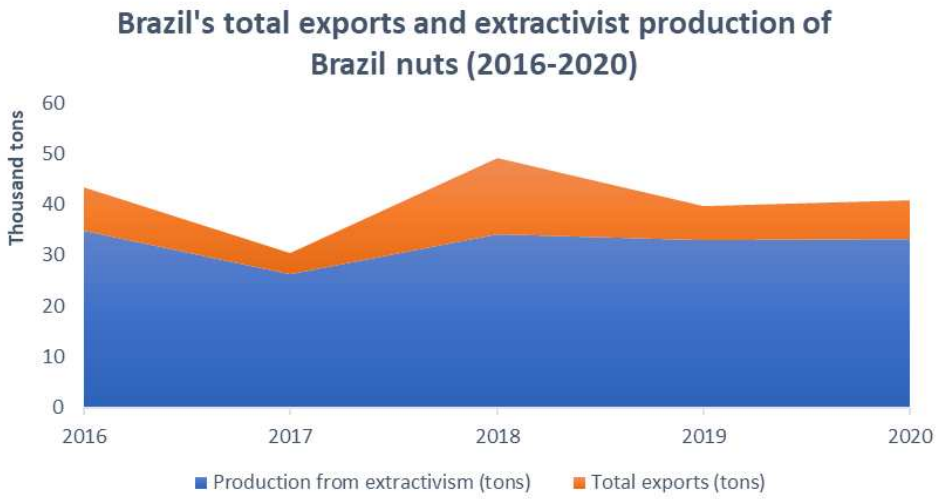

Figure 22. Brazil's exports quantity (tons) of Brazil nuts and its production quantity (tons) from extractivist sources. Own elaboration from IBGE (various years) and ComexStat (2022).

Despite the high demand for Brazil nuts, there are pessimistic predictions of production growth in Brazil. According to Cavalcante *et al*. (2011), the lack of investments in the sector results in a bad quality of production, which hinders its entry in international markets; discourages people to work in this value chain, as it is usually of low productivity and provides poor remuneration, while other alternatives, such as cattle raising, provides greater financial return. In 50 hectares plot the harvest of wild Brazilian nuts would yield around US$ 500 per year, while logging the area would yield around US$ 787/year (adjusted to 2022 prices) and farming would yield even higher values (Homma, 2014). Even though harvests could be done perpetually, as *B. excelsa* produces fruits for many years, harvests are seasonal (rainy months), which also hinders full reliance on it as an income source in the country.

Bolivia's production is continuously increasing along the years, as shown in **Figure 23**. The production in 2020 was almost 10 times higher than in 1961. According to Stoian (2004a), the Brazil nuts sector in Bolivia has historically been connected to the rubber economy. Due to the strong competition with rubber production in Brazil and Southeast Asia, the rubber extractivism in Bolivia collapsed in the early 90's. This scenario has brought benefits for the Brazil nuts economy, as its capital and workforce have been liberated to be used in the Brazil nuts sector. The author states that the Brazil nuts prevented the extractivist economy in Bolivia to be completely interrupted in the 90's, with the conversion of the rubber-based economy into a Brazil nuts one.

According to Stoian (2004a), the Brazil nuts sector would temporarily employ, in Bolivia, 12 to 13 thousand workers as collectors in the forests, plus 1,500 contractors, middlemen and transporters, apart from the workers in the processing facilities. Around two thirds of the rural households and one third of the urban ones were involved in the collection, processing, and trade of the nuts in the Amazonian forests of Bolivia (Stoian, 2004a). According to Vos (2017) estimates are that the Brazil nut contributes with up to 70% or regional income and between 45% and 70% or its labor potential, with its direct and indirect work

opportunities. In certain communities of the Bolivian Amazon, Brazil nuts are responsible for 75% to 90% of their income (Vos, 2017).

The Brazil nut processing industry considered to be the most modern in the world, Tahuamanu S.A, is in the city of Cobija (Homma, 2014). According to Tahuamanu's website, 4 thousand families of collectors are involved with the company.

Figure 23. Historical series of production quantities (tons) of in-shell Brazil nuts in Bolivia. Own elaboration from FAOSTAT (2022).

Despite the relevant role played by the Brazil nuts in the Bolivian economy, there is an increasing concern among Bolivian actors about the negative effects of climate change and forest degradation in the Brazil nuts production (Vos, 2017). The downgrade in the harvest of 2016 and 2017 alarmed the sector of a risk of collapse of the regional economy due to its dependence on the resource. In response, the regional government of Pando has announced an emergency plan to face the situation, with proposals of economic diversification including other Amazonian products such as açaí and cupuaçú/copoazú (Vos, 2017).

In Peru, production is much lower than Brazil and Peru, but has conspicuously risen in the last years of the XX century, as shown in **Figure 24.** Peru's production more than tripled in two years, between 1997 and 1999. Its production peak happened in 2008, accounting for 6,100 tons (FAOSTAT, 2022). Since then, production slightly decayed but remained stable for the past decade. **Figure 25** shows how, despite the decrease in production quantities after 2008, production value has increased in Peru.

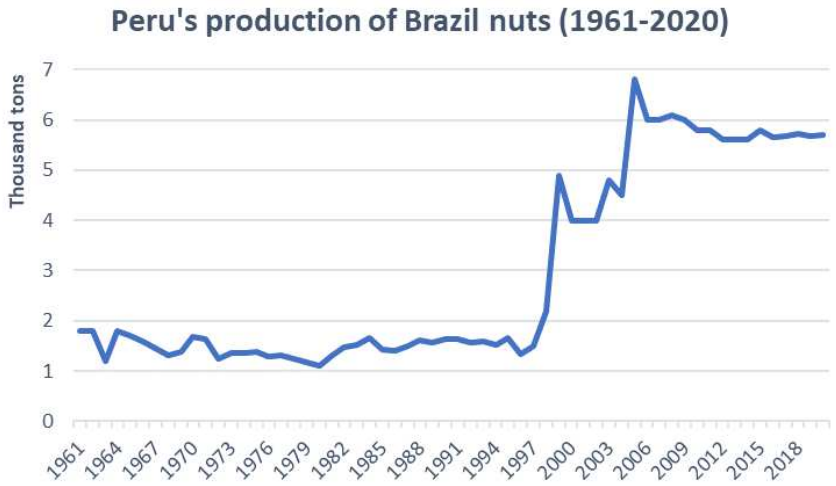

Figure 24. Evolution of the Brazil nut production (tons) in Peru, from 1961 to 2020. Own elaboration from FAOSTAT (2022).

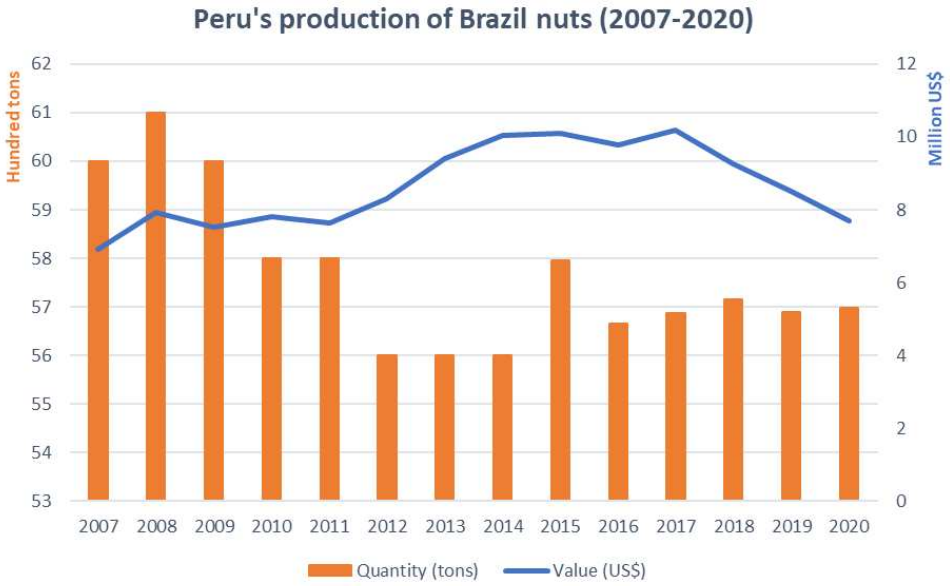

Figure 25. Production quantity (tons) and value (US$ in 2022 prices) of Brazil nuts in Peru, from 2007 to 2020. Own elaboration from FAOSTAT (2022).

Despite the current scenario of Brazil being the main producer worldwide, Bolivia has overtaken this position five times over the years, the first time in 1997 (FAOSTAT, 2022). **Figure 26** shows a comparison of Brazil, Bolivia, and Peru's production of Brazil nuts between 1961 and 2020. It is possible to see how Brazil has gradually diminished its production, while Bolivia and Peru have been increasing it over the years.

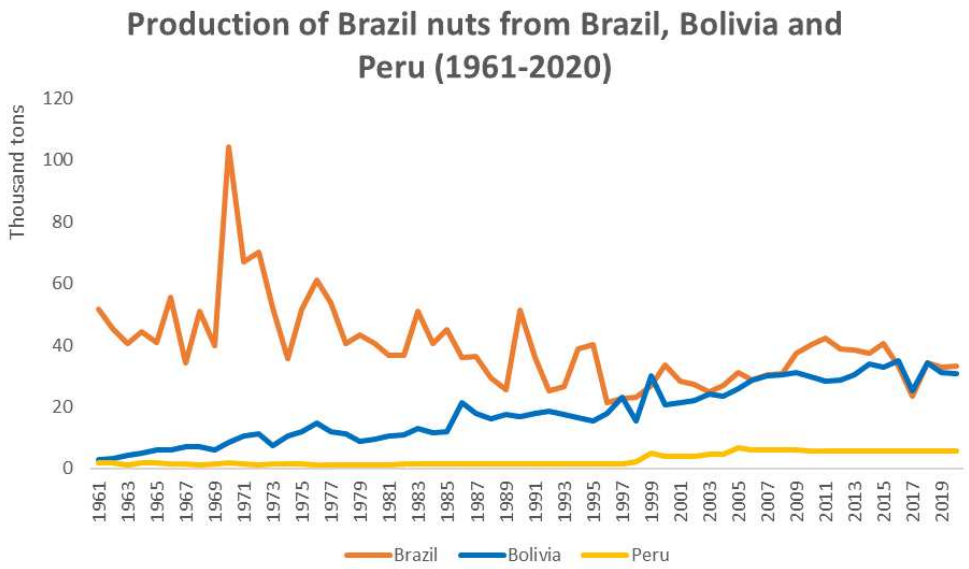

Figure 26. Historical production (tons) of Brazil nuts by Brazil, Bolivia and Peru, between 1961 and 2020. Own elaboration from FAOSTAT (2022).

Differently from Brazil, Bolivia's and Peru's productions are mostly destined to the international market, as their domestic market is not as substantial. According to Stoian (2004[a]), less than 2% of the Bolivian production was destined to the national market. **Figure 27** shows how exports have varied between 55% and 79% of the total produced plus imports in Bolivia, between 2016 and 2020, while in Peru, they ranged from 37% to 68% (**Figure 28**). Brazil, in its turn, had a minimum of 16% of produced plus imported destined to export, and a maximum of 44% **(Figure 29)** (Comtrade, 2022), due to the well-established local and national markets in the country. **Figure 30** shows a comparison of Brazil nuts exports of the three countries.

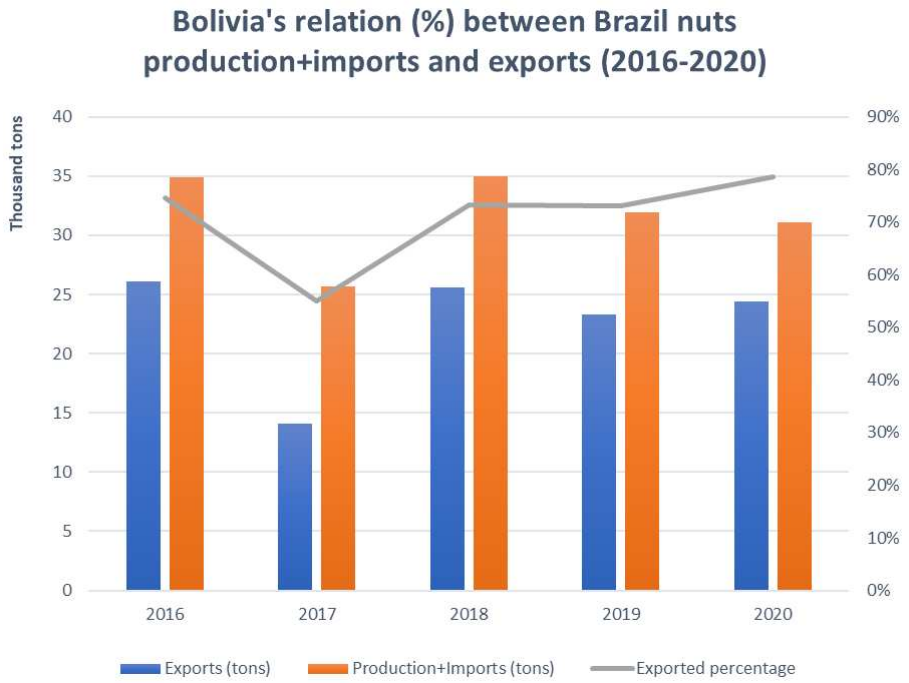

Figure 27. Relation, in percentage, of the annual produced plus imported (tons) Brazil nuts and exports (tons), from 2016 to 2020, in Bolivia. Own elaboration from FAOSTAT (2022) and Comtrade (2022).

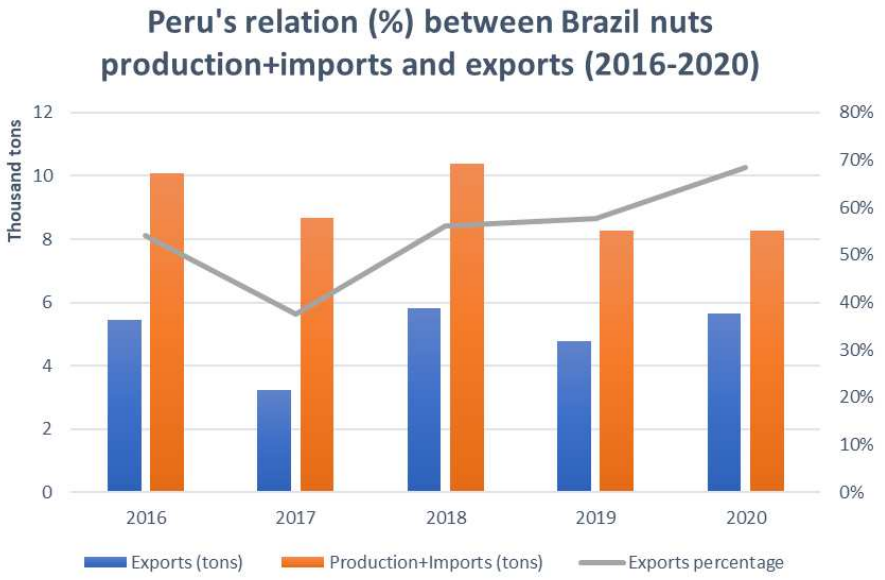

Figure 28. Relation, in percentage, of the annual produced plus imported (tons) Brazil nuts and exports (tons), from 2016 to 2020, in Peru. Own elaboration from FAOSTAT (2022) and Comtrade (2022).

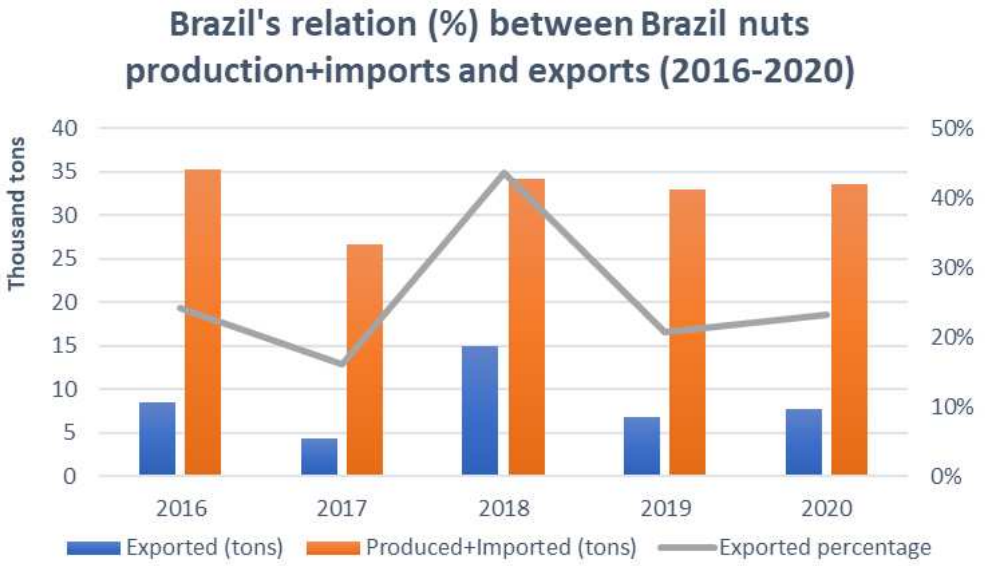

Figure 29. Relation, in percentage, of the annual produced plus imported (tons) Brazil nuts and exports (tons), from 2016 to 2020, in Brazil. Own elaboration from FAOSTAT (2022) and Comtrade (2022).

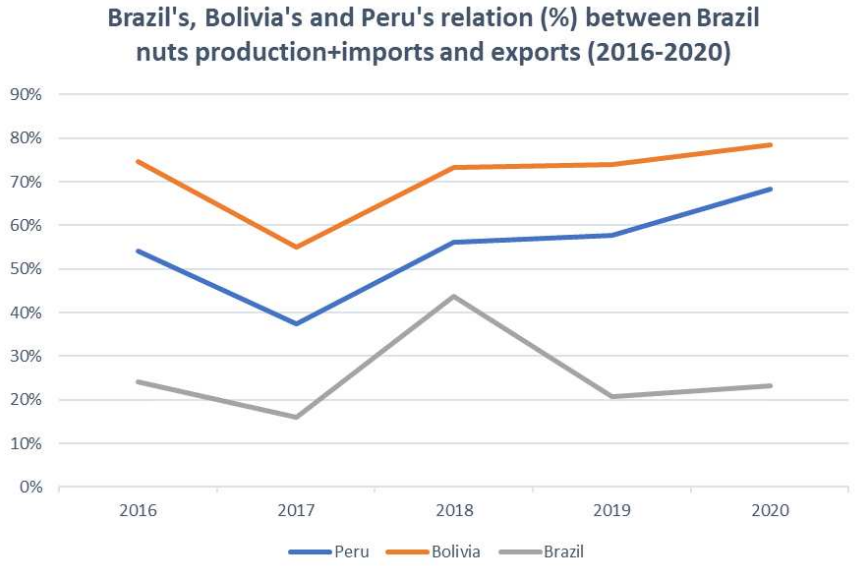

Figure 30. Percentage of production plus imports (tons) which is exported, in Brazil, Bolivia and Peru, annually (2016-2020). Own elaboration from FAOSTAT (2022) and COMTRADE (2022).

According to Comtrade data, available from 1997, 1999 was the first time Bolivia has taken the lead as the main Brazil nuts exporter, overtaking Brazil's position. After that, these countries exchanged between first and second position as main exporters, but since 2006 Bolivia has continuously taken the lead (**Figure 31**). Exports values from Bolivia are also considerably higher than from Brazil (**Figure 32**). Both quantity and value exports seem to follow the same pattern, as can be seen in **Figures 31** and **32**, with simultaneous increasing and decreasing rates in both countries.

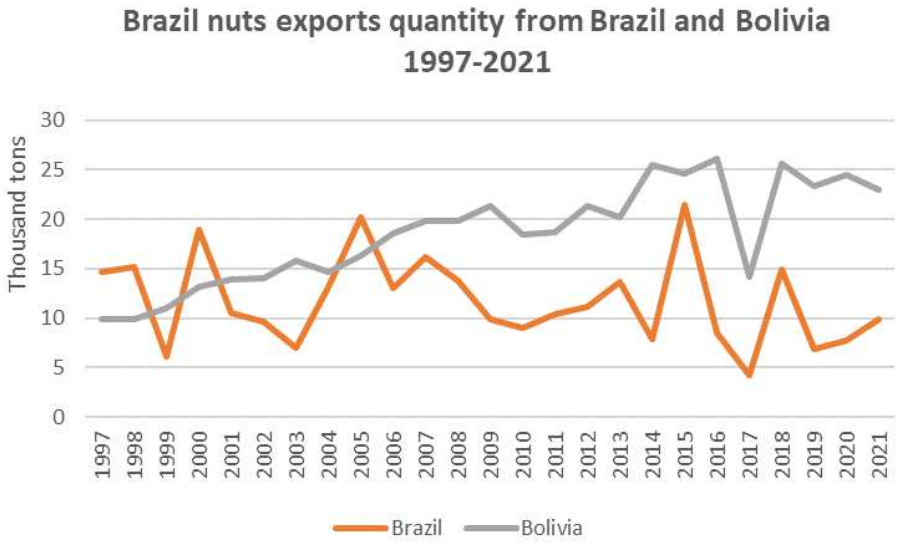

Figure 31. Exports of Brazil nuts (In-shell and shell) from Bolivia and Brazil, between 1997 and 2021. Own elaboration from Comtrade (2022).

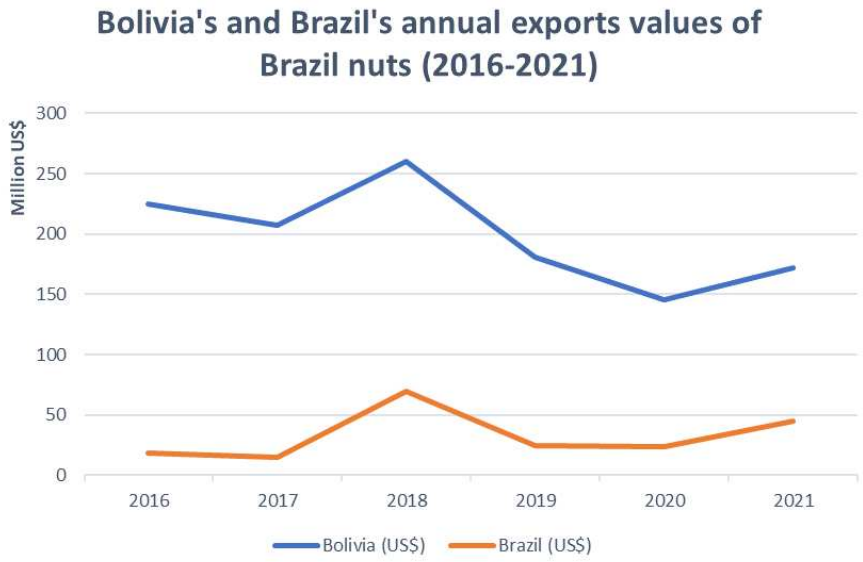

Figure 32. Brazil and Bolivia's annual exports values (US$ in 2022 prices) of Brazilian nuts, between 2016 and 2021. Own elaboration from Comtrade (2022).

In 2021, Bolivia was responsible for 62% of all shelled Brazil nut exports in the world (a total of 35,650 tons). In that year, the second main exporter of shelled nuts was Germany, accounting for 11% of the exports - 3,823 tons (US$ 35,780,155 in 2022 prices), followed by Brazil, which accounted for 8% of the world's exports.

Regarding in-shell Brazil nuts, the main exporter in 2021 was Nigeria, with 8,622 tons (US$ 15,430,450 in 2022 prices), followed by Brazil (6,896 tons, US$ 11,732,839 in 2022 values) and Bolivia (904 tons, US$ 2,041,382 in 2022 prices). While Nigeria accounted for around 49% of all in-shell Brazil nuts exported in 2021, Brazil was responsible for 39% and Bolivia for 5%.

The peak of Bolivia's exports quantity was reached in 2016 (**Figure 33**), when it exported 26,088 tons, amounting to a total of US$ 225 million (in 2022 prices) (Comtrade, 2022). In 2021, the exports amounted to 22,964 tons, corresponding to US$ 171.5 million (in 2022 prices), a decrease from the previous years.

Figure 33. Quantity (tons) and value (US$ in 2022 prices) of Bolivia's exports of Brazil nuts, shelled and in-shell, summed, between 1997 and 2021. Own elaboration, from Comtrade (2022).

Bolivia shows higher export rates than Brazil despite presenting disadvantageous conditions in respect to access to international market access, such as lack of access to the ocean (which is apart from the Bolivian forest by the Andes Mountain range), while Brazil has navigable rivers and a privileged geographic position to access the European market (Forest Trends, 2022a). The prominent position occupied by Bolivia results from the new regulations set by the European Union in 1998, determining a limit to the acceptable level of aflatoxins present in Brazil nuts (Forest Trends, 2022a). Aflatoxins are substances secreted by fungus present in the soil that contaminate the nuts if not adequately handled.

The fact that Bolivia is highly dependent on the international market for the commercialization of Brazil nuts caused a rapid response, with an organized strategy involving different actors of the value chain, from the central government to the private sector (Forest Trends, 2022a). With the support of the Bolivian Association of the Northeast Almonds (ABAN), which represented the Brazil nuts producers, they upgraded manufacturing practices and facilities, which was key for their success in the given conditions (Coslovsky, 2014). On the other hand, due to the much stronger internal market in Brazil, the effect there was based on individual and disconnected initiatives for adequacy. As several shipments were sent from Brazil to Europe with higher levels than

permitted, the European market shut down to Brazilian producers in 2003 (Coslovsky, 2014). Since then, Bolivian production is internationally recognized as of higher quality (Forest Trends, 2022a) and exports from Bolivia, which was similar to Brazil in 1997, took great distance from it, as can be perceived in **Figure 34**.

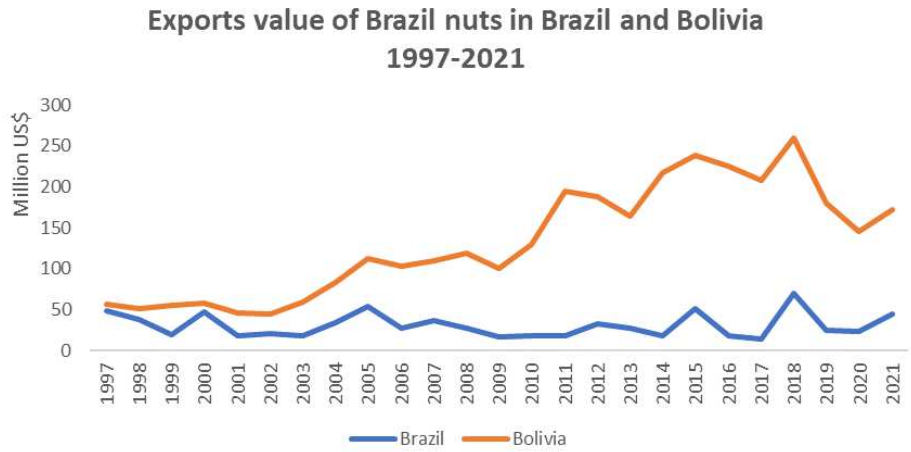

Figure 34. Exports value (US$ in 2022 prices) of Brazil nuts, shelled and in-shell summed, in Brazil and Bolivia between 1997 and 2021. Own elaboration, from Comextat (2022) and Comtrade (2022).

Since the late 90's, Brazil nuts has become the main forest product in Bolivia's exports, thanks to the production increase and to its high aggregated value (Stoian, 2004a), which is due to the largest share of exports being from shelled nuts (**Figure 35**). The average price, for in-shell exported Brazil nuts in Bolivia, between 2016 and 2021, was US$ 2,476 per ton, while shelled nuts price was US$ 8,567 per ton (in 2022 prices), about 3.5 times higher (IBCE/INE, 2022).

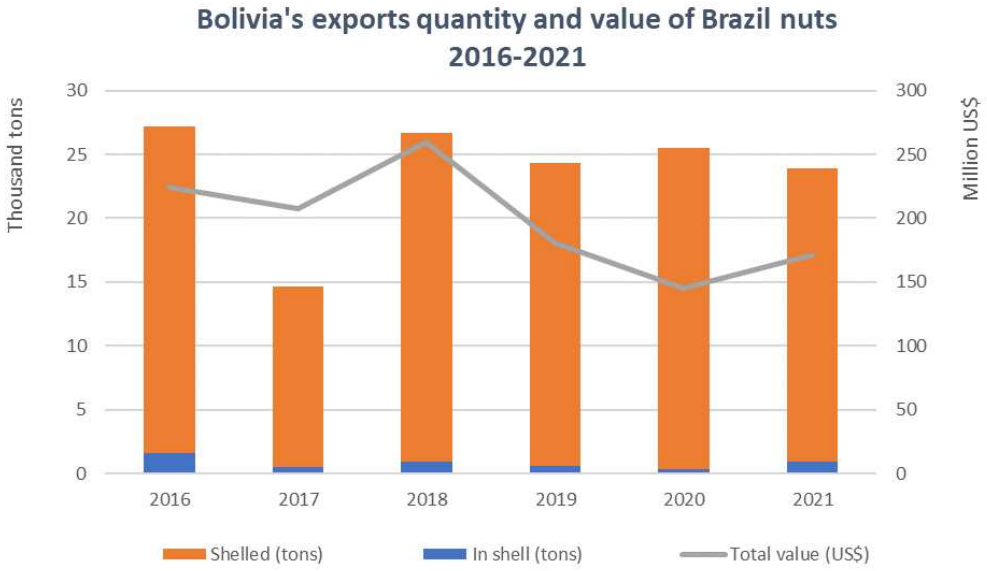

Figure 35. Bolivia's exports quantity (tons) and value (US$ in 2022 prices) of in-shell and shelled Brazil nuts, between 2016 and 2021. Own elaboration from IBCE/INE (2022).

Bolivia's exports of shelled Brazil nuts are mostly to the UK (23.9%), the Netherlands, (24.2%), Germany (14.2%) and the USA (14%), as represented in **Figure 36**. In-shell nuts, on the other hand, are mainly exported to Peru and the Netherlands, which were, together, the destinations of almost 93% of the in-shell nuts from Bolivia between 2016 and 2021 - Peru accounting for 69% and Netherlands 24%, as shown in **Figure 37** (Comtrade, 2022).

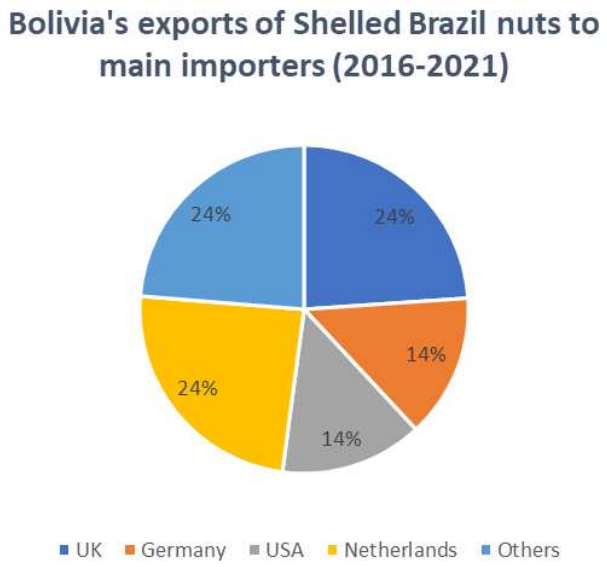

Figure 36. Share of exports (%) of Bolivia's shelled Brazil nuts to its main importers, between 2016 and 2021. Own elaboration from Comtrade (2022).

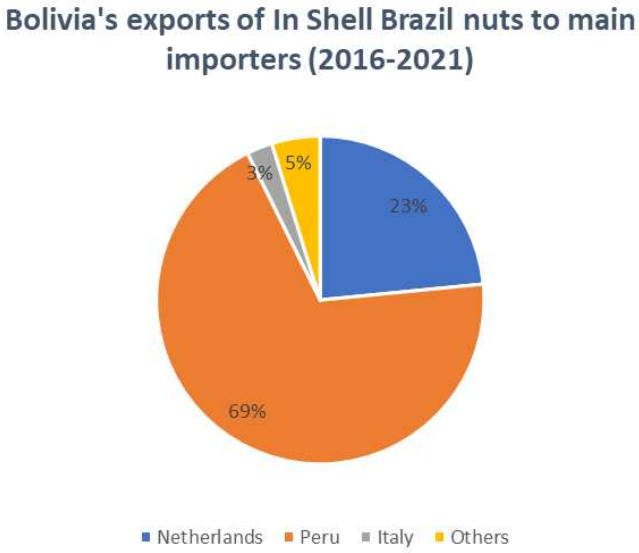

Figure 37. Share of exports (%) of Bolivia's in-shell Brazil nuts to its main importers, between 2016 and 2021. Own elaboration from Comtrade (2022).

Despite being the main importer of in-shell Brazil nuts from Bolivia, the vast majority of Peru's imports come from Brazil. The country imports mainly in-shell nuts - between 2018 and 2020, Peru imported a total of 9,547 tons of in-shell

(corresponding to US$ 16 million) and only 261 tons (US$ 1.6 million) of shelled nuts (in 2022 prices) (Comtrade, 2022). The total imported between 2007 and 2020 can be seen in **Figure 38** and data on imported shelled nuts from 2007 to 2020 is presented on **Table 3**.

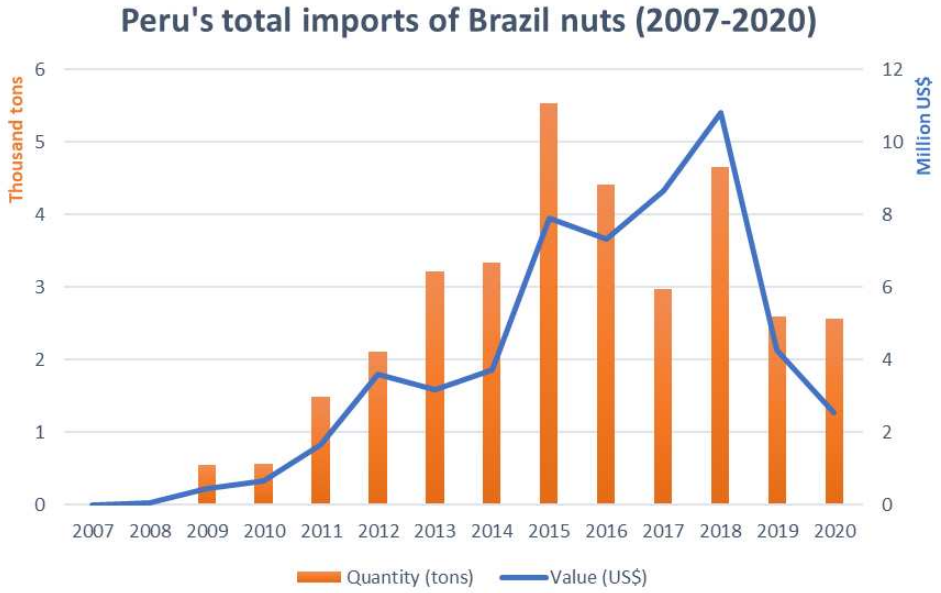

Figure 38. Peru's total imports (both shelled and in-shell) of Brazil nuts, in tons and US$ (in 2022 prices), between 2007 and 2020. Own elaboration from Comtrade (2022).

Table 3: Imports of shelled Brazil nuts in Peru (2007-2020), in tons and US$ (in 2022 prices). Own elaboration. Source: Comtrade (2022).

Year	Quantity (tons)	Value (US$)	Year	Quantity (tons)	Value (US$)
2007	0	0	**2014**	8	6,179
2008	25	40,037	**2015**	5	21,773
2009	15	36,446	**2016**	68	588,587
2010	16	25,761	**2017**	116	2,417,275
2011	3	3.719	**2018**	101	801,589
2012	176	1,618,877	**2019**	36	256,006
2013	0	0	**2020**	124	589,955

Between 2018 and 2020, 91% of Peru's imports of in-shell Brazil nuts came from Brazil, the remaining 9% came from Bolivia (**Figure 39**). As for shelled Brazil nuts, 77% of the quantity imported in the same period was from Brazil, the remaining 23% coming from Bolivia (**Figure 40**).

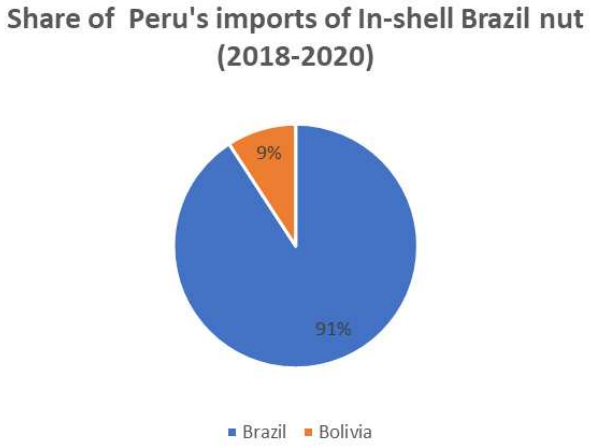

Figure 39. Peru's sources of In-shell Brazil nuts imports, in quantity (tons), between 2018 and 2020. Own elaboration from Comtrade (2022).

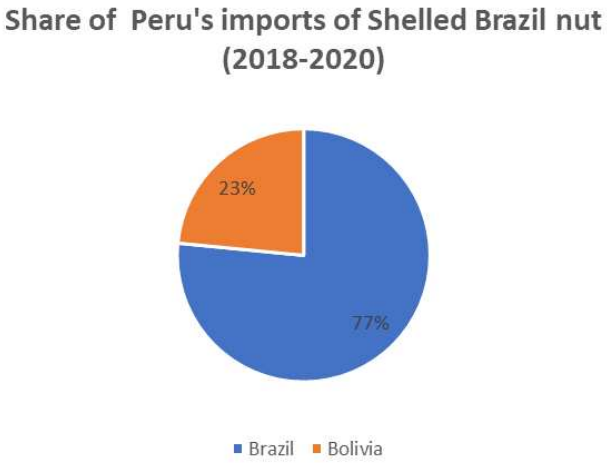

Figure 40. Peru's sources of Shelled Brazil nuts imports, in quantity (tons), between 2018 and 2020. Own elaboration from Comtrade (2022).

Peru's exports have considerably risen in the past decade - from 2010 to 2018 values became almost 4 times higher - reaching a maximum in 2018 with a value of US$ 76.2 million, after which it decreased to 33.9 million in 2020 (**Figure 41**) (Comtrade, 2022). Exports correspond mostly to shelled nuts, with in-shell exports being almost insignificant when compared to shelled exports, but it has been considerably rising (**Table 4**).

Figure 41. Peru's total exports (both shelled and in-shell) of Brazil nuts, in tons and US$ (in 2022 prices), between 2007 and 2020. Own elaboration from Comtrade (2022).

Table 4: Exports of In-shell Brazil nuts from Peru (2007-2020). Own elaboration. Source: Comtrade (2022).

Year	Quantity (tons)	Value (US$)	Year	Quantity (tons)	Value (US$)
2007	2	9,590	**2014**	1	9,473
2008	3	26,410	**2015**	33	350,977
2009	15	31,761	**2016**	0	0
2010	0	0	**2017**	0	0
2011	0	0	**2018**	12	229,048
2012	0	852	**2019**	20	158,845
2013	0	0	**2020**	74	518,193

The main importers of Peru's shelled Brazil nuts are Korea and the USA, which together account for almost 80% of total exports in terms of value (**Figure 42**) and 72% in terms of quantity (**Figure 43**). As for in-shell imports, most of exports go to the Republic of Korea **(Figure 44)**. From 2018 to 2020, 106 tons of in-shell nuts were exported from Peru, from which 80% were sent to Korea (Comtrade, 2022).

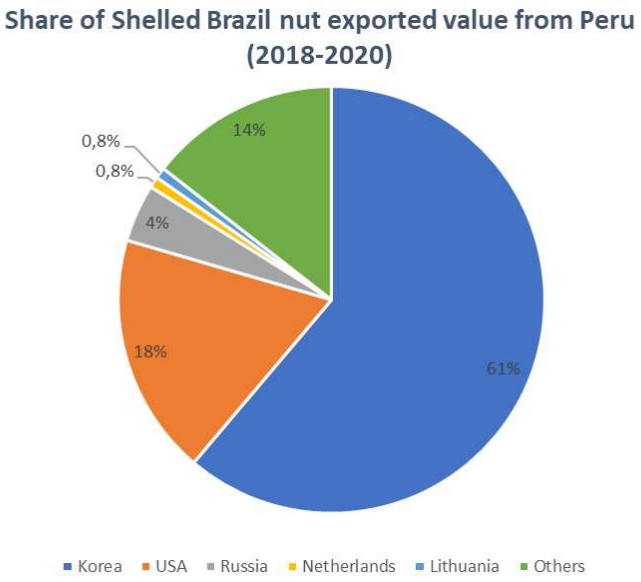

Figure 42. Share (%) of Shelled Brazil nut exports value (US$) to the main importer countries, between 2018 and 2020. Own elaboration from Comtrade (2022).

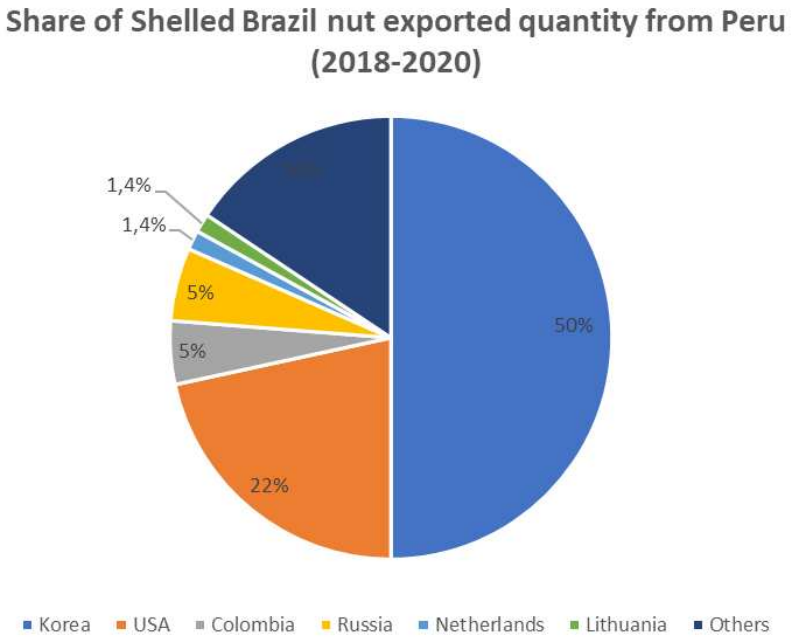

Figure 43. Share (%) of Shelled Brazil nuts exports quantity (tons) to the main importer countries, between 2018 and 2020. Own elaboration from Comtrade (2022).

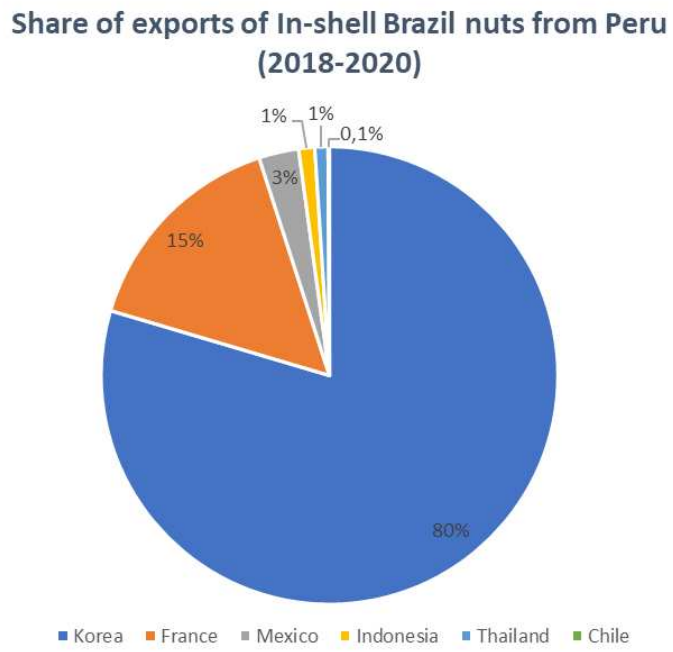

Figure 44. Share (%) of In-shell Brazil nut exports quantity (tons) to each importer country, between 2018 and 2020. Own elaboration from Comtrade (2022).

As for Brazil, in 2021 Brazil nuts exports amounted to a total of 9,890 tons, corresponding to US$ 44,996,307 (Comexstat, 2022) (**Figure 45**)**.** Despite the fact that shelled nuts have a higher value, Brazil exports mostly in-shell nuts. Between 2016 and 2021, around 75% of Brazil's exports of Brazil nuts were in-shell, but this corresponded to only 37% of the value obtained by the total exports of Brazil nuts (ComexStat, 2022). The higher value of shelled nuts results that, although in-shell exports were continuously bigger than shelled, the value obtained from these frequently exceeds the value from in-shell exports (**Figures 46** and **47**). In 2021, Brazil reported a total value of US$ 11.7 million (in 2022 prices) for the 6.9 thousand tons of in-shell nuts exports, averaging US$ 1.7 thousand per ton. In the same year, 3 thousand tons of shelled nuts were exported for a total value of US$ 33.3 million, an average of US$ 11.1 thousand per ton (ComexStat, 2022). This shows how this basic level of processing can already increase the value of the product by about 6.5 times.

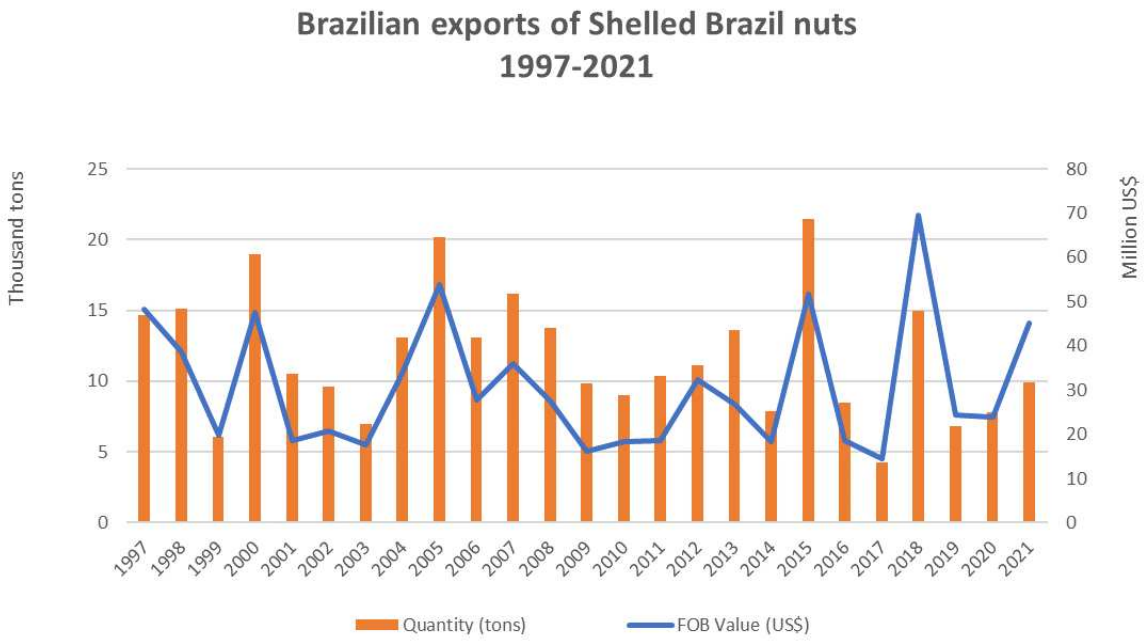

Figure 45. Value (US$ in 2022 prices) and quantity (tons) Brazil nuts exports from Brazil, shelled and in-shell summed, between 1997 and 2021. Own elaboration from ComexStat (2022).

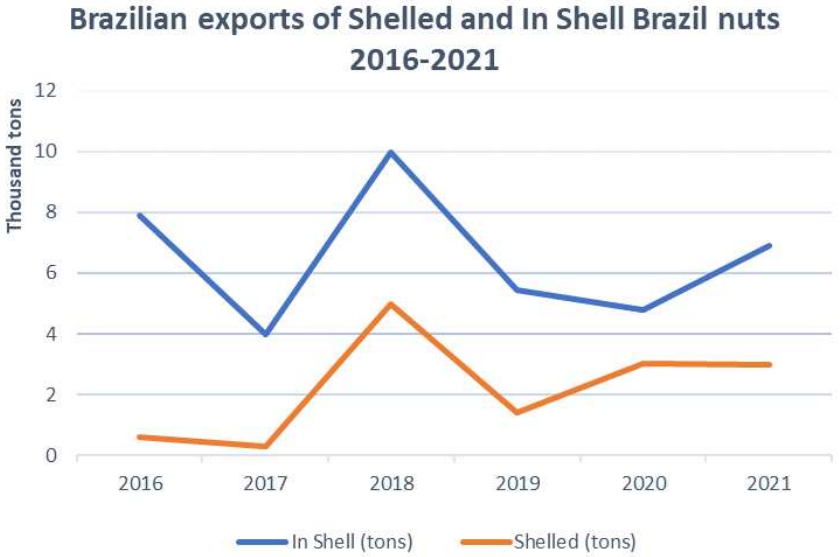

Figure 46. Brazilian annual exports, in tons, of In shell and Shelled Brazil nuts between 2016 and 2021. Own elaboration from ComexStat (2022).

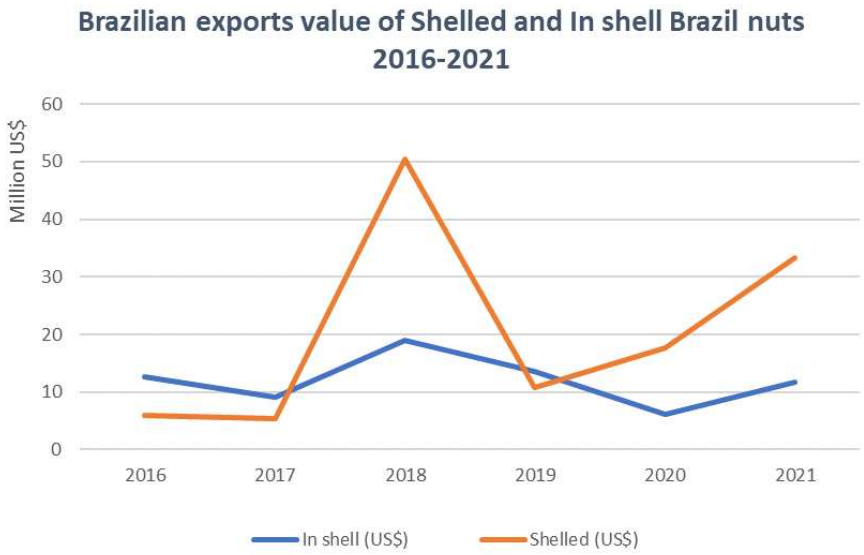

Figure 47. Brazilian annual exports, in US$ (in 2022 prices), of In shell and Shelled Brazil nuts between 2016 and 2021. Own elaboration from ComexStat (2022).

Brazil exports Brazil nuts to 49 countries (Comtrade, 2022), the main importers being Peru for in-shell Brazil nuts, and USA for the shelled ones. Between 2016 and 2021, Peru imported 50% of Brazil's in-shell nuts, amounting to 19,541 tons, while Bolivia, the second main importer of in-shell nuts, imported 32% in this period (**Figure 48**). In the same period, the USA imported 34% of the shelled production - a total of 4,521 tons (**Figure 49**). Only in 2021, 68% of the total exports of in-shell nuts were sent to Peru, while 50% of the shelled ones went to the USA (Comtrade, 2022). According to Chaves (2007), the USA processes the shelled nuts and re-sell it to Europe for a higher price and higher guarantee of quality.

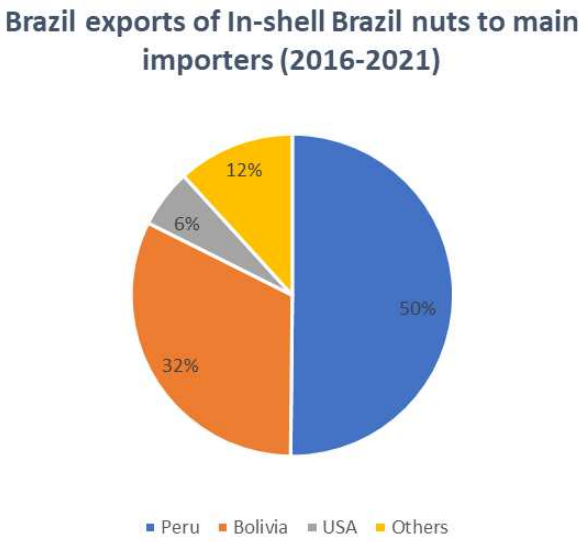

Figure 48. Share (%) of imports of In-shell Brazil nuts by main importers from Brazil, between 2016 and 2021. Own elaboration from Comtrade (2022).

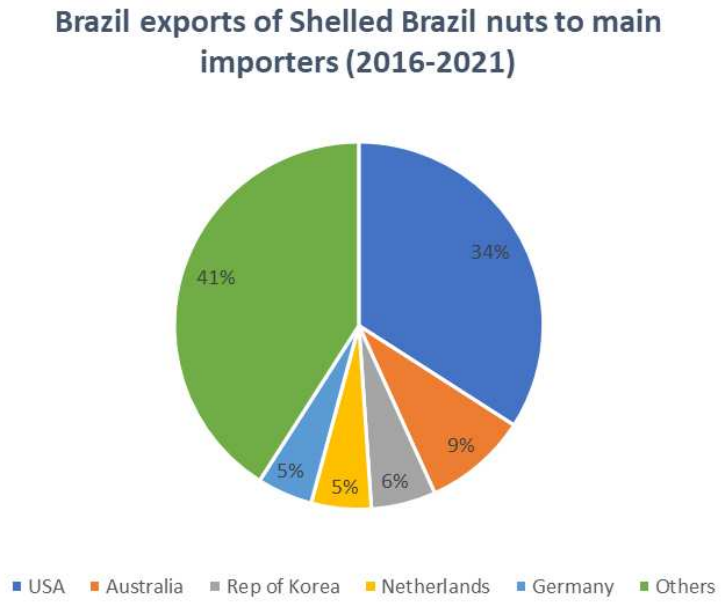

Figure 49. Share (%) of imports of Shelled Brazil nuts by main importers from Brazil, between 2016 and 2021. Own elaboration from Comtrade (2022).

In-shell nuts exported to Bolivia and Peru are de-shelled in those countries and subsequently exported to other countries, including Brazil, under higher prices. Between 2016 and 2021, Brazil reported a total of US$ 11.6 million obtained from exporting in-shell Brazil nuts to Bolivia (12,545 tons), which corresponds to an average of US$ 926 per ton (in 2022 prices) (Comtrade, 2022). According to Bolivia's reporting, the average would be US$ 480 per ton (US$ 1.1 million for 2.273 tons) (in 2022 prices) (Comtrade, 2022). On the other hand, shelled nuts valued an average of US$ 5,698 per ton, with a much smaller variation between the reported by both countries (Comtrade, 2022).

In fact, Bolivia's imports are almost fully constituted of in-shell nuts coming from Brazil. From 2016 to 2021, the only registers of Bolivia's imports of shelled Brazil nuts were in 2019, a total of 370 kg from the USA, amounting to US$ 2,886, and 12 kg from Brazil, amounting to US$ 182 (in 2022 prices), and there are no records of in-shell nuts from any other country (Comtrade, 2022). The whole decade has had the same tendency, of a big majority of in-shell nuts from Brazil with sporadically small amounts of shelled imports from other countries. **Figure 50** shows the discrepancy between Bolivia's exports and imports, while **Figure 51** shows this discrepancy for Brazil.

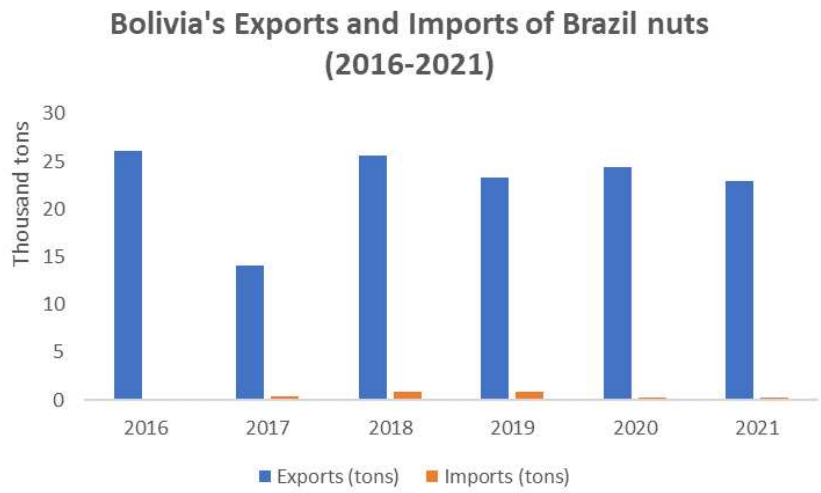

Figure 50. Bolivia's annual exports and imports (tons) of Brazil nuts (shelled and in-shell), between 2016 and 2021. Own elaboration from Comtrade (2022).

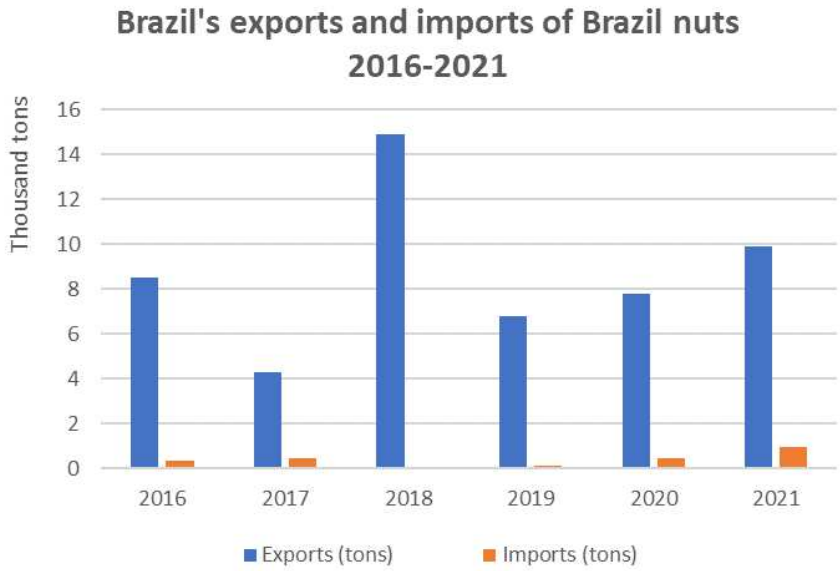

Figure 51. Brazil's annual export and import quantities (tons) of Brazil nuts. Own elaboration from ComexStat (2022) and Comtrade (2022).

A factor that hinders the growth of the Brazil nut markets and influences its price in all three countries is the strong competition with other nuts, such as macadamia and walnuts, which are easy substitutes in case of price or demand rise (Stoian, 2004a). An alternative for increasing the importance of this market would be to increase the aggregate value, producing secondary products such as Brazil nut's oil, milk, flour, granola, shampoo, and others (Stoian, 2004a).

4.5 National policies

To better understand the background supporting or constricting the development of the NWFP value chains, it is useful to have a clear picture of the policy framework in each country.

4.5.1 Brazilian policies

Table 5 reports the main Brazilian policies and regulations relevant to NWFP in general.

Table 5: Brazil's Policies and regulations relevant to NWFP in general. Own elaboration.

Legal act	Policy Name	Brief description	Reference
Law Nº 10.696/2003	Food Acquisition Program (PAA)	Aims to support smallholders by purchasing their products, forming public stocks, sustaining market prices and stimulating processing and associationism, while providing food for people under nutritional insecurity conditions.	Brasil (2003)
Decree-Law Nº 79/1966 Regulated by Law Nº 11.775/ 2008	Minimum Price Guarantee Policy for Sociobiodiversity Products (*Política de Garantia de Preços Mínimos para Produtos da Sociobiodiversidade - PGPM-Bio*)	Aims to contribute to environmental conservation and support extractivists' livelihood by establishing minimum prices they should receive for a set of sociobiodiversity products.	Brasil (1966) Brasil (2008)
Law Nº 11.947/2009	National School Feeding Program (PNAE)	Determines that food served in public schools shall be diversified and "respect culture, traditions and healthy eating habits". The Program establishes that at least 30% of the food provided shall be sourced from smallholders, with priority to indigenous and traditional communities.	Brasil (2009b)
Interministerial Ordinance Nº 239/2009	National Plan for Promotion of Sociobiodiversity Products Value Chains (PNPSB)	An umbrella policy addressing different topics related to NWFP value chains. Its main objectives are to develop integrated actions for the promotion and strengthening of sociobiodiversity value chains, while consolidating sustainable markets.	Brasil (2009a)

Family Farming Food Acquisition Program (*Programa de Aquisição de Alimentos da Agricultura Familiar - PAA*)

The Family Farming Food Acquisition Program was created by Law Nº 10.696 of 2003. Since then, the Program has been modified and regulated by several Decrees. Nevertheless, the core of the Program has remained. According to Brasil (2012), the Program's main objectives are to enhance access to food and promote family farming. For that, the Program buys food from smallholders, without the need of bidding, and allocates it to people in situations of food and nutrition insecurity, as well as those attended by the social-assistance services. Moreover, the Program contributes to forming public stocks of food produced by family farming and strengthens short circuits and commercialization networks. In addition, the Program stimulates healthy diets and promotes associationism between producers.

There are two categories of beneficiaries from this Program, the suppliers (Agrarian Reform settlers, foresters, extractivists, artisanal fishermen, indigenous, *quilombolas* and other traditional populations) and the consumers (individuals in situations of nutritional insecurity and/or attended by social-assistance services.

Suppliers may participate both individually or as part of an organization, such as a cooperative. In both cases, they must be registered and have a Suitability Certificate issued by the Pronaf (*Programa Nacional de Fortalecimento da Agricultura Familiar*). As for consumers, to be attended by the Program they shall contact the social-assistance services from their Municipality, which shall arrange with the Program's Implementing Units to be included in it and receive the food purchased.

Açaí, Brazil nuts (both shelled and in-shell) and palm heart (*B. gasipaes*) are present in the list of products included in the Program, along with other NWFP such as cupuaçú, buriti and tucumã. Each of the products included have a reference price that can be consulted (Conab, 2019b). According to Conab (2021a), in 2020 the PAA acquired a total of 141 tons of açaí, corresponding to R$ 543 thousand (US$ 116,8 thousand in 2022 prices), in the States of Pará, Amazonas and Maranhão.

The Program has five different modes: Simultaneous Donation, Direct Purchase, Stocks Formation, PAA Milk and Institutional Purchase. They differ on the objectives, methods of action, Institutions involved and financial limitations for provisions.

The modality of purchase with Simultaneous Donation aims to attend to the local demands of dietary supplementation, and includes different types of food, with a specification for those characteristic of local food diets.

The Direct Purchase aims for the price sustenance of some specific items, the formation of public stocks of these products and meeting the demand of public programs directed to food accessibility. When the market price drops under a reference price, established by the Program's Management Unit, the National Company of Supplies, Conab (*Companhia Nacional de Abastecimento*), establishes a local Purchase Center to where the supplier beneficiaries shall take their products to be sold. The food acquired is mostly used for composing

food parcels (basic-needs grocery packages) to be distributed among specific social groups.

The price sustenance is also an objective of the Stocks Formation model, as well as adding value to the family farming production. However, in this case, stocks are made by the producer's organizations. When the possibility of forming a stock is identified, the organization shall send a proposal to Conab, containing the specifications of the product, quantities, proposed price, timing for the stock formation and list of producer beneficiaries. If approved, Conab shall provide financial resources for the organization to buy the products from the beneficiaries, process and stock them. After commercializing the processed products in the conventional market, the organization must return the resources (in the forms of products or financially, depending which Institution was responsible for providing the resources) after a specified deadline and increasing a per-year charge of 3%.

The PAA Milk aims to stimulate the consumption of milk by households in nutritional insecurity situations, as well as the milk production from family farmers. The Institutional Purchase, on the other hand, aims for the States and Municipalities to be able to purchase products from family farming, with their own resources and without the need for bidding, to attend to the regular food demands from public hospitals, university restaurants, prisons, military quarters, among others.

Both PAA and the National School Feeding Program (PNAE) are supported by the list of "*food-valuable sociobiodiversity species*", which was published by the Inter-Ministerial Ordinance Nº 284, on May 30th, 2018. In addition to the common and scientific names of the main food species from the sociobiodiversity in the country, the list also states the most frequently used parts of the plants and gives examples of uses.

Among the 84 species in the list, are *E. oleracea* and *E. precatoria,* under the common name of açaí, for which the uses described are both the pulp for production of ice-creams, jams, puddings, etc., and its palm heart; *B. excelsa*, for which the uses mentioned are the nuts *in natura*, toasted or used the preparation of cakes, ice creams and plant-based milk; *E. edulis,* for which the description of parts used contains the palm heart (with the specification of "*only sourced from plantations")* and the pulp for making deserts, jams, liquors, sauces, ice-creams, and others, and *B. gasipaes*, for which the usable parts mentioned are the palm heart and fruits' pulp for producing flour, which can be used in the formulation of breads, pasta and other products.

The list also contains species that were mentioned in the analyzed Bolivian and Peruvian policies, such as *Theobroma cacao* – common name "*cacau"* in all three countries; *Theobroma grandiflorum* – named "*cupuaçú*" in Brazil and "*copoazú"* in Bolivia and Peru; *Oenocarpus bataua* – known as "*pataua*" in Brazil, "*majo*" in Bolivia and "*ungurahui*" in Peru and *Myrciaria dubia* – named "*camu-camu*" in all three countries. Other species present in the list were found in the literature describing the NWFP from these countries, such as *Mauritia flexuosa* – known as "*buriti*" in Brazil, "*kikyura"* in Bolivia and "*aguaje"* in Peru; *Dypterix alata* – "barú" in Brazil, "*almendra chiquitana*" in Bolivia and Peru;

Hymenae courbaril/H. stigonocarpa) – named "*jatobá*" in Brazil, "*paquió*" in Bolivia and Peru.

Minimum Price Guarantee Policy for Sociobiodiversity Products (*Política de Garantia de Preços Mínimos para Produtos da Sociobiodiversidade - PGPM-Bio*)

The PGPM was first put in place by the Decree-Law Nº 79/1966. As described in Conab (2017), the Minimum Price Guarantee Policy (PGPM) "*is an important tool to reduce oscillations in the rural producers' income and ensure a minimum remuneration".* It also regulates the food supply, balancing supply and demand by encouraging or discouraging production.

The Law Nº 11.775, of September 2008 regulated the PGPM, creating the Minimum Price Guarantee Policy for Sociobiodiversity Products (*Política de Garantia de Preços Mínimos* para Produtos da Sociobiodiversidade - *PGPM-Bio*), specifically for the extractivist value chains – while the PGPM referred to rural products in general. PGPM-Bio aims to contribute to environmental conservation and support extractivists' livelihood by guaranteeing an adequate income to the communities (Conab, 2021b).

The minimum prices are proposed by the National Supply Company (Compania Nacional de Abastecimento - Conab), based on market analysis, national and international supply and demand evaluation, production costs, among other factors. The proposal is the technical foundation from which the Ministry of Agriculture, Livestock and Supply (*Ministério da Agricultura, Pecuária e Abastecimento* - MAPA), the Ministry of Economy (*Ministério da Economia - ME*) and the National Monetary Council (*Conselho Monetário Nacional - CMN*) will discuss and define the minimum prices. The price list is updated yearly and can be accessed in the Conab's website (Conab, 2022).

In practice, whenever the extractivist producer is paid less than the established prices defined by Conab, this same government body shall pay the producer the difference between these prices, upon the presentation of an invoice showing the price received. This policy instrument is called Direct Subsidy to the Extractivist Producer (*Subvenção Direta ao Produtor Extrativista - SDPE*) (Conab, 2021b).

The beneficiaries of the Program are extractivist producers and family farmers, indigenous and other traditional populations, individually or organized in associations or cooperatives, and registered in the National Program to Strengthen Family Agriculture (*Programa Nacional de Fortalecimento da Agricultura Familiar - Pronaf*), a government agency with policies focused on family farming.

The PGPM-Bio includes 17 extractivist products, from different biomes. Among them are açaí, in-shell Brazil nuts and juçara fruits (*E. edulis*). According to Conab (2021b), from 2009 to 2020, the Program has subsidized more than R$ 95 million (Brazilian Reais) to thousands of extractivists throughout the country.

The Inter-Ministerial Ordinance Nº 2, of April 2019, defines the limits for the subsidies for each product, in each Region, per year. In-shell Brazil nuts' value chains are limited to receiving R$ 1,000 (US$ 292 in 2022 prices) per year. The açaí (from *E. oleracea*) value chain is limited to receiving R$ 1,500 (US$ 437 in 2022 prices) per year. The value chain of juçara (*E. edulis*) fruits, on the other hand, have a much higher limit: R$ 4,000 (US$ 1,166 in 2022 prices). This indicates the government's will to invest substantially in the value chains of juçara fruits, while the other two, for being better consolidated in the market, would require less financial support from the government.

Conab (2021) shows the increase in the subsidies from PGPM-Bio from 2016 to 2019, which went from 2.4% to 9.6% of total production which was subsidized. The State of Amapá responded for most of the subsidies provided (2.3% in 2016 and 9.2% in 2019). No information is provided for the other value chains.

National School Feeding Program (*Programa Nacional de Alimentação Escolar - PNAE*)

The National School Feeding Program (PNAE) was established by the Law Nº 11.947/2009 and "*aims to contribute to the biopsychosocial growth and development, learning, school performance and the formation of healthy eating habits of students, through food and nutrition education actions and the provision of meals that cover their nutritional needs during the school term*".

It determines that the food served in public schools shall be "*healthy and adequate, including the use of varied and safe food that respect culture, traditions, and healthy eating habits*", as well as support sustainable development, by stimulating the acquisition of diversified products, sourced locally and preferably from smallholders and traditional communities.

The funding for the PNAE comes from the Education Development National Fund (*Fundo Nacional de Desenvolvimento da Educação - FNDE*), and at least 30% of the resources destined from FNDE to the PNAE shall be utilized for the acquisition of food items directly from family farmers, entrepreneurs and their organizations, giving priority to Agrarian Reform settlers, indigenous and quilombola communities. This can be done without the need for bidding procedures, as long as the prices of the products are in accordance with the local market. The determined percentage, however, can be exempted in case of impossibility of producers to emit invoices, impossibility of regular and constant provision of the food items or when hygienic-sanitary conditions are not adequate.

According to ISPN (2020), it would be necessary to adapt the hygiene procedures required by this regulation to allow for the inclusion of indigenous and other traditional communities products. It is proposed to consider schools' consumption within the same territory where the food was produced as household or self-consumption, for this way some of the requirements in the preparation, stocking and processing of the food, are exempted by determination of the Ministry of Agriculture (MAPA). This would be the case, for

example, in schools within an indigenous or *quilombola* territory, as the students consist of the sons and daughters of the producers of the land. Moreover, technical assistance should be provided to these traditional communities on how to obtain the documentation required to access the Program, as well as on producing assessments of the local production that could be adequate for public purchases.

National Plan for the Promotion of Sociobiodiversity Product Chains (*Plano Nacional de Promoção das Cadeias de Produtos da Sociobiodiversidade*)

The National Plan for the Promotion of Sociobiodiversity Product Chains was created by the Inter-Ministerial Ordinance No. 239 of 2009 and is an umbrella policy that touches upon most of the essential aspects related to the development of sociobiodiversity productive value chains.

The National Plan starts by giving important definitions. It defines sociobiodiversity as a "*concept that expresses the interrelationship between biological diversity and the diversity of socio-cultural systems*". Sociobiodiversity products are defined by the same source as "*goods and services (final products, raw materials or benefits) generated from biodiversity resources, aimed at the formation of value chains of interest to family farmers, traditional people and communities, promoting the maintenance and valorization of their practices and knowledge, and ensuring their rights, generating income and improving their quality of life and of the environment in which they live*". As for a sociobiodiversity productive chain, the policy defines it as "*an integrated system, consisting of interdependent actors and a succession of processes of education, research, management, production, processing, distribution, marketing and consumption of products and services from sociobiodiversity, with cultural identity and incorporation of local values and knowledge, and that ensure the fair and equitable distribution of its benefits*" (Brasil, 2009a).

The main objective of the National Plan is to develop integrated actions for the promotion and strengthening of sociobiodiversity value chains, while consolidating sustainable markets. Its specific objectives are: to promote the conservation, sustainable management and use of sociobiodiversity products; to strengthen their value chains in all Brazilian biomes, adding value to the products; to strengthen social and productive organization of family farmers, indigenous, *quilombolas* and other traditional populations; to amplify, strengthen and articulate the economic instruments necessary to the value chains structuring; to strengthen the knowledge networks, integrating research, technical assistance and capacity building actions; to strengthen intra/inter-institutional and intersectoral articulations; to adapt the legal framework in order to meet the specificities of sociobiodiversity products and value chains.

The National Plan is structured in six main action lines, which are here identified, along with some of the main points contained:

1. Promotion and support of sustainable production and extractivism
2. Structuring and strengthening of industrial processes
3. Structuring and strengthening of markets for sociobiodiversity products

4. Strengthening of social and productive organization
5. Complementary actions to strengthen the chains of sociobiodiversity products
6. Complementary actions to promote the valuation of the sociobiodiversity services.

Some of the points contained in each of the action lines, are related to:

a) Conducting studies and research:
- about the areas of production and sustainable extractivism
- for the structuring and support of industrial processes (development of new products, new technologies and industrial processes of low cost for adding value to sociobiodiversity products, as well as for the utilization of the byproducts resulting from the processing)
- on markets opportunities for sociobiodiversity products, roots of production outflow and logistics
- on management instruments and organizational models adequate to the social and cultural diversity of the organizations
- for the strengthening of the value chains, such as surveys of the value chains existent in each biome; bioprospecting research looking for nutritional, medicinal, etc. attributes in the sociobiodiversity products; researches on sustainability indicators of the value chains; and organization of participative research networks involving all links in the chain, especially young people from the communities
- for the development of indicators of the environmental services provided by the sociobiodiversity value chains.

b) Strengthening the services of technical assistance:
- in rural areas, meeting the demands of local communities for assistance in production projects
- meeting the requests from associations and cooperatives in the legal, administrative and organizational areas
- prioritizing the integration of policies and programs with other governmental sectors that work with family farmers, indigenous and other traditional populations.

c) Capacity building of the several actors of the value chains:
- especially producers and technicians, focusing on the production and sustainable management techniques (such as seedling production, harvest and post-harvest)
- focusing on the elaboration of business plans and marketing capacities
- focusing on production management; informatics; project elaboration, administration and financial management; associationism and cooperativism; legislation on sociobiodiversity products and services
- fostering the creation of exchange networks between organizations, as well as exchange programs between producers of different localities
- creating scholarships at different levels (technical education, specialization, etc.) to form qualified personnel for working in the sociobiodiversity value chains; production of pedagogical material about the sociobiodiversity value chains and the inclusion of these topics in the schools' curriculum.

d) Strengthening and expanding the credit lines and agricultural insurances:
- for the production and sustainable management of sociobiodiversity products
- for the investment in cooperatives' infrastructure, acquisition of equipments and infrastructure adaptation to renewable energy sources;
- for the elaboration of business plans and marketing capacities
- for the development of enterprises, and of organizational activities of associations and cooperatives
- through mapping and disseminating the existing credit lines and adjusting credits schedule for funds releasing to the specificities of the regions and value chains.

e) Developing mechanisms of fiscal incentives:
- to production, management and sustainable extractivism of sociobiodiversity products (including a mechanism of increasing taxation for agricultural activities causing environmental pollution and degradation)
- to the industrialization of sociobiodiversity products, such as to encourage private investment in research for developing new products, as well as a system of differentiated taxation for companies working with such products.

f) Adapting the regulatory framework:
- to the specificities of the sociobiodiversity products and of family farmers, indigenous, quilombolas and other traditional populations, as well as of their organizations and enterprises (such as the development of simplified norms for the licensing of production projects, or adequating norms related to forest management to the livelihoods of these people and ensuring their right of access to the lands where the resources occur)
- to the specificities of processing and marketing of sociobiodiversity products, such as hygiene standards, labeling, transportation and distribution norms.

g) Structuring actions to promote the production, management and sustainable extractivism of sociobiodiversity products, such as:
- landholding regularization
- creation of a non-reimbursable fund for the development of management plans, licensing of productive projects, cultivation of native species and restoration of degraded areas.

h) Expansion of access to local, regional, national and international markets, through the creation of local trade fairs, extractivist products reception poles, trade networks connecting rural and urban organizations; investments in infrastructure and logistics for the storage, transportation and distribution of the products; expansion of the participation of sociobiodiversity products in government purchases, including by the Family Farming Food Acquisition Program (*Programa de Aquisição de Alimentos da Agricultura* Familiar - PAA).

i) Publicity and promotion of the sociobiodiversity products, prioritizing a marketing strategy for the dissemination of uses of the products by specific sectors (gastronomy, clothing, etc.) and through awareness campaigns about the value of products and services from sociobiodiversity.

j) Development and implementation of mechanisms for conformity assessment, such as a social label to identify sociobiodiversity products.

k) Incentives and investment to strengthen the sociobiodiversity value chains, for example through the creation of scholarships for research projects focused on sociobiodiversity value chains (foreseeing specific scholarships for communities' researchers).

l) Dissemination and promotion of information about the sociobiodiversity value chains, through the creation of an informational portal; about business opportunities and partnerships involving the government, private sector, and producer organizations; and about successful projects in sociobiodiversity value chains.

m) Adoption of economic instruments to promote the ecosystem services, focusing on the creation of a remuneration fund for services provided.

Minimum Price Guarantee Policy for Sociobiodiversity Products (*Política de Garantia de Preços Mínimos para Produtos da Sociobiodiversidade - PGPM-Bio*)

The PGPM was first put in place by the Decree-Law Nº 79/1966. As described in Conab (2017), the Minimum Price Guarantee Policy (PGPM) "*is an important tool to reduce oscillations in the rural producers' income and ensure a minimum remuneration".* It also regulates the food supply, balancing supply and demand by encouraging or discouraging production.

From this Policy, derived the Minimum Price Guarantee Policy for Sociobiodiversity Products (*Política de Garantia de Preços Mínimos* para Produtos da Sociobiodiversidade - *PGPM-Bio*), created in 2009 with a focus on the extractivist value chains, while the PGPM referred to general rural products. It aims to contribute to environmental conservation and support extractivists' livelihood by guaranteeing an adequate income to the communities (Conab, 2021b).

The minimum prices are proposed by the National Supply Company (Compania Nacional de Abastecimento - Conab), based on market analysis, national and international supply and demand evaluation, production costs, among other factors. The proposal is the technical foundation from which the Ministry of Agriculture, Livestock and Supply (*Ministério da Agricultura, Pecuária e Abastecimento* - MAPA), the Ministry of Economy (*Ministério da Economia - ME*) and the National Monetary Council (*Conselho Monetário Nacional - CMN*)

will discuss and define the minimum prices. The price list is updated yearly and can be accessed in the Conab's website (Conab, 2022).

In practice, whenever the extractivist producer is paid less than the established prices defined by Conab, this same government body shall pay the producer the difference between these prices, upon the presentation of an invoice showing the price received. This policy instrument is called Direct Subsidy to the Extractivist Producer (*Subvenção Direta ao Produtor Extrativista - SDPE*) (Conab, 2021b).

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The Inter-Ministerial Ordinance Nº 2, of April 2019, defines the limits for the subsidies for each product, in each Region, per year. In-shell Brazil nuts' value chains are limited to receiving R$ 1,000 (US$ 292 in 2022 prices) per year. The açaí (from *E. oleracea*) value chain is limited to receiving R$ 1,500 (US$ 437 in 2022 prices) per year. The value chain of juçara (*E. edulis*) fruits, on the other hand, have a much higher limit: R$ 4,000 (US$ 1,166 in 2022 prices). This indicates the government's will to invest substantially in the value chains of juçara fruits, while the other two, for being better consolidated in the market, would require less financial support from the government.

Conab (2021) shows the increase in the subsidies from PGPM-Bio from 2016 to 2019, which went from 2.4% to 9.6% of total production which was subsidized. The State of Amapá responded for most of the subsidies provided (2.3% in 2016 and 9.2% in 2019). No information is provided for the other value chains.

4.5.2 Bolivian policies

Table 6 reports the main Bolivian policies and regulations relevant to NWFP in general.

Table 6: Bolivia's Policies and regulations relevant to NWFP in general. Own elaboration.

Legal act	Policy Name	Brief description	Reference
Supreme Decree Nº 27328, of	I Buy Bolivian (*Compro Boliviano*)	Aims to strengthen national production and enhance participation of small scale producers in	Bolivia (2004)

January 2004		procurement processes of public institutions.	
Supreme Decree Nº 29315 of October 2007	Empower Program (*Programa Empodera*r)	Aims to improve the productive and entrepreneurial capacities of organized smallholders and self-management of vulnerable communities to gain access to markets under competitive conditions. One of its objectives is to diversify and increase agricultural productivity for supplying the domestic market. It is the basis for the Rural Alliances Project (PAR) and the National Program to Support the Production and Harvesting of Amazonian Fruits.	Bolivia (2007)
Law Nº 786, of March 2016	Economic and Social Development Plan 2016-2020 (*Plan de Desarrollo Economico y Social 2016-2020*)	Sets the guidelines for the development of the country in the following 5 years. Among its main targeted achievements is to diversify the country's economic matrix and increase its degree of industrialization, including processing plants for Amazonian products.	Bolivia (2015) Bolivia (2016)
Amazonian Municipal Law Nº 113, of April 2019	Declaration of Amazonian fruits: Asaí, Majo, Copoazú and Cacao as strategic products of the Municipality of Riberalta (*Declaratoria de las frutas Amazónicas: Asaí, Majo, Copoazú y Cacao como productos estratégicos del Município de Riberalta*)	Aims to promote the consumption of the fruits and open new markets for them, ensure their supply and conserve the forests where they occur, strengthen productive, processing, marketing and financing capacities of producers, support health and safety compliance.	Riberalta (2019)
Law N° 1407, of November 2021	Economic and Social Development Plan 2021-2025 (*Plan de Desarrollo Economico y Social 2021-2025*)	Sets the guidelines for the development of the country in the following 5 years. Among its targets are to diversify and increase agricultural productivity for supplying the domestic market and to increase industrialization, striving for value-added exports.	Bolivia (2021)

I Buy Bolivian (*Compro Boliviano*)

In 2004, the Bolivian government procurement policy I Buy Bolivian (*Compro Boliviano*) was established, through the Supreme Decree Nº 27328. The policy aimed to strengthen national production and enhance participation of small-scale producers in procurement processes of public institutions (Bolivia, 2006). In the context of NWFP value chain, this policy is particularly relevant in terms of public procurements for food, which are, together with construction goods,

the main goods in such procurements, particularly for school feeding (Argandoña & Luna, 2005).

I Buy Bolivian fosters the purchase of products and hiring of services from national organizations, enhancing the participation of Bolivian producers in the national market, substituting imports and reinforcing the national economy (OIT *et al*., 2022). It determined that public procurements under 8 million bolivianos (US$ 1.57 million, in 2022 prices), shall be exclusively directed to national endeavors (Bolivia, 2004). Moreover, this policy fosters participation of Micro and Small Enterprises (MSE), Small Producers Associations (SPA) and Peasant Economic Organizations (PEO), as they have preferential right in procurements of until 1 million bolivianos (US$ 197 thousand, in 2022 prices) (Argandoña & Luna, 2005). Moreover, the Goods and Services Management System (SABS), made it so that no public bidding process would be required for government procurement in high poverty rate Municipalities, therefore allowing for direct contracting (Bolivia, 2009a).

According to Argandoña & Luna (2005), some important benefits brought by this policy, in addition to fostering the national economy and production, are the induction to formalization of entrepreneurs (as they must be registered in the "Code of Commerce and Small Producers' Associations and Peasant Economic Organizations"), which contributes to market transparency, and promotes the aggregate value in products from natural resources, since the State demand is for finalized products, instead of raw materials.

Empower Program (*Programa Empoderar*)

The Empower Program (*Programa Empoderar*) was created by the Supreme Decree Nº 29315 of October 17th 2007. It is part of the Economic and Social Development Plan (Plan General de Desarrollo Económico y Social) and is managed by the Rural Development and Land Ministry (Ministerio de Desarrollo Rural y Tierras - MDRyT). It aims, among other things, to "*promote productive development poles according to the capacities and potentialities of each region" and "diversify and increase agricultural productivity to supply the domestic market*". Currently, more than 31 thousand families of producers are directly benefited by the Program (Bolivia, 2022).

The Empower Program opened space for other programs and projects to be created. One of them is the Rural Alliances Project (PAR - *Proyecto de Alianzas Rurales*), which is currently in its third development phase. PAR's main objective is to improve smallholders' access to the market by promoting alliances between smallholders' organizations and buyers. It also strengthens the producer organizations by supporting its legal formalization and its access to production assets, technology and financial services (Bolivia, 2009[b]; Bolivia, 2022). Its main points are to provide training to organizations' members for carrying out their alliance's plans; financial resources for investing in capital goods; and technical assistance to strengthen the administration and financial capacities. Between 2021 and the first months of 2022, PAR included 1,181 implementing projects, from which more than 30 thousand families were benefited (Bolivia, 2022).

Another Program created from the Empower Program is the National Program to Support the Production and Harvesting of Amazonian Fruits (*Programa Nacional de Apoyo a la Producción y Recolección de Frutos Amazónicos*), created by the Supreme Decree Nº 4008, in August 14th 2019. It aims to increase yields and volumes of a set of Amazonian fruits – açaí, Brazil nuts, cupuaçu/copoazu (*Theobroma grandiflorum*) and majo (*Jessenia bataua/Oenocarpus bataua*) through strengthening production, harvesting and post harvesting processes. More specifically, its objectives are to plant açaí and cupuaçú under agroforestry systems; reduce waste and improve efficiency in the harvest and post-harvest phases by providing supporting tools, equipment, infrastructure and technical assistance by the Executing Entities (Bolivia, 2022). The focus districts where this project takes place are La Paz, Beni and Pando. Between 2021 and the beginning of 2022, 94 projects were implemented, benefiting 1.351 families. So far, açaí is the fruit that has more projects implemented (41) (Bolivia, 2022).

Within the Empoderar Program, there is also a Project specific for the cocoa value chain, the National Program to Support Cocoa Production and Harvesting ("*Programa Nacional de Apoyo a la Producción y Recolección de Cacao*"), created by the same Decree Nº 4008, in August 14th 2019. Just like the Amazonian Fruits Program, it also aims to improve processes of production, harvest and post-harvest, but focusing on the establishment of business agreements between producer and harvester organizations and buyers. It also aims to improve producers and harvesters' access to technology, and consequently enhance yield and quality of cultivated and wild harvested cacao (Bolivia, 2022). The focus districts where this project takes place are La Paz, Beni, Pando, Cochabamba and Santa Cruz. Between 2021 and the beginning of 2022, 65 projects were implemented, benefiting 1,467 families. All of these projects were related to cultivated cocoa – although there were 15 alliances scheduled, none was put into practice (Bolivia, 2022).

Declaration of the Amazonian fruits: Açaí, Majo, Copoazú and Cacao as strategic products of the Municipality of Riberalta. (*Declaratória de las frutas Amazónicas: Açaí, Majo, Copoazú y Cacao como productos estratégicos del Municipio de Riberalta*)

The Declaration was established by the Municipal Amazonian Law Nº 113, setting the strategic feature of the four Amazonian fruits (*Euterpe precatoria*, *Jessenia bataua/Oenocarpus bataua*, *Theobroma grandiflorum* and *Theobroma cacao*) for their high nutritional value and importance in the economy of rural and indigenous households. Some of its objectives are to boost the economy of the households engaged in collection and harvesting of these fruits for subsistence; promote their consumption by the Riberalta inhabitants and of all Bolivia; ensure their supply in the local and national markets through public policies and specialized technical assistance; implement policies to achieve local food sovereignty; conserve and manage the forests from where the fruits are harvested; strengthen the productive, processing, marketing and financing capacities of the rural communities involved; support health and safety

compliance from the moment of collection until its industrialization and marketing (Riberalta, 2019).

The law also defines the Riberalta Municipality's responsibilities for achieving the stated objectives. Among them, there are the search and opening of local and national markets, in coordination with regional and national levels; to provide the harvester communities with technical assistance together with other public or private institutions, in order to support conservation and sustainable management of the resources; foster industrialization and marketing of the fruits with aggregate value; carry out awareness-raising campaigns among the Riberalta inhabitants about the importance of consuming these fruits; to integrate these fruits in the School Complementary Feeding Program (Riberalta, 2019).

Economic and Social Development Plans (*Plan de Desarrollo Económico y Social*)

The Economic and Social Development Plans (*Plan de Desarrollo Económico y Social*) periodically sets guidelines for the Country's development path for the following five years. The Plan for the 2016 to 2020 was approved by the Law Nº 786, of March 9th 2016. It establishes as one of its main aimed achievements for the Industry Sector, the creation of Productive Complexes, "*in order to make a qualitative leap in the diversification of the country's economic matrix, increasing the degree of industrialization*". The Complexes are a set of production and processing plants, storage facilities and technology centers for innovation and boost of economic activities. They aim to strengthen the productive capacity and potential of private producers as well as of social organizations, cooperatives, associations and communities, by providing technical assistance, training and other necessary inputs (Bolivia, 2015).

Among the results that were expected for 2020, there is the creation of at least 13 Territorial Productive Complexes. They were defined according to some criteria, such as natural resource potential, contributions to food security, employment generation, import substitution and capacity to adopt technology. They should be executed according to the particularities and potentialities of the different regions and items, as well as articulating priorities from the National Government, Autonomous Territorial Entities and the actors from private, community and cooperative production (Bolivia, 2015).

One of these 13 Complexes is the Amazonian Products Complex, which comports a Transformation and a Processing Plant. The first one would be responsible for producing plant oils and butters, while the second would produce essences, active principles and pulps for juices. The objectives were to promote the production of Amazon fruits, produce articles with aggregate value for the internal and external markets and to provide supplies for the cosmetic, pharmaceutical and food industries (Bolivia, 2015).

As for the 2021-2025 Development Plan, it holds 10 main strategic axes, of which Axis 3 is for Food Security with Sovereignty, Promotion of Value Added

Exports and Tourism Development. This Axis focuses on Productive Sovereignty with Diversification (Pilar 6) and Food Sovereignty (Pilar 8), aiming for imports substitution and entering the international market (Bolivia, 2021). This axis also sets Target 3.2, which consists of "*Diversify and increase agricultural productivity to supply the domestic market; and industrialization with import substitution, with a view to value-added exports*". Target 3.2 specifies the industrialization of Amazonian fruits as an expected result, with the implementation of a Transformation Plant for Amazonian fruits as the necessary action to be developed. There are three indicators for measuring its achievement: number of Transformation Plants, tons of Amazonian fruits transformed per year and tons of Amazonian fruits exported. By 2025, it is expected that two Transformation Plants will be implemented and operational, a total of 8,480 tons of Amazonian fruits transformed and 500 tons exported. Only three fruits were specified: Brazil nut, açaí and cupuaçu (*Theobroma grandiflorum*) (Bolivia, 2021).

4.5.3 Peruvian policies

Table 7 reports the main Peruvian policies and regulations relevant to NWFP in general.

Table 7. Peru's Policies and regulations relevant to NWFP in general. Own elaboration.

Legal act	Policy Name	Brief description	Reference
Legislative Decree Nº 1077, of August 2008	Competitiveness Compensation Program (*Programa de Compensaciones para la Competitividad*)	Aims to elevate the competitiveness of small and medium producers through promotion of associative formations in the value chains of family farming and adoption of adequate agricultural technologies.	Peru (2008)
Law Nº 30355, of November 2015	Law for the Promotion and Development of Family Farming (*Ley de Promoción y Desarrollo de la Agricultura Familiar*)	Aims to support the sustainable development of family farming through policies that improve access to technical, financial and natural resources; their stable and adequate linkage with the market, guaranteeing social protection and the welfare of families and communities.	Peru (2015)
Executive Management Resolution Nº 013-2016, of February 2016	Guidelines for the development of intermediate forest management plans for the harvesting of forest products other than timber (*Lineamientos para la Formulación de Planes de Manejo Forestal Intermedio para el Aprovechamiento de*	Guides the sustainable management of NWFP and the development of management plans.	Peru (2016a)

	Productos Forestales Diferentes a la Madera)		
Ministerial Resolution Nº 0069-2020, of December 2020	Direct Financing Program for Prioritized Non-Timber Forest Products Chains in Madre de Dios (*Programa de Financiamiento Directo para las Cadenas Productivas Forestales no Maderables Priorizadas en Madre de Dios*)	Aims to provide direct financing for the forestry production chains prioritized in the Madre de Dios Region, providing financial resources to small producers organized under any associative form contemplated in the current regulations in force, including peasant communities and native communities, who present, through the Organization to which they belong, requests for direct financing.	Peru (2020)

Competitiveness Compensation Program (*Programa de Compensaciones para la Competitividad*)

The Competitiveness Compensation Program (CCP) was created by the Legislative Decree Nº 1077 and its purpose is to contribute to the competitiveness of agricultural production of small and medium-sized family farmers and their associative forms. The Supreme Decree Nº 005-2020, that regulates the Program, includes production and transformation of NWFP in the list of possible economic activities carried out by the small and medium-sized producers to be included in the Program (Peru, 2020a).

Aiming for productivity, profitability and sustainability (Peru, 2020b), the Program's main strategies are the strengthening of associative forms of small and medium agricultural producers, improvement of their management capacities and technology adoption. It does so by granting Incentives for Associativity, Incentives for Business Management, Incentives for the Technology Adoption, and the Incentive for the Strengthening of Associative Forms of Agricultural Producers (Peru, 2020a).

The CCP supports the creation, development and monitoring of business plans for the Agricultural Producers' Organizations (AO) and of work plans for family farmers' associations. It also promotes, formulates and monitors Projects of Productive Farming Conversion to innovate and add value to production through the use of efficient technological systems. These conversion projects aim to support farmers to foray a new business when they are situated in sectors of little economic potential. They intend to modernize, improve and diversify agriculture for a better insertion in the market (Pery, 2006).

The Program also coordinates with the adequate public entities the land titling of productive units that are subject to attention (Peru, 2020b). In addition, it promotes the access of the AO to trade fairs and business meetings to strengthen their market articulation (Peru, 2020b). Moreover, CCP holds different Regional Units which are responsible for coordinating, executing and controlling the Program's interventions in the territory (Peru, 2020b).

Law for the Promotion and Development of Family Farming (*Ley de Promoción y Desarrollo de la Agricultura Familiar*)

In consideration of the importance of family farming for food security and nutrition, agrobiodiversity conservation, the sustainable use of natural resources, climate change mitigation and adaptation actions and environmental services, the Law Nº 30355, from 2015, aims to support family farmers by improving their quality of life and reducing rural poverty levels. It is intended as a basis for policies to improve family farmers' access to technical, financial and natural resources, as well as to basic conditions of life quality (sanitation, education, electricity, etc.) and adequate market articulation (Peru, 2015).

Even though NWFP are not specifically mentioned in the text, forest management is included among the economic activities referred to in the law's definition of family farming, along with agriculture, cattle ranching, apiculture, and others.

The general guidelines presented for the promotion and development of family farming are: to prioritize family farmers' access to programs of technical capacity, technology and information; to formalize the titling of the land owned and managed by family farmers, through competent authorities; to develop programs of financing, technical assistance and counseling for the development of business plans and marketing strategies; foster family farmers' associativity through programs of capacity building in technical and business management; promote their participation in local and international trade fairs (Peru, 2015).

For technical assistance and technology transfer, the National Institute for Agrarian Innovation (*Instituto Nacional de Innovación Agraria* - INIA) and the Research Institute of the Peruvian Amazon (*Instituto de Investigación de la Amazonía Peruana* - IIAP) shall be engaged. They shall also offer supply of seeds, seedlings and breeding stock of high genetic value. Moreover, the National Agrarian Health Service (*Servicio Nacional de Sanidad Agraria* - SENASA) shall engage in providing advice and support for the quality of family farmers' products.

For supporting family farmers in accessing the local markets, the law states that the Ministry of Agriculture and Irrigation, as well as regional and local governments, are responsible for providing the necessary infrastructure, promoting and generating local agricultural markets and fairs, as well as for implementing policies to strengthen local markets and families farming articulation, recovering cultural practices of commercial exchange. Furthermore, the Ministry shall promote family farmers' and native communities' capacities for project managing, planning and formulation skills, in order to increase their competitiveness.

For financial support, the law sets the Development Financial Corporation (*Corporación Financiera de Desarrollo* - COFIDE) and the Agribusiness Bank (*Banco Agropecuario* - Agrobanco) to develop credit and insurance programs, specially tailored for family farmers.

Furthermore, in 2016 the Supreme Decree Nº 015-2016 approved the Law Nº 30355 and created the Multisectorial Commission of Promotion and Development of Family Farming (*Comisión Multisectorial de Promoción y Desarrollo de la Agricultura Familiar*). This Commission, of permanent character, is submitted to the Agriculture Ministry, with the purpose of monitoring compliance with Law Nº 30355, as well as a space for the exchange of experiences of the different sectors and public agencies in the promotion and development of family farming (Peru, 2016b). In addition, this Decree defines community forest management as: "A set of activities aimed at sustainable harvesting and conservation of timber and non-timber goods, as well as forest ecosystem services and other wild ecosystems carried out by native and rural communities, riparian or other local populations".

Guidelines for the development of intermediate forest management plans for the harvesting of forest products other than timber (*Lineamientos para la Formulación de Planes de Manejo Forestal Intermedio para el Aprovechamiento de Productos Forestales Diferentes a la Madera*)

This regulation was created by the Executive Management Resolution Nº 013-2016 in 2016 (Peru, 2016a). It is focused on the ecological aspects of the NWFP value chains and how to sustainably manage these resources. The guidelines for developing management plans describe in detail each information required. It defines the information that must be contained in the plan, specifies conditions, requires clarifications and definitions and gives suggestions and recommendations. The document states that management plans are required when the harvesting implies death of the target individuals, when heavy machinery is used or when the activities might put at risk the regeneration of the species.

The presentation of a management plan requires an enabling title to be granted to the responsible for the management, as well as a list of all beneficiaries in the case of community management. At the end of each operational year, the person or organization entitled to the management must present an annual performance report, as well as a final report at the end of the management plan valid period.

Some information required for the management plan are: geographical location of the areas to be managed; list of the main fauna and flora species present in the area; physical aspects of the area (hydrography and physiography); a land use planning map, defining the production, infrastructure, protection and recuperation zones; information about the species to be harvested (common and scientific name, products to be obtained and parts of the plant to be harvested); inventories of the target species (may be done by census or sampling) and a dispersion map of individuals; a projection of the productivity of the forest to be managed; a description of the activities in each step of the management, techniques and materials to be applied (equipment, tools and inputs); and how will rotation of management parcels be undertaken.

The regulation also specifies when a sample inventory can be done and when a census is required; the required size of parcels for the sampling depending on

the type of ecosystem; and how to determine the percentage of resources that can be extracted out of the total available resources, in order for the harvest to be sustainable (for example, when harvesting leaves, no more than ⅓ of the plants' leaves should be harvested; in the case of fruits and seeds, at least 20% of the plants' production should be left uncollected). It requires the definition of what protection measures shall be undertaken to protect the area of external risks (poaching, forest fires, invasive species, etc.); what are the possible negative impacts and what measures will be taken to avoid and mitigate such impacts; and a calendar of all activities related to management of the natural resources, according to seasonality, species phenology, availability of financial resources, etc.

Direct Financing Program for Non-Timber Forest Product Value Chains in Madre de Dios (*Programa de Financiamiento Directo para cadenas productivas forestales no maderables en Madre de Dios*)

This Program is part of the "Agrarian Financing Program for productive development in the department of Madre de Dios", created by the Ministerial Resolution Nº 0069-2020-MINAGRI, from December 2020, and is headed by the Agriculture Ministry (MINAGRI). It consists of awarding small scale producers with lines of credit for the development of agricultural, livestock and forestry value chains. The forest products included in the Agrarian Financing Program are Brazil nut, açaí, aguaje (*Mauritia flexuosa*), ungurahui (*Oenocarpus bataua*/*Jessenia bataua*), rubber (*Hevea brasiliensis*) and products developed in agroforestry systems (camu camu, cocoa and cupuaçú) (SERFOR, 2021).

The Direct Financing Program for NWFP, in its turn, was created in 2021 and is put forward by SERFOR (Servicio Nacional Forestal y de Fauna Silvestre). It consists of a source of financing with accessible conditions at low financial costs to associations of small-scale producers of four prioritized value chains (Brazil nut, aguaje, ungurahui and rubber). By granting loans to the associations, the Program finances working capital for the harvesting, processing, and marketing of the value chains, allowing for the achievement of higher productivity and quality levels (SERFOR, 2021). Up to 70% of the production costs (working capital required by small producers to finance their activities) of an organization can be directly financed by the Program.

To be eligible for benefiting from the Fund, small scale producers of the four mentioned NWFP must be organized under any associative form contemplated by Peruvian laws, including peasant and native communities, and have a net income of up to 11 ITUs (Impositive Tax Units), to be determined based on the cash flow of its forestry activity. They must apply for the credit lines to the Agribusiness Bank (*Banco Agropecuario* - AgroBanco), which is the administrator of the AgroPeru Fund (SERFOR, 2021).

Another requirement for organizations applying to the loans, are that they hire a technical assistant to carry out an integral accompaniment of all producers to facilitate productivity increase. Technical assistants shall ensure the proper implementation of good practices for harvesting, post-harvest management,

processing and marketing, as well as the permanent coordination with the organization to which the producers are part of. Their responsibilities are: to carry out, along with the producer, a programming of harvesting, transformation and commercialization activities; to conduct monthly field visits for verifying the adequate implementation of the forestry activities, leave technical recommendations; and develop monthly follow up reports to the organization, AgroBanco and SERFOR, informing the state of the forest harvesting area, the level of investment executed and of compliance with the main indicators (SERFOR, 2021).

The Direct Financing Program for NWFP has available a maximum of 20% of the total destined to the Agrarian Financing Program, which revolves around S/ 66,9 million (Peruvian Soles, corresponding to US$ 17,4 million in 2022 prices). The Program's duration is until December 2023 and some expected positive impacts are the boost of rural economy, employment promotion, deforestation pressure reduction and the support to mitigating climate change effects (SERFOR, 2021).

5. Discussion

This section analyzes the data collected. Section 5.1 describes the Extractivism-cycle and 5.2 a background consideration of the dichotomy between NWFP extractivism versus cultivation, which will be both useful for the analysis of the three value chains in section 5.3. Section 5.4 is an assessment of the twelve policies described.

5.1 Extractivism-cycle analysis

Homma (1980) classifies extractivist processes as: 1) "*Extractivism by annihilation or depredation*", characterized by the sourcing implies the depletion of the resources; 2) "*Collection extractivism*", in which usually the speed of extraction follows the one of resource renovation. Some extractivist activities are a mix of both types. Moreover, Homma (2014) describes the extractivism activities in the Amazon in phases of beginning, expansion, stagnation and decline. It divides the extractivist economic cycle into three phases (**Figure 52**). The first phase is characterized by the increasing extraction of resources, following the increase of demand. The second phase corresponds to the stabilization of extraction, as the limit of available stocks is reached and costs for extraction are higher, including by the need to look for the resources in further areas. The third phase indicates the depletion of resources and demand still increasing. Other external factors such as the expansion of agriculture frontiers, increased demographic density and forest degradation, are responsible for this decline in the resource availability. In this phase, if domestication is possible (biologically and economically), resources start to be cultivated, compensating for the natural stock's scarcity.

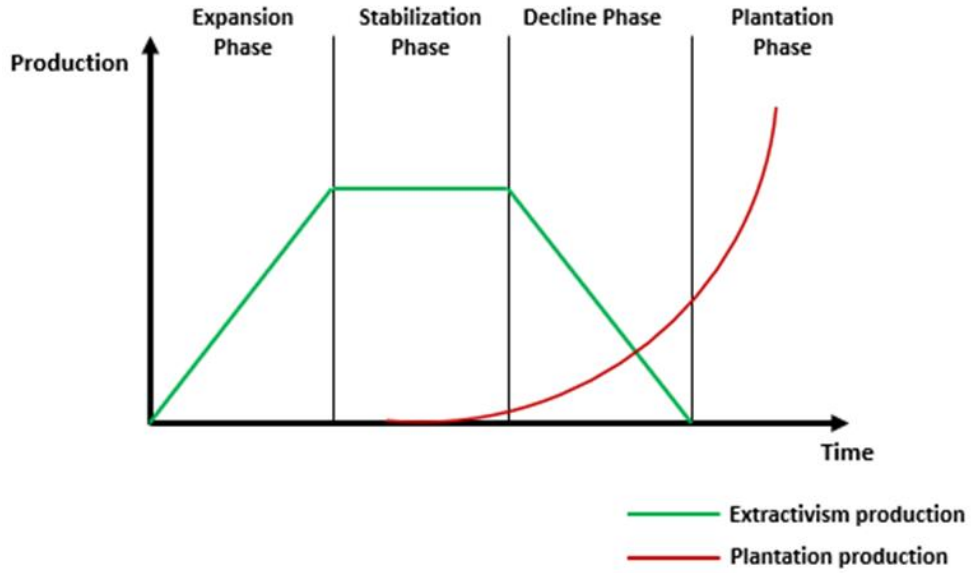

Figure 52. Homma's model of the extractivism cycle in the Amazon. Own elaboration from Homma (2014).

Both Homma's classification (Homma, 1980) and placement of an extractivism value chain in a given phase of the extractivism cycle (Homma, 2014), however, reflect a snapshot of the time and place in which the evaluation takes place, being influenced by several contextual factors. For example, Homma (1980) classifies Brazil nuts as a "collection extractivism", and açaí as a mixed type, since its fruits are obtained by collection, while the palm heart is by annihilation. Nevertheless, the açaí collection in the last decade has been so intensive that some authors argue that it has an annihilative effect, since few seeds are left in the forest to germinate into new individuals. Moreover, *E. edulis* palm heart extractivism is classified as the annihilation type, but the growing sector of the *jussaí*, made from its fruits, can move the classification to a mix type as well.

5.2 Extractivism vs. cultivation

Homma (2014) states that, when social rights increase in areas where extractivism is substantial (such as the elevation of minimum wage or the emergence of new economic options) and new market options are developed for a product (such as synthetic substitutes or plantation techniques), extractivism is no longer viable. The author states that policies to support extractivism would need to deprive producers from such social rights, to keep extractivism as an interesting option for them. Maintaining the extractivist path would also deprive consumers from benefits such as increased supply and quality and reduced prices.

Furthermore, Homma (2014) states that the limited capacity of supply from extractivism sources naturally leads to the development of management techniques or domestication of wild products, in addition to the exploration of possible substitutes for them, either natural or synthetic. For products in which a clear conflict exists between supply and demand, promoting domestication is essential, while dwelling on extractivism would yield many social damages.

Some species are intrinsically hard to cultivate, such as the Brazil nut, for the long period before fruiting, which yields financial return after around 27 years, and the impossibility of monocultures. Nevertheless, Homma (2014) argues that the sustainability of this industry is tied to better management techniques and the development of plantations that would allow for the formation of stocks and a constant supply, from areas closer to the processing sites. Other authors, such as Scoles & Gribel (2021), advocate for *B. excelsa* plantation for enrichment of degraded or secondary forests.

Another factor that hinders the establishment of cultivations is the existence of large natural stocks, as is the case for açaí in Peru and Bolivia. As long as these stocks are large enough to compensate for the labor involved in the wild harvesting, the extractivism will stand (Homma, 2014). The author stands for the cultivation of açaí to restore previously deforested or degraded land, enable supply all year long and reduce the production costs, avoiding the social exclusion of groups from accessing this product that was traditionally part of their diet.

The case of açaí in Brazil shows the possibility of a mixed situation, in which extractivism does not have to be substituted by cultivation, but they can coexist and promote different benefits to different segments of the value chain.

Extractivism presents many challenges, among them are the risk of land grabbing or loss of access to the land, and the instability of income that these activities provide, due to high market fluctuations, and these aspects can only be dealt with by adequate public policies, not by a technological switch to cultivation strategies, which would instead aggravate these problems for the extractivist population.

5.3 Value chain analysis

The information obtained from each of the products' ecological description, its production and trade data and from the historical-social description of their value chain, allows for an analysis of the relevance of each of the target products in the three categories of relevance initially defined: relevance for food security, economic development and biodiversity conservation.

From the obtained results, it is also possible to place each of the product's value chains into a phase of Homma's (2014) cycle, in the present moment and within the analyzed countries. Of course, there are differences between specific locations, when analyzing smaller scales - the resource might be in the expansion phase in more isolated regions of the North of the Brazilian Amazon, while being already in the decline phase in forests closer to urban centers in the Southeast Amazon, where trade is favored.

5.3.1 Açaí value chain

Açaí, in Brazil, can be placed in the last portions of the Stabilization phase of Homma's chart, but differently from the graph developed by Homma (2014), the cultivation curve has started much before the decline of the resources. In fact, the açaí value chain supported the conservation of *E. oleracea* and *E. edulis*, which were being depleted by the extraction of palm heart. The rise in demand, therefore, promoted the conservation of the palm trees and the areas where palm trees occur, better management techniques that yield higher productivity in natural areas and cultivation. Intensively managed forests and cultivation are currently the main sources of açaí in the country (**Figure 53**).

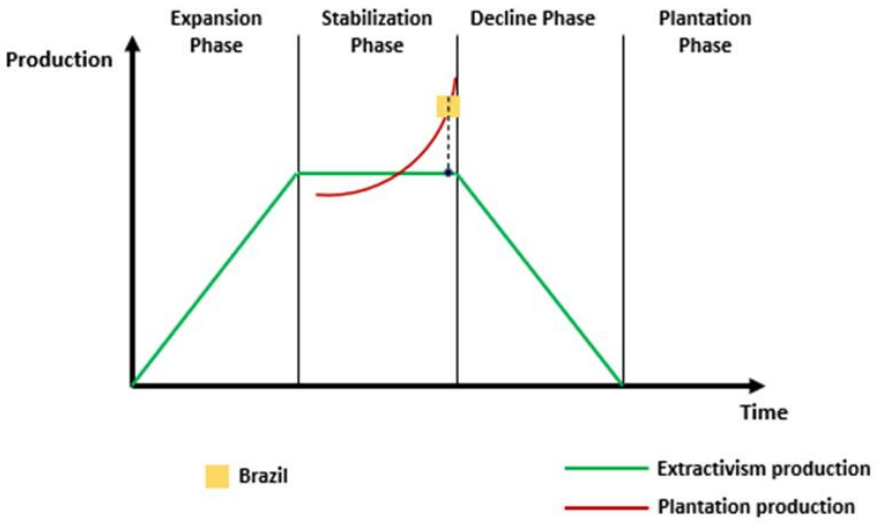

Figure 53. Placement of Açaí's value chain from Brazil in Homma's model of the extractivism cycle in the Amazon. Own elaboration from Homma (2014).

In Bolivia and Peru, açaí is in the Expansion phase, as it is still a new activity in these countries, so the natural stocks of fruits are still abundant in Bolivian and Peruvian's forests and harvesting is increasing with the increasing demand. Açai harvest activity is still mostly from wild and managed populations in both countries (**Figure 54**).

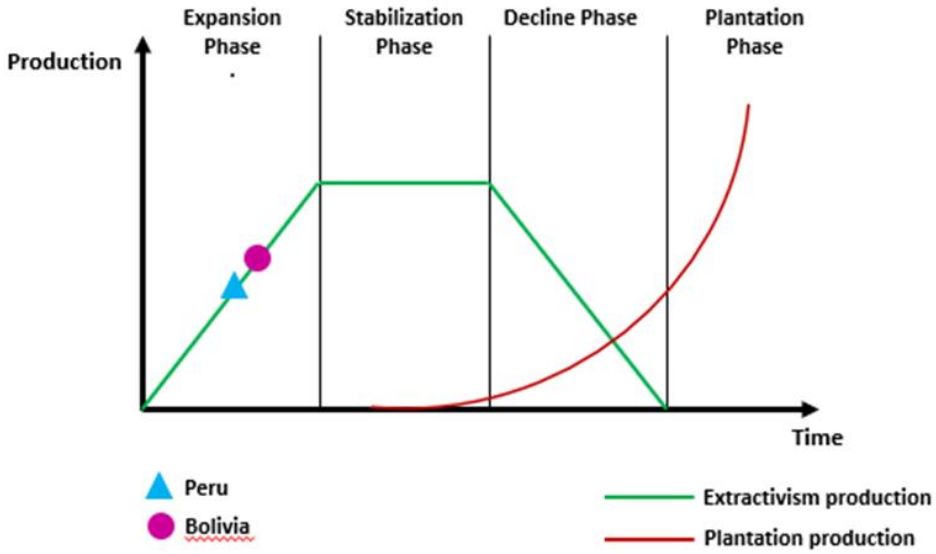

Figure 54. Placement of Açaí's value chain from Peru and Bolivia in Homma's model of the extractivism cycle in the Amazon. Own elaboration from Homma (2014).

In economic terms, açaí is currently the most important NWFP in Brazil, corresponding to a production value of US$149.4 million in 2020. In Bolivia and Peru, the economic significance of açaí is not as relevant, which is reflected in the absence of official trade data for the product. Nevertheless, this scenario is

changing with the increasing stimulus for açai production in Peru and Bolivia, as the product is starting to be an alternative for income diversification for many families that currently depend solely on the Brazil nuts production.

The açaí production in Brazil is focused on the national market, which reflects its low financial values coming from exports. This focus on the national markets also generates a point of attention depicted from the trade results: despite Brazil being the biggest açai producer in the world, the USA is the main processor of the product into products of high added value. This identifies an important gap in the NWFP related policies in the country that must be addressed.

Moreover, the açaí value chain is of high importance in the regional and local economies, as it generates significant income essential for producer households and is among the most important food items produced in the northern region of Brazil, moving its economy and creating jobs.

5.3.2 Palm heart value chain

For analyzing the palm heart value chain within the Homma extractivist cycle, it is important to highlight that it is not possible to restrict the overview to a single species, since there are three different species included: *E. edulis*, *E. oleracea* and *B. gasipaes.*

In Brazil, harvesting of natural populations of *E. edulis* and *E. oleracea* has decayed abruptly in the beginning of the 90's, when, as previously exposed, the natural populations of *E. edulis* were almost completely depleted and *E. oleracea* was affecting the production of açaí. Production started in the early 2000's and has been considerably increasing since then, with a relative stabilization in the last decade. According to the above, palm heart production in Brazil can be placed in the Plantation phase.

In Bolivia and Peru, palm heart production is mainly sourced from *B. gasipaes* cultivations, with still some sourcing from *E. precatoria*. Therefore, this value chain can also be placed in the Plantation phase (**Figure 55**).

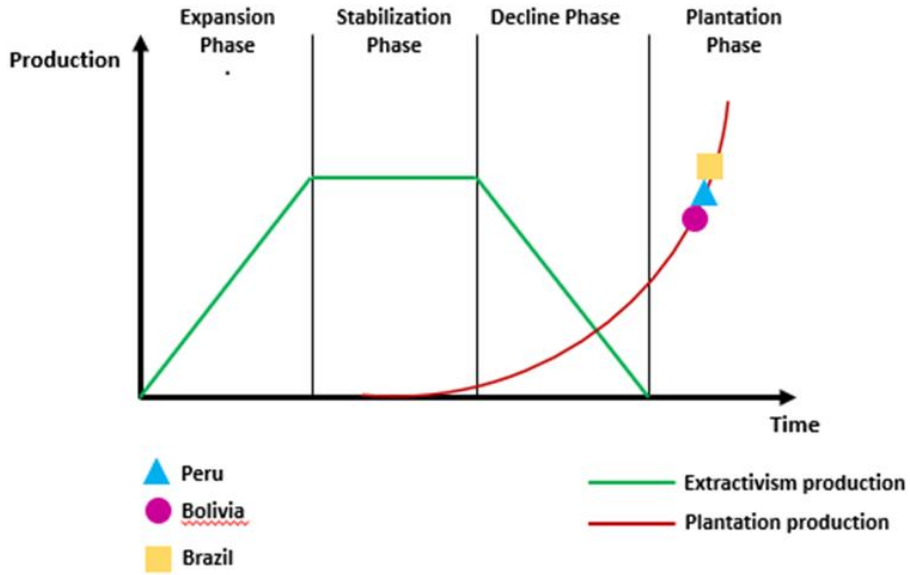

Figure 55. Placement of Palm heart's value chain from Peru, Bolivia and Brazil in Homma's model of the extractivism cycle in the Amazon. Own elaboration from Homma (2014).

The palm heart value chain, despite its historical importance for the Brazilian economy, is currently a minor product in national economic terms for the country and is mostly focused on the national market. Nevertheless, palm heart harvest from natural populations, although illegal in most cases, is to the present days an essential income source for many families where unemployment is a chronic issue (Corso, 2003), which makes it economically important in local scales.

For Bolivia, revenues coming from palm heart exports are expressive (40 times higher than the revenue obtained by Brazilian exports), making it an important product for economic development in the country, both in national and local market scales.

Analyzing the history of the socioeconomic importance of this product it is possible to understand that if, on the one hand, the switch of the extractivism practices to cultivation took pressure off from natural populations of *E. edulis and E. oleracea* palms, allowing for its recovery and resulting in good ecological benefits, on the other hand it also contributed to wealth concentration, since its cultivation is mostly done in monocultures (which most frequently does not contribute to wealth distribution among society). Moreover, this also opens up to discussion if palm heart should be considered as a NWFP or as a cultivated crop.

According to Trevisan *et al*. (2015), the regulation of the palm heart extraction activities should get great attention from public institutions. The author argues that the creation of quality seals and certificates of origin for the wild harvested *E. edulis*, along with public campaigns for creating a positive identity for the juçara palm heart and pulp sustainable extractivism, would be desirable government initiatives for this value chain. Of course, this should be done in conjunction with initiatives that support the feasibility of these sustainable

extractivism practices, as well as extensive public investment in research on *E. edulis* to enhance production, develop management practices suited to the local realities of communities and provide them with technical assistance.

Investing in the development of the açaí made from *E. edulis'* fruits would increase the standing palm, as happened with *E. oleracea*, making the value of its palm heart consisting in subsistence values, instead of commercial. The fact that the limits of subsidy granted by the PGPM-Bio in Brazil is considerably higher for the *E. edulis* fruits than for *E. oleracea* açaí, as previously mentioned, indicates the government's will to invest in this value chain and increase its relevance in the market, to the detriment of its palm heart.

5.3.3 Brazil nut value chain

In Brazil, the Brazil nuts could be placed in the last portion of Homma's Stabilization phase, whereas even though natural stocks are still large, they are decreasing and so are production rates over the years, while threats to forests increase. This is a result of forest substitution by pastures and agriculture, roads building, timber extraction, forest fires, urban expansion, and other factors (Homma, 2014). Degraded forests hinder *B. excelsa* pollination and, therefore, its productivity (Scoles *et al.*, 2016). Despite the increasing demand, reduced availability doesn't allow for increased collection and has been forcing collectors to look for the product in further places. In Brazil, plantation initiatives have been starting since the end of the past century, but still most of the production is extractivism-sourced.

In the case of Bolivia and Peru, production has increased until the first decade of this century, becoming stable in the last 15 years (**Figure 56**), due to the reduction of nut availability caused by very similar reasons to the ones already mentioned for Brazil. The two countries can be placed in the earlier stages of the Stabilization phase.

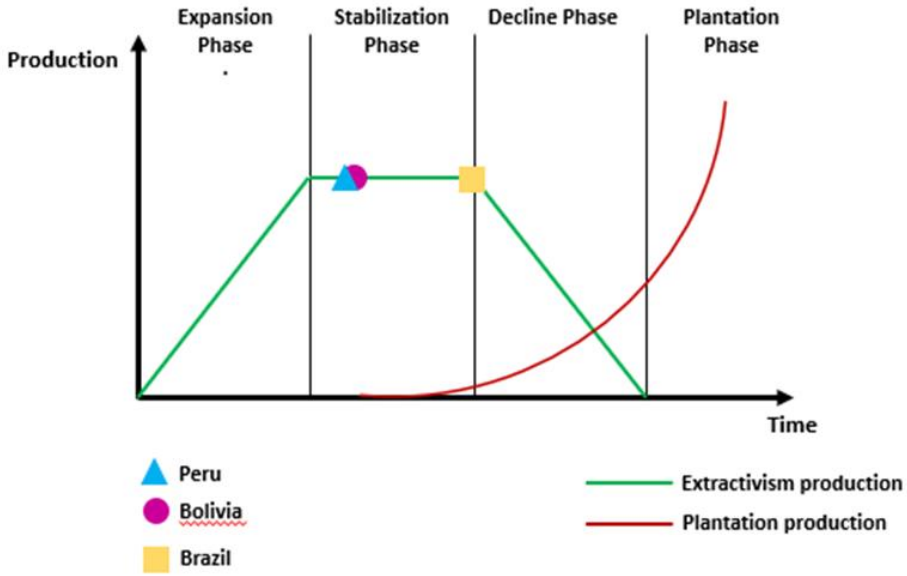

Figure 56. Placement of Brazil nut's value chain from Peru, Bolivia and Brazil in Homma's model of the extractivism cycle in the Amazon. Own elaboration, from Homma (2014).

This product is of high economic importance in all three countries, especially for Bolivia, where it is the most important NWFP in economic terms. This importance is present both in the national economy scale and in local scales, as the household's main income source. As revealed in the results section, in some regions Brazil nuts can respond for 70% of regional income (Vos, 2017). In fact, the high economic importance for households is verified in all the three countries.

Nevertheless, Sousa Silva *et al*. (2019) states that the social organization of this value chain and "*the form of appropriation of the wealth generated from the nut, the way it is set, does not promote the development of the communities*". Therefore, it is necessary for policies to focus on "*mobilization and social organization, aggregation and appropriation of value of the product*" to better distribute the wealth generated by the Brazil nuts production and promote well-being for the communities.

Being the Brazil nuts value chain in Bolivia focused on the international market, the revenues coming from its exports (US$ 171.5 million) are almost four times higher than those coming from exports in Brazil (US$ 45 million) and five times higher than those coming from Peru's exports (US$ 33.9). The country has invested significantly in the processing of this product, which is reflected by Bolivia's much higher export rates of shelled Brazil nuts, in comparison to in-shell ones. The country imports the in-shell nuts from Brazil, processes them in their national industries, and resells them with higher aggregate values (including to Brazil itself). This is also the case for Peru; however, Peru has been decreasing its imports of Brazil nuts since 2015, a result of its higher production rates.

According to Coslovsky (2014), while Bolivia and Peru's governments perceive Brazil nuts as a strategic product, Brazil does not give it due importance. In Bolivia, some regions heavily depend on the Brazil nuts industry and present

several processing agro-industries, from small and family-owned to high-tech ones. Additionally, multiple associations of local exporters push the government to create favorable conditions for the sector development, and to increase its market competitiveness.

According to Chaves (2007), among the factors that determined Brazil's loss of leadership position in the Brazil nuts market are "*the reduction of productive chestnut groves; deficiencies in the production chain, especially in transport and storage logistics; the absence of policies and incentive programs for production, direct support for commercialization and income support for the extractivist; the difficulties of meeting the phytosanitary requirements for export, especially regarding the tolerance limits for the presence of aflatoxin*". Nevertheless, Vos (2017) states the need for policies to enhance the national market and consumption of Brazil nuts in Bolivia.

Moreover, it is important to highlight that, in 2021, Nigeria was the biggest exporter of in-shell Brazil nuts. This indicates that the process described by Homma *et al.* (2006) of market loss due to products appropriation by other countries is occurring and should be a factor of alarm for Brazil, Bolivia and Peru's governments and industries.

5.3.4 Conjunct analysis of the value chains

Altogether, it is possible to understand the relative importance of each of the analyzed products. While açaí is highly important for national and regional economies in Brazil, it is also a staple food in the country, revealing its importance for food security. Its high ecological importance stems mainly from preventing *E. oleracea* depletion due to palm heart exploitation.

Palm heart, on the other hand, has a relevant economic importance in the national markets of Bolivia and Peru, as well as having a high conservation relevance, for *E. edulis* is an endemic species from the Atlantic Forest and was previously defined as endangered in the IUCN Red List. Finally, Brazil nuts have high economic importance to the national economies of Bolivia and Peru, in addition to its importance to household's economy in all three countries.

Adequate policies are essential to avoid Homma's (2014) statements that: supporting extractivism practices would mean to deprive producers from social upliftment with higher and more stable income sources; extractivism leads to depletion of natural resources – and therefore the only solution for sustaining the use of NWFP in the market would be strictly through cultivation.

Cultivation could be sustained by policies as a complementary practice to sustainable extractivism, mainly for açaí and palm heart, being incentivized to enrich degraded areas or restore deforested ones, with a preference for agroforestry systems.

The enhancement of production and coexistence between cultivation and extractivist practices is possible, as shown by the case of açaí in Brazil. However, for the açai and palm heart value chains, under which cultivation is substantial, policies focusing on ensuring social justice levels, in such a way

that the extractivism practices – that proportionate better wealth distribution than large cultivation sites, do not loose competitiveness and that smallholders and traditional communities that rely on these practices receive fair remuneration for their work. This is in part done by the various incentives and subsidies granted to extractivist practices described in the policies of the three countries.

As for Brazil nuts, which cultivation is hindered by its botanical characteristics, policies that focus on better management practices resulting in higher yield and processing that adds value to the production are valuable.

According to Forest Trends (2022a), the individual marketing of production hinders producers' capacity to identify themselves as a social category and limits the articulation between them. When, on the other hand, they seek collective organization of production it allows for better values obtained, as *"the community organization has the ability to reduce the asymmetry of power between the productive link and the other links in the chain, valuing the work of the extractivist*". Nevertheless, other challenges arise, such as lack of working capital, which shall be addressed by policies that increase their access to credit.

For all three products, a basic factor to be addressed by policies is the landholding regularization (enabling more security for producers to invest in better management practices and providing social benefits) and guarantee of traditional populations' access to these natural resources; the improvement of infrastructure in remote areas, mainly in the transportation (to allow for production outflow without so much value lost along the way to the commercial centers) and electricity networks (to enable storage and processing on site, therefore enhancing producers' bargain power and aggregate value to the production). Both measures would strengthen harvesters' negotiating power and reduce vulnerability to market fluctuations (Cavalcante *et al*., 2011). These measures would also reduce products loss of value along the chain and mitigate the reduced competitiveness from wild harvested products in relation to cultivated ones (which are frequently done in areas closer to the commercial centers).

Moreover, it is stressed the need for research of new management techniques and new uses for the products in specialized industries (Cavalcante *et al*., 2011). The fact that the U.S.A. are the main processors of açaí in the world and that Germany was the second main exporter of shelled Brazil nuts in 2021 indicates the need for Brazil, Bolivia and Peru, as producer countries, to invest immediately in processing facilities to dominate this higher value markets, instead of proceeding with being merely commodity producers.

5.4 Policy assessment

Few policies refer directly to NWFP. Frequently, these products are included later in already existing policies whose main focus is on agricultural products, rural development, social inclusion, etc. In other cases, they are included in policy interpretation and implementation, despite not being specifically mentioned, such is the case of the I Buy Bolivian policy. Many of these policies are directly targeting food sovereignty and security, diversification of agricultural

productivity, aggregating values to exports, etc., and NWFP are indirectly involved.

By analyzing the main and specific objectives of each selected policy and their main instruments, it is possible to identify which of the six elements described in the methodology are in focus in the policy and therefore comprehend the effects that the policies may have in the described value chains.

5.4.1 Brazilian policies

Both Family Farming Food Acquisition Program and National School Feeding Program are policies that focus on the element of "creation of new markets to absorb the NWFP production" (element 6), as they serve as mechanisms for producers and extractivists of NWFP to drain their production, guaranteeing constant demand, as opposed to the insecurities of the regular market. The Minimum Price Guarantee Policy for Sociobiodiversity Products, on the other hand, is based on the supporting suppliers in its basic need for adequate remuneration (element 4, "supporting suppliers in its various needs for entering or staying in the markets").

The National Plan for the Promotion of Sociobiodiversity Product Chains is an umbrella policy that touches upon all six defined elements. However, element 4 stands out, as several of its actions points address this same topic: strengthening technical assistance services; capacity building of value chains' actors; expanding access to financial credit and agricultural insurances; creating fiscal incentives for producers and extractivists; adapting the regulatory framework to the specificities of the producers and extractivists; promoting landholding regularization; funding the development of management plans and licensing of productive projects.

Therefore, despite the analyzed policies from Brazil focusing on elements 4 and 6, the National Plan for the Promotion of Sociobiodiversity Product Chains includes all 6 elements in at least one action point. However, it is clear the focus in all four Brazilian policies on supporting the producers and improving the national market demand. This is reflected in the country's trade data, which, for all three products, are focused on the national market.

5.4.2 Bolivian policies

While I Buy Bolivian policy focuses on the "creation of new markets to absorb the NWFP production" (element 6), as its main target is to increase public purchasing from national organizations, substituting imports, it also includes element 4 as it prioritizes and facilitates participation of smallholder producers in the public purchases. Therefore, this policy also stimulates the "improvement of the social organization of the value chain's actors" (element 3), due to the fact that actors must organize themselves into formal associative forms in order to be able to access the policy.

The Empower Program, through its Rural Alliances Project and National Program to Support the Production and Harvesting of Amazonian Fruits focuses its objectives on the improvement of smallholders' access to the market, technology, infrastructure, technical assistance, and technical capacity building, which are all included aspects of the element 4. Moreover, this policy also strengthens producer organizations by supporting its legal formalization, assistance and organizational capacities (element 3).

The Bolivian Economic and Social Development Plans, despite having many other focuses that do not relate to NWFP bioeconomy, stands out for its focus on element 1 ("Explicitly supporting the processing of NWFP until its finished products") on its objective of creating an Amazonian Products Complex, for transforming Amazonian NWFP into higher levels of processing articles, with high aggregate value.

The "Declaration of the Amazonian fruits: Açaí, Majo, Copoazú and Cacao as strategic products of the Municipality of Riberalta", aiming for the promotion of these fruits' consumption, through awareness-raising campaigns, addresses element 5 ("improving the engagement of the national market, such as enhancing the society's interest for NWFP"), while by aiming to integrate them in the School Complementary Feeding Program it addresses element 6. Furthermore, by providing technical assistance to strengthen the productive, processing, marketing, and financing capacities of harvester communities it addresses element 4. By targeting the industrialization and marketing of the fruits with aggregate value, the Declaration addresses element 1, while by fostering the conservation and sustainable management practices it addresses element 2.

In general, the analyzed policies from Bolivia addressed, at least once, all the proposed elements. In fact, the "Declaration of the Amazonian fruits: Açaí, Majo, Copoazú and Cacao as strategic products of the Municipality of Riberalta" on its own includes all six elements in at least one defined Municipality's responsibility. It is evident from the Bolivian policies that a great focus is put on the improving of processing of the production and enabling actors to organize themselves collectively, specially marked in the Empower Program and Economic and Social Development Plans. This is reflected in the trade country's trade data presented, that, for Brazil nuts and palm heart, are intensively focused on the international markets. Bolivia's higher exports rates of shelled Brazilian nuts then in-shell form and its capacity of organization between the actors for coping with the EU's regulation on aflatoxins and presenting a response (which allowed Bolivia to dominate the Brazil nuts exports) reflects the countries policies in promoting processing facilities and social organization among actors of the value chain.

5.4.3 Peruvian policies

Both the Competitiveness Compensation Program and the Law for the Promotion and Development of Family Farming focus on supporting the suppliers to improve their production, organization and market articulation. In the first, this is done with a focus on the associations, while the second, despite

also fostering associativity, focuses on the individuals. Both policies intend to provide the suppliers with technical assistance, capacity building, technology transfer, financial resources, market insertion mechanisms, and land titling formalization.

The Competitiveness Compensation Program focuses on the strengthening of associative forms of small and medium agricultural producers and improvement of their management capacities, which are characteristic of elements 3 and 4. Moreover, the Program also aims to support producers' technology adoption, modernization, and production diversification, as well as strengthen their market articulation and support land titling, which are all included in element 4.

The Law for the Promotion and Development of Family Farming, aiming for improving family farmers' technical capacity, access to technology, information, financing, technical assistance, and counseling, as well as supporting land titling, is focusing on element 4. In addition, by targeting to foster family farmers' associativity, addresses element 3.

The "Direct Financing Program for Non-Timber Forest Product Value Chains in Madre de Dios" also focuses on supporting supply in the value chain, by providing small-scale producers' organizations with accessible financial credit. This measure aims to finance working capital, improving harvesting, processing and marketing activities. In addition, through the mandatory hiring of technical assistance by the suppliers, the program targets capacity building of the suppliers and internal coordination of the value chains, as a result of the assistant's reporting and coordinating actions between producers and their associations and with the forestry service (SERFOR). Therefore, this Program focuses on element 4.

The "Guidelines for the development of intermediate forest management plans for the harvesting of forest products other than timber" offers the government a precious overview of the natural resources in the country, with the comprehension of their spatial location, abundance, utilization, productivity, techniques and materials implemented for its management and utilization, and a temporal perspective of management and productivity. This is extremely valuable for the government's institutions to make better informed decisions related to developing adequate and effective policies, or adjusting and better coordinating the existing ones. Since the policy's focus is on the sustainable management of NWFP, it mainly addresses element 2.

Therefore, the policies analyzed from Peru only cover elements 2, 3 and 4, half of the total elements considered relevant. This is reflected in the trade values obtained for the country, which, despite having a high focus on the international markets (for Brazil nuts and palm heart), are still dependent on importing raw material from Brazil and Bolivia, to be able to process it and export. The country's policies focusing on supporting NWFP harvesters and producers to increase supply has reflected in the decreasing import rates of in-shell Brazil nuts since 2015. They have also been successful in supporting the increase in açaí production.

5.4.4 Conjunct analysis of the policies

According to Ton *et al.* (2007), despite frequently governmental purchases of production providing a higher price than the regular market, the main factor that attracts smallholder organizations to public procurements are the enhanced possibilities to enter more advanced stages of processing of the products than what is usually requested by regular markets – which frequently demands for unprocessed agricultural commodities. Moreover, trading with the government can be an opportunity for these organizations to prepare themselves for entering markets of processed products, as well as organic and fair-trade markets. Training on how to respond to logistic requirements, such as delivery schedules, quantities and quality standards, are valuable learnings for smallholder organizations.

An important indirect impact from many of the revised policies is that they contribute to NWFP market transparency, by requiring the value chain actors - which are frequently operating under informal labor conditions - to register their activities to be able to access the programs' benefits. Depending on the level of registering requirements of each program, this can support the availability of an overview of what are the NWFP value chains in each region, who are the actors and how many they are, what are the quantities being traded and for what prices, among other relevant information.

One of the main challenges related to the NWFP public policies and inclusion of family farmers, indigenous and other traditional communities, is the high complexity and transaction costs of accessing government procurements. Frequently, these groups are not structured enough for entering the procurement process, lacking the required documentation. Specifically in the cases of the government's purchase of the products, a common bottleneck are the hygiene standards required. According to ISPN (2020), traditional communities find it hard to access policies of NWFP purchase, in specific the PNAE in Brazil, due to logistics issues, sanitary legislation incompatible with the traditional ways of production and consumption of the products, lack of knowledge about the policy or of the required documentation in the process.

Another challenge that is common to all value chains in the three countries is the land tenure insecurity from harvesters and producers, along with the disparity between customary and formal rights (Stoian, 2004a). This hinders the long-term success of any project and program. Without the adequate documentation of land rights, or the territorial demarcation in case of indigenous and traditional communities, access to credit is compromised, as well as licensing for production process and other benefits provided by public policies. Policy favoring land hold regularization enhances security to engage with production systems (Ball & Brancalion, 2016).

Furthermore, factors hindering all NWFP value chains' development are the high levels of illiteracy and incomplete educational training, particularly in rural areas, that are a considerable obstacle to community engagement in productive projects and enterprises, but also the lack of infrastructure in transportation and energy, mostly in remote areas. The latter hinders the potential of processing the products on the site of harvests or by the same organizations, and, consequently, the verticalization of the value chains (Brasil, 2009a).

According to McGinley & Cubbage (2018), comprehensive solutions to the complex issues related to forests sustainable management should be addressed by cross-sectorial policies and programs with coordinated aims, strategies, and instruments. Despite the fact that national policies assessed cover many of the key issues for the development of the NWFP bioeconomy in the analyzed countries, the lack of coordination (both horizontal and vertical) among policies and its multiplicity of agents, hinders the effectiveness and efficiency of the existent policies, in terms of actual implementation, durability, accessibility, etc. (Knickel & Maréchal, 2018).

Many of the policies are dispersed across different Ministries without consistent articulation that would allow for the coordination of actions and more effective investments and are susceptible to the changes in government according to the political party in power. In addition, Marshall *et al*. (2006) states that the commercialization of NWFP suffers with the excess of bureaucratic procedures, which can be intensified by the overlapping of different policies: NWFP "*are subject to several laws related to natural resources, resulting in the inevitable involvement of a variety of institutions*".

Therefore, as important as developing policies to support the contribution of NWFP to a bioeconomy, it would be beneficial to implement strategies to enhance this coordination among policy initiatives and actors, fixing possible overlaps and inconsistencies and addressing the existent gaps to move forward in the structuring of value chains and consolidating markets for NWFPs (Brasil, 2009a).

5.5 Limitations and suggestions for future research

Many limitations were found in this study related to lack of available information. Firstly, the limited information available from official sources on production and trade data in the target countries. Specifically, the fact that açaí does not have a trading code in the international system classification system (Harmonized System), represents a significative challenge to comprehend its commercial importance. A code for açaí is present only in the Mercosur Common Nomenclature (MCN), which is used in Brazil, but it was very recently created, which hinders its historical trade analysis. A code for açaí is absent in the Nomenclatura Común Andina (NANDINA).

Secondly, the non-segregation between wild harvested and cultivated NWFP hampers the analysis of its relative importance in economic terms. This was markedly perceived for açaí and palm heart analysis. Despite annual publications for NWFP (PEVs publications) exist in Brazil, they do not account for extractivist-sourced palm heart. In the case of açaí, the national system of Conab aggregates data from cultivated and high-intensive management practices, which should also be disaggregated for a better understanding of the context of açaí production in the country.

Moreover, Bolivia does not publicly disclosure production data of Brazil nuts or palm heart and there are inconsistencies between the data provided by IBCE and Comtrade for palm heart exports quantities. Peru's official sources do not

provide data on production or exports of palm heart, and inconsistencies between INEI's and FAOSTAT's data were found for Brazil nut production.

Gaps in the literature describing the açai value chain in Bolivia and Peru were also a challenging factor. Information about the prices paid for wild harvested palm heart in Brazil were also not found in the literature, for being mostly an illegal activity. Both topics would be valuable to be further explored in future research, which could also support policies aiming to develop the açaí value chain and to better cope with the spread illegal palm heart extraction.

6. Conclusions

The results from this research show the high economic contribution of the selected NWFP value chains to the national economies of Bolivia, Brazil and Peru, especially of açaí in Brazil and Brazil nuts in Bolivia and Peru.

Açaí is the most important extractivist alimentary NWFP in Brazil – in 2016, 59% of the production value from all alimentary NWFP in the country was originated from açaí production. In addition, açaí (summing up extractivist and non-extractivist production) ranked third among the primary sector products with the largest production in the North region of Brazil in 2021, just after soy and corn. Its exports have been considerably increasing over the last decades. This product has low, but increasing, production values in Bolivia and Peru.

Palm heart's production values are more significative for Bolivia and Peru. Nevertheless, in Brazil, despite the relevant decrease in production along the last decades, it is still substantial in absolute values.

The largest producer of Brazil nuts is Brazil, but the main exporter of this product is Bolivia. For both Bolivia and Peru, Brazil nuts is the economically most important NWFP. While Bolivia and Peru export mainly shelled Brazil nuts, Brazil exports mainly in-shell nuts, which returns lower export values due to its lower prices.

Açai is mostly produced through high-intensity management in Brazil, while it is mostly extractivist-sourced in Bolivia and Peru. In all three countries palm heart is mostly produced through cultivation and Brazil nut through extractivism.

For all the three products, Brazil's production is mostly directed to the national market, while Brazil nut and palm heart production from Bolivia and Peru is mainly export-oriented and aimed to the international markets.

Confirming many of the gaps and bottlenecks identified within existing literature, the economic contributions of these NWFP cannot be fully understood due to gaps in the available production and trade data, such as the absence of specific codes in the international trade market for açaí and of disaggregated data for wild harvested and cultivated NWFP, which hinders the evaluation of products that are both extractivism and cultivation-sourced, such as palm heart.

Production increase observed over time for all three products imposes the question that is inherent to all NWFP: how to increase a product supply and, consequently, the economic benefits that the value chain can produce, while simultaneously conserving their natural environment and improving the producers and harvesters' quality of life? This could be addressed by appropriate policies supporting a large array of NWFP value chains, considering the ecological, seasonal, cultural, and social variability.

In general, the assessed policies from the three countries focus mainly on supporting suppliers in their various needs for entering or staying in the market (element 4), while other elements such as explicitly supporting the processing of

NWFP until its finished products (element 1) and improving the engagement of the national market (element 5) were much less frequently addressed.

The assessed policies from Brazil support NWFP' value chains to achieve higher economic performances, mostly by increasing the market demand for NWFP, by creating new markets to absorb production (element 6), and supporting suppliers in their various needs for entering or staying in the market (element 4). Nevertheless, one of the Brazilian policies covers all six defined elements. The Peruvian policies assessed also focus on the element of supporting suppliers (element 4) to support NWFP value chains, along with fostering improvement of the social organization of the value chain's actors (element 3) and promoting conservation and good management practices of the resources involved in the value chains (element 2). Finally, the Bolivian policies assessed are the most diversified and balanced in terms of focusing on different elements: they touch upon all the elements, with a focus on element 4, but all other elements are touched upon in at least two of the selected policies (except for element 1, which is a focus only of one of the policies).

Nevertheless, the presence of policies without full enforcement and adequate coordination among them and the responsible institutions, along with their frequent overlapping, hinders policy effectiveness and can make their accessibility complicated for smallholders and traditional populations. Moreover, policies contributions are jeopardized by the lack of basic infrastructure in producing sites, insecure tenure rights, high levels of illiteracy, and other factors that are essential for NWFP value chains' development. This requires a good level of coordination and cohesion between multisectoral policies beyond forestry, such as rural development, food security, bioeconomy, transports, education, etc. In addition, public policies should be associated to private sector initiatives, such as through certification and standards, which could complement the development of NWFP value chains' development and better insertion in the market.

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Annexes

Annex 1 – Brazilian production data for açaí from extractivist sources. Own elaboration from IBGE (2022d).

Year	Quantity (tons)	Value (US$ in 2022 prices)
1994	98857	108099493
1995	108922	75056751
1996	111438	98109791
1997	100214	61558435
1998	119074	76925215
1999	116132	83877232
2000	121800	56300550
2001	123135	46689367
2002	131958	54140320
2003	144531	38390167
2004	101041	30891151
2005	104874	52203532
2006	101341	66364227
2007	108033	79604244
2008	120890	111153662
2009	115947	113440010
2010	124421	133582126
2011	215381	251802192
2012	199116	213871201
2013	202216	246279952
2014	198149	235721135
2015	216071	188130898
2016	215631	174833596
2017	219710	213696683
2018	221646	185844081
2019	222706	171860910
2020	220489	149360466

Annex 2 – Brazilian production and trade data for açaí from high-intensity managed sources. Own elaboration from Conab (2021a) and ComexStat (2022).

Year	Production Quantity (tons)	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)
2016	1307298	1126	-
2017	1554750	2458	-
2018	1731668	2075	3334
2019	1621034	3523	1253
2020	1698657	1038	71305
2021	-	10219	165039

Annex 3 - Bolivian production quantity of açaí from extractivist sources. Own elaboration from INE (2022).

Year	Quantity (tons)
2006	124
2007	386
2008	0
2009	17
2010	61
2011	485
2012	911
2013	466
2014	1766
2015	1238
2016	280897
2017	308421
2018	1132
2019	0,13
2020	130

Annex 4 – Brazilian production quantity and value of palm heart from extractivist sources. Own elaboration from IBGE (2022d).

Year	Quantity (tons)	Value (US$ in 2022 prices)
2000	17154	9074088
2001	15596	6351207
2002	14529	7413852
2003	13704	6244616
2004	12124	5506065
2005	7863	6741545
2006	6524	6391129
2007	6037	7390693
2008	5873	4976509
2009	5076	5196130
2010	4920	6472155
2011	5563	7883132
2012	4787	6908448
2013	4620	6741022
2014	4729	7101838
2015	4669	5640990
2016	4277	5477007
2017	4350	5411808
2018	4336	4913871
2019	4296	4968459
2020	4274	3891556

Annex 5 – Brazilian production quantity and value of palm heart from cultivated sources. Own elaboration from IBGE (2017b).

Year	Quantity (tons)	Value (US$ in 2022 prices)
2000	24356	26797896
2001	26118	25272117
2002	41119	31747248
2003	37672	25663790
2004	37432	23699433
2005	43967	40349529
2006	73411	67614806
2007	61429	76736181
2008	84006	109424184
2009	70784	78149007
2010	116495	193148891
2011	103419	158481125
2012	194138	215227956
2013	106418	186276798
2014	146279	250466551
2015	109409	83038774
2016	117515	84492014

Annex 5 – Brazilian exports and imports quantity and value of palm heart. Own elaboration from Comtrade (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)	Imports Quantity (tons)	Imports Value (US$ in 2022 prices)
2016	443	2671273	43	206281
2017	265	1727331	47	189466
2018	291	1679115	58	288341
2019	196	1200350	46	196738
2020	152	850367	2	15287
2021	411	1937423	16	88477

Annex 6 – Bolivian exports quantity and value and imports quantity of palm heart. Own elaboration from IBCE (2020) and Comtrade (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)	Imports Quantity (tons)
2006	4479	10222656	0.30
2007	4963	14221654	0.41

2008	4517	14221654	0.16
2009	4287	11377323	0.01
2010	6712	17065984	0.00
2011	7380	19910315	0.01
2012	8241	20659828	-
2013	8313	21572594	0.07
2014	7694	19891400	0.02
2015	7214	18625135	0.09
2016	6655	14752973	0.38
2017	7468	13306203	-
2018	6728	12934775	0.14
2019	5642	9254549	0.00
2020	6084	10344570	-

Annex 7 - Peruvian exports and imports quantity and value of palm heart. Own elaboration from Comtrade (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)	Imports Quantity (tons)	Imports Value (US$ in 2022 prices)
2007	1666	6080956	0	0
2008	1684	7244684	0	0
2009	1391	5324986	0	0
2010	1530	5421044	0	0
2011	1727	6551105	0	0
2012	1702	6379734	0	0
2013	1384	5258471	0	0
2014	1493	5214170	0.069	379
2015	1259	4621922	0	0
2016	1450	5263756	0	0
2017	1999	6055580	0	0
2018	2637	7777651	0	0
2019	3758	9964401	12	29137
2020	3648	9831574	0	0

Annex 8 – Brazilian production of in-shell Brazil nuts. Own elaboration from FAOSTAT (2022).

Year	Quantity (tons)
1961	51713
1962	45442
1963	40431
1964	44223
1965	40798
1966	55470

1967	34164
1968	50977
1969	40004
1970	104487
1971	67005
1972	70000
1973	52095
1974	35776
1975	51719
1976	61043
1977	53958
1978	40449
1979	43242
1980	40456
1981	36702
1982	36849
1983	50860
1984	40710
1985	45020
1986	36136
1987	36241
1988	29391
1989	25672
1990	51195
1991	35838
1992	25303
1993	26505
1994	38882
1995	40216
1996	21469
1997	22786
1998	23111
1999	26856
2000	33431
2001	28467
2002	27389
2003	24894
2004	27059
2005	30975
2006	28806
2007	30406
2008	30815
2009	37467
2010	40357
2011	42152
2012	38805
2013	38300
2014	37499

2015	40643
2016	33328
2017	23357
2018	34170
2019	32905
2020	33118

Annex 9 – Brazilian exports of in-shell Brazil nuts. Own elaboration from ComexStat (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)
2016	7912	12715484
2017	3989	9147497
2018	9960	18929723
2019	5421	13511545
2020	4769	6135696
2021	6896	11732839

Annex 10 – Brazilian exports of shelled Brazil nuts. Own elaboration from ComexStat (2022) and Comtrade (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)	Imports Quantity (tons)
2016	587	5882707	328
2017	300	5320909	475
2018	4973	50474958	16
2019	1395	10867142	118
2020	3007	17707484	483
2021	2994	33263468	988

Annex 11 – Bolivian production of in-shell Brazil nuts. Own elaboration from FAOSTAT (2022).

Year	Quantity (tons)
1961	2834
1962	3117
1963	4306
1964	5000
1965	6000
1966	6000
1967	7000
1968	7000
1969	6200

1970	8500
1971	10500
1972	11400
1973	7500
1974	10700
1975	11800
1976	14750
1977	11900
1978	11350
1979	8700
1980	9380
1981	10412
1982	11000
1983	13000
1984	11500
1985	12000
1986	21366
1987	17777
1988	16080
1989	17496
1990	17000
1991	18000
1992	18500
1993	17500
1994	16500
1995	15400
1996	18000
1997	23000
1998	15400
1999	30000
2000	20500
2001	21332
2002	22121
2003	24090
2004	23410
2005	26045
2006	28585
2007	30054
2008	30315
2009	31259
2010	29630
2011	28205
2012	28543
2013	30336
2014	34007
2015	32820
2016	34809
2017	25245

2018	34196
2019	31146
2020	30843

Annex 12 – Bolivian exports quantity and value of Brazil nuts (in-shell plus shelled). Own elaboration from Comtrade (2022).

Year	Quantity (tons)	Value (US$ in 2022 prices)
1997	9834	56768478
1998	9949	51367013
1999	10982	55089070
2000	13224	58098964
2001	13936	46188138
2002	14068	45089564
2003	15747	59204306
2004	14700	83353323
2005	16263	112591903
2006	18537	102504227
2007	19995	109162903
2008	19865	119196352
2009	21353	99993602
2010	18399	129312300
2011	18643	194704982
2012	21390	188028747
2013	20192	164303045
2014	25484	217633006
2015	24597	238434943
2016	26088	224627356
2017	14112	207338240
2018	25628	260093447
2019	23342	180416291
2020	24430	145410028
2021	22964	171501187

Annex 13 – Bolivian exports and imports quantity of in-shell and shelled Brazil nuts. Own elaboration from Comtrade (2022).

Year	Exports in-shell (tons)	Exports shelled (tons)	Imports in-shell (tons)	Imports shelled (tons)
2016	1623	24465	111	0
2017	503	13609	430	0
2018	913	24715	813	0
2019	614	22728	456	0.37
2020	357	24074	265	0
2021	904	22060	198	0.012

Annex 14 – Peruvian production of in-shell Brazil nuts. Own elaboration from FAOSTAT (2022).

Year	Quantity (tons)	Value (US$ in 2022 prices)
1961	1800	-
1962	1800	-
1963	1200	-
1964	1800	-
1965	1700	-
1966	1588	-
1967	1443	-
1968	1317	-
1969	1387	-
1970	1680	-
1971	1635	-
1972	1247	-
1973	1349	-
1974	1367	-
1975	1384	-
1976	1283	-
1977	1315	-
1978	1240	-
1979	1177	-
1980	1107	-
1981	1302	-
1982	1476	-
1983	1521	-
1984	1656	-
1985	1430	-
1986	1396	-
1987	1506	-
1988	1607	-
1989	1572	-
1990	1639	-
1991	1634	-
1992	1564	-
1993	1582	-
1994	1525	-
1995	1662	-
1996	1336	-
1997	1500	-
1998	2200	-
1999	4900	-
2000	4000	-
2001	4000	-
2002	4000	-

2003	4800	-
2004	4500	-
2005	6800	-
2006	6000	-
2007	6000	6920257
2008	6100	7934036
2009	6000	7507613
2010	5800	7816797
2011	5800	7638749
2012	5600	8316872
2013	5600	9405651
2014	5600	10035211
2015	5795	10104757
2016	5665	9784909
2017	5687	10184084
2018	5716	9251892
2019	5689	8517656
2020	5697	7709003

Annex 15 – Peruvian exports and imports quantity and value of in-shell Brazil nuts. Own elaboration from Comtrade (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022 prices)	Imports Quantity (tons)	Imports Value (US$ in 2022 prices)
2007	2	9590	0	0
2008	3	26410	0	0
2009	15	31761	540	424837
2010	0	0	544	622927
2011	0	0	1487	1663549
2012	0	852	1939	1983288
2013	0	0	3214	3166753
2014	1	9473	3336	3712669
2015	33	350977	5526	7875669
2016	0	0	4342	6730941
2017	0	0	2859	6249276
2018	12	229048	4554	10013030
2019	20	158845	2558	3995700
2020	74	518193	2435	1933671

Annex 16 – Peruvian exports and imports quantity and value of shelled Brazil nuts. Own elaboration from Comtrade (2022).

Year	Exports Quantity (tons)	Exports Value (US$ in 2022	Imports Quantity (tons)	Imports Value (US$ in 2022

		prices)		prices)
2007	3206	19752672	0	0
2008	2920	18727795	25	40037
2009	3063	15732873	15	36446
2010	2645	20124681	16	25761
2011	3172	36109135	3	3719
2012	0	27885187	176	1618877
2013	4206	36516392	0	0
2014	4101	37875860	8	6179
2015	4288	42636803	5	21773
2016	5450	49730312	68	588587
2017	3247	56826937	116	2417275
2018	5810	76003792	101	801589
2019	4754	39215406	36	256006
2020	5575	33344405	124	589955

Annex 17 – Consumer Price Index (CPI) and currency conversion rates. Own elaboration from U.S.A. (2022) and UN (2022).

Year	CPI	Brazilian currency conversion rate	Bolivian currency conversion rate	Peruvian currency conversion rate
1994	149.7	0.8480	-	-
1995	152.5	0.9080	-	-
1996	156.7	0.9984	-	-
1997	160.3	1.0717	-	-
1998	163	1.1505	-	-
1999	166.2	1.1505	-	-
2000	172.4	1.8104	-	-
2001	178	2.3833	-	-
2002	179.9	2.5220	-	-
2003	183.7	2.9656	-	-
2004	189.7	3.1302	-	-
2005	194.5	2.4286	-	-
2006	202.9	2.2713	-	-
2007	208.352	1.9056	-	-
2008	218.815	1.6294	-	-
2009	215.693	1.9440	-	-
2010	217.965	1.8255	-	-
2011	225.722	1.5878	-	-
2012	229.478	2.0300	6.91	2.592
2013	233.504	2.1110	6.9	2.693
2014	238.343	2.2260	6.86	2.762
2015	238.638	3.1710	6.9146	3.159
2016	241.018	3.6200	6.91	3.3443
2017	244.955	3.2690	6.91	3.2886

2018	251.989	3.7460	6.91	3.2769
2019	256.143	3.9670	6.91	3.3625
2020	257.797	5.3430	6.846	3.446
2021	271.696	5.2950	6.848	3.847
2022	296.311	-	6.822	3.649