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Potential For Geographical Indication of Guaraná from Taperoá-Bahia: Territorial, Productive and Socioeconomic Factors

Giovanna Martins Sampaio[1]; Valdir Silva da Conceição[2]; Angela Machado Rocha[3]; João Antônio Belmino dos Santos[4]; Marcelo Santana Silva[5]; Hermes Oliveira Gomes[6]; Bruno dos Passos Assis[7]

[1, 2, 4, 6, 7]Universidade Federal de Sergipe – UFS
[3]Federal University of Bahia - UFBA
[5]Federal Institute of Education, Science and Technology of Bahia - IFBA

***Corresponding Author**: Giovanna Martins Sampaio
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Abstract

The present study aimed to analyze the potential for recognition of guaraná produced in the municipality of Taperoá, Bahia, as a Geographical Indication (GI), considering the natural, human and socioeconomic factors associated with the territory. The research was characterized as descriptive, exploratory and with a qualitative approach, based on a literature review and analysis of secondary data from official institutions and academic literature. The results show that guaraná from Taperoá has high historical productivity, regional economic relevance, market notoriety and differentiated characteristics resulting from edaphoclimatic conditions and local production practices. It was observed that, despite the recent growth in the region, due to the export of the product to other markets. In addition, the local guaraná has notoriety, intrinsic quality and high productivity, reduction of the cultivated area and productive oscillations, the product maintains strategic importance for territorial development. The interaction between know-how, productive tradition and environmental factors contributes to the construction of a territorial identity associated with guaraná, an essential element for recognition as a GI, especially in the Indication of Origin modality. It is concluded that recognition can act as an instrument of economic valorization, strengthening of local governance and promotion of sustainable development, and the institutional articulation of producers and the performance of complementary technical studies to support the registration process are recommended.

Keywords: *Development, Productivity, Territory of identity.*

INTRODUCTION

The territory is a geographically delimited physical space with multidimensional characteristics, covering environmental, economic, social, identity, and cultural aspects, among other attributes [1], [2], [3], [4], [5].

The Territory of Identity is a unit for planning public policies aimed at promoting territorial development in a sustainable and solidary way, integrating government policies with the actions of public entities in an articulated manner and with social participation, aiming to improve the quality of life of the population [1], [2], [3], [4], [5].

The Planning Secretariat of the State of Bahia (SEPLAN) ´1] defines the Identity Territory as follows:

> It is a public policy planning unit, made up of municipal identity groupings, usually contiguous, formed according to social, cultural, economic and geographical criteria, recognized by the population as the historically built space to which they belong, with an identity that expands the possibilities of social and territorial cohesion as provided for in the Multiannual Plan [1].

The State of Bahia, with a territorial extension of 567,295 km², is administratively divided into 27 Territories of Identity, among which the Lower South stand out. This territory is composed of 15 municipalities: Aratuípe, Cairu, Camamu, Gandu, Ibirapitanga, Igrapiúna, Ituberá,

Jaguaripe, Nilo Peçanha, Piraí do Norte, Presidente Tancredo Neves, Taperoá, Teolândia, Valença and Wenceslau Guimarães [6].

Located in the eastern portion of the state, the Lower South are part of a mosaic of Environmental Protection Areas (APA), having a rich architectural and cultural heritage of inestimable historical value, makes it a favorable destination for ecotourism. The region also has significant economic potential, resulting from its natural wealth and strong agricultural vocation [6].

The municipality of Taperoá originated from an indigenous village called São Miguel de Taperaguá, founded on a hill by the Jesuits in 1561, the year in which the Church of São Miguel was also built. The name Taperaguá later gave rise to the word Taperoá, which, in the Tupi language, means "inhabitant of the taperas" or "ruins of the wrecks", while Taperaguá means "bags of stone", reflecting geographical and cultural characteristics associated with the territory [7], [8].

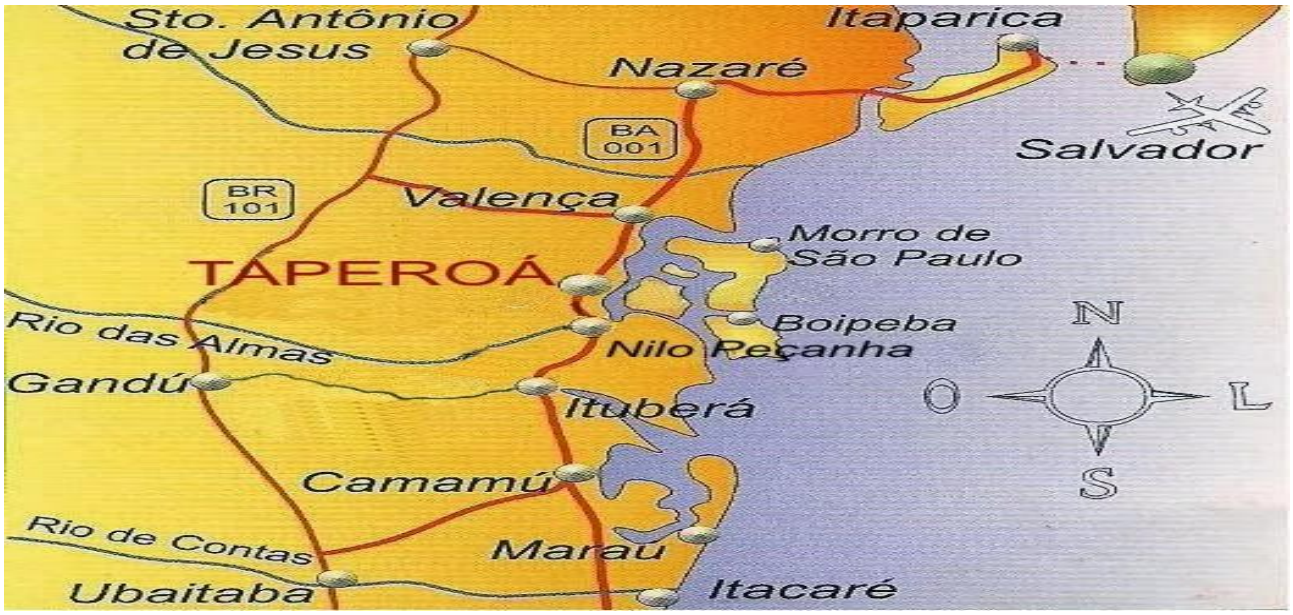
This historical process evidences the strong indigenous and missionary influence in the sociocultural formation of the municipality, constituting relevant identity elements for the understanding of the local territorial dynamics. The municipality was initially created with five villages [9].

The local climate is tropical, hot and humid, with no defined dry season. The average annual rainfall is approximately 2,000 mm, and the average annual temperature is 25 ºC [10].

The municipality of Taperoá is part of the Lower South region of the State of Bahia. It is located in the homogeneous microregion of the Tabuleiros de Valença and being part of the Bay of Tinharé. It is limited to the north by Valença; to the south with Nilo Peçanha; to the east by Cairu; and to the west by Teolândia [9], [10].

Currently, the municipality is composed of the villages of Graciosa, Lamego, Escadinha, Serra Grande, Roda D'Água, Formosa, Itiuba, Waldick, Jequié Mirim, Miguel Chico, Areinha, Jacaré, Jordão, Tanques, Marimbú, in addition to the district of Camurugi [9], [10], as can be seen in Figure 1.

Figure 1 – *Map of Taperoá*



Source: http://portaldetaperoa.blogspot.com/p/dados-geograficos_13.html (2022)

Agriculture is the main sector of the local economy, especially the cultivation of guaraná, as well as extractivism, fishing and shellfish. The main crops in the region are: oil palm, cloves, cocoa, piassava and rubber trees [9], [10].

Brazil is one of the largest fruit producers in the world, with a wide diversity of fruit species, each presenting distinct characteristics when compared to those produced in other places. This condition may be related to both the edaphoclimatic conditions and the agricultural management employed [11], [12].

In a globalized world, in which strong competition between companies, cities, states and countries predominates, differentiation is sought as a strategy to obtain competitive advantages. One of the tools used to highlight a product that is distinct from its peers is the Geographical Indication (GI), which acts as an instrument for insertion in markets, creation of niches and consolidation of the product as a reference of quality and origin [13].

There are already several notorious and internationally recognized products, such as champagne from the homonymous region, Parma ham, Carrara marble, Port wine, tequila from Mexico, Brazilian cachaça, among others. In Brazil, the recognition of the wine produced in Vale dos Vinhedos has brought notoriety to the product, conferred a competitive advantage and boosted regional wine tourism [14], [15], [16], [17].

GI is related to the unique characteristics of a production process, such as production method, cultivation techniques, traditional know-how, and notoriety of the product or service. It is a distinctive sign used in products or services that have a geographical origin, as well as quality, reputation or characteristics attributable to a particular location. These characteristics may result from traditional knowledge and processes passed down orally between generations in a specific region [18]. GI is also an instrument for the promotion and safeguarding of cultural heritage, environmental preservation, social responsibility and territorial development [19]. In some cases, the knowledge is in the public domain, and it is not possible to prevent its use or appropriation by third parties.

Law No. 9,276/1996 (Industrial Property Law - LPI) is the legislation in force in Brazil. The Gis are regulated in articles 176 to 182, with its definitions and modalities: Indication of Origin (IP) and Denomination of Origin (DO) [20].

Article 177 defines an IP to be the geographical name of a country, city, region or locality in its territory that has become known as a center of extraction, production, or manufacture of a certain good or provision of a specific service [20]

Article 178, in turn, defines DO as the geographical name of a country, city, region or locality in its territory that designates a product or service whose qualities or characteristics are exclusively or essentially due to the geographical environment, including natural and human factors [20].

GI has been growing in the national and international scenario, consolidating itself as an instrument of territorial enhancement and product differentiation. In Brazil, however, despite recent advances, it is still a field in the process of consolidation, whose strengthening depends on the support of academia, public policies, and development institutions - factors that are likely to drive its expansion in the coming years [15], [17].

The State of Bahia, despite its large territorial extension, cultural diversity, and geographical division, has only five exclusive GI (sugarcane brandy of the cachaça type, green coffee beans, cocoa beans, bobbin lace and banana) and two shared with the state of Pernambuco (table grapes and mangoes, as well as wines). This number is even smaller when one considers that the state has 417 municipalities, many of which have high potential for the recognition of products or services, especially agricultural and artisanal, managed and produced based on traditional knowledge resulting from the miscegenation of people and their cultural contribution.

The guaraná tree, whose scientific name is *Paullinia cupana*, is a climbing shrub of the family *Sapindaceae* that can take form a vine in its wild state and is native to the Amazon, being found in Brazil and Venezuela. It was initially cultivated by the Maués indigenous people. Even before colonization, the Sataré-Mawé indigenous people, known as "children of guaraná", already used the fruit as a stimulating drink, according to a report by Father João Felipe Bettendorf, in 1664. The name of the fruit derives from the indigenous term *uaranã*, which means "people's eye", because, when opened, it bears a physical resemblance to the human eye [21], [22], [23]. The fruit has a red color (when ripe), white pulp and black seeds. Figure 2 shows guaraná.

Figure 2 *- Guaraná*

Source: Internet

Guaraná is widely used in the pharmaceutical industry and in the production of soft drinks, powder, syrup, juices, and sticks. It possesses stimulating and aphrodisiac properties, cardiovascular tonic action, and can help fight migraines, fever, cramps, and cramps, in addition to having a diuretic effect. In the cosmetics sector, it is used in the treatment of oily skin and cellulite. Its composition includes caffeine, proteins, iron, starch, sugars, potassium, tannin, phosphorus, calcium, thiamine, and vitamin A [24], [25], [26].

In the 1970s, the guaraná culture began to expand throughout Brazil, being introduced in the municipality of Taperoá, where it naturally adapted to the local edaphoclimatic conditions, such as fertile soil, rainfall, relative humidity, and temperature. The agricultural techniques employed provided higher productivity compared to that cultivated in the Amazon, due to the greater ease of management, allowing the municipality to become one of the largest producers on a commercial scale from the 2000s onwards [21], [27]. Planting can take place throughout the year, and local production is destined for factories installed in the region as well as for export to other countries [27].

Guaraná cultivation has an average productivity of 350 kg/ha, which is considered high when compared to the productivity of the Amazon region, a national reference for being the place of origin of the crop [10], [27], [28]. The Lower South Territory concentrates the largest national production of guaraná cultivated outside the Amazon region, with the municipality of Taperoá accounting for the highest productive share in recent years [10].

Other municipalities in the Lower South include Camamu, Ituberá, Nilo Peçanha, Valença, and Una. The productive period occurs between October and March, when the fruits reach adequate physiological maturity and are ready for harvest, according to technical information on the cultivation of the crop in Brazil [10], [21], [28].

The notoriety of the product can be evidenced by the holding of the Guaraná Festival, an international event held in the municipality. The municipal administration seeks to consolidate Taperoá as the "city of guaraná".

In this context, the objective of the present work is to verify the possibility of recognizing guaraná from Taperoá (BA) as a Geographical Indication (GI).

METHODOLOGY

The methodology applied was characterized as descriptive, having as an investigative means the bibliographic research, since it used databases and specialized literature [29], [30], with the objective of identifying information related to guaraná, the Lower South Identity Territory, the municipality of Taperoá (BA) and the GI, in addition to the use of secondary sources.

The methodological approach adopted consisted of a literature review [29]. [30], Initially, the study addressed content related to guaraná, its origin and its importance for socioeconomic development. Next, aspects related to GIs, the central theme of the present work, were analyzed.

As for the purposes, the research had an exploratory character. Exploratory research aims to provide greater familiarity with the proposed problem, contributing to the improvement of ideas and enabling a better understanding of the various aspects related to the investigated theme [29].

The qualitative approach was chosen, considering the purpose of the study, whose purpose is to deepen the understanding of the analyzed phenomenon and collaborate to improve the interpretations of the research object, allowing a broader understanding of the aspects related to the theme studied [29].

For the collection of secondary data, a bibliographic survey was carried out through consultation of current legislation, academic literature and available materials on the investigated theme. This procedure is characterized as bibliographic research, as it involves the collection of information in existing publications, such as books, scientific articles, technical reports and institutional documents available in reliable physical or digital media [30].

Databases and documents from recognized institutions were consulted, such as the National Institute of Industrial Property (INPI), the Brazilian Agricultural Research Corporation (EMBRAPA) and the Brazilian Institute of Geography and Statistics (IBGE), among other relevant sources.

The structuring of the research stages can be seen in Table 1.

Table 1 *– Methodological stages of the research*

Step	Description	Procedures performed	Data Source
1 Problem definition and objectives	Delimitation of the theme and formulation of the research question	Identification of the potential for recognition of guaraná from Taperoá (BA) as a GI	Scientific literature and institutional documents
2 Literature review	Theoretical survey on the object of study	Research on guaraná, Lower South territory, GI, territorial development and legislation	Scientific articles, books, legislation, technical reports
3 Characterization of the territory	Analysis of the geographical, historical and socioeconomic characteristics of the study area	Data collection on the municipality of Taperoá (BA) and the Lower South Identity Territory	IBGE, SEPLAN, municipal documents
4 Product Review	Identification of the productive and differential characteristics of local guaraná	Survey of information on cultivation, management, tradition, productivity and notoriety	CEPLAC, EMBRAPA, specialized literature
5 Analysis of the potential IG	Assessment of requirements for GI recognition	Verification of notoriety, territorial link, know-how, productive organization and cultural identity	INPI, current legislation, academic studies
6 Synthesis and interpretation of results	Integration of the information obtained	Discussion of the potential for recognition of the GI of guaraná from Taperoá (BA)	Qualitative analysis of the data
7 Conclusions and recommendations	Presentation of the final results of the study	Indication of possibilities, limitations and future perspectives for GI recognition	Authors' interpretation

Source: Prepared by the authors (2026)

RESULTS AND DISCUSSION

Over time, consumers have become increasingly demanding in relation to handling, use, durability, origin, labor employed, working conditions and quality of products [31]. There are several strategies that companies can use to meet these requirements imposed by the market, one of them being the GI, which ensures the origin, quality and differentiation of the product in relation to similar products produced in other territories.

Consumers also show growing concern about environmental issues and the sustainability of the planet. In this context, GI products have, among their principles, the valorization of responsible production practices, including the prohibition of the use of labor in conditions analogous to slavery and child labor in their production chain, thereby contributing to the fulfillment market and socio-environmental requirements.

Producers need to be made aware of the benefits generated by the recognition of a GI, as well as the importance of collective organization through associations, which enable cost reduction, strengthening competitiveness, and access to broader markets. The association also favors the exchange of know-how among its members, allowing best practices to be disseminated, resulting in productive and economic gains. In addition, it constitutes a channel of collective representation for forwarding bureaucratic demands, facilitating dialogue with public and private institutions, and defense of the common interests of producers, thereby promoting the development of both the production chain and the region.

Guaraná is part of the Sectorial Chamber of the Secretariat of Agriculture, Livestock, Irrigation, Fisheries and Aquaculture (SEAGRI), and is linked to several institutions that are part of the production chain, such as the Association of Small Producers of the Onça Project, the Cooperative of Guaraná Producers of Family Agriculture of the Lower South Territory, and the Union of Rural Workers of Taperoá. Guaraná is the main agricultural product and a primary source of income for a significant portion of the local population. Among the requirements for the recognition of a product or service as a GI, the need to organize producers into an entity representing their interests stands out, which can be carried out through existing associations, which is one of the fundamental requirements for the application for registration [6].

Law No. 9,276/1996, in its articles 177 and 178, establishes the minimum requirements that must be considered when intending to recognize a product or service as a GI. Table 2 presents the main elements necessary to enhance the recognition process.

***Table 2** – Minimum requirements for enhancing recognition as a GI*

Minimum requirements to potentiate or register as a GI							Product differentiation
Human factors			Natural factors				
Know-how	Tradition	Typicality	Climate	Solo	Vegetation	Relief	Notability

Source: Authorship (2022)

Table 2 systematizes the minimum requirements necessary to support a request for recognition of a product or service with a GI, organized into two main categories: human factors and natural factors, which, together, contribute to the differentiation of the good.

The structure of Table 2 shows that GI is not based on a single aspect, but on the interaction between the human element and the geographical environment. Human factors encompass intangible and cultural elements built over time by the local community:

- **Know-how**: refers to traditional knowledge, cultivation, management and processing techniques developed and transmitted between generations by the producers of Taperoá.
- **Tradition**: refers to the historical continuity of guaraná production in the region, consolidating a culture around the product.
- **Typicality**: represents the unique characteristics of the guaraná de Taperoá that distinguish it from others, giving it its own identity.
- **Notoriety**: corresponds to the public recognition and reputation that the product has achieved, both regionally and internationally, as exemplified by the Guaraná Festival.

The natural factors refer to the specific edaphoclimatic conditions of the territory of Taperoá, which are decisive for the qualities of the product:

- **Climate**: the climatic conditions of the region, such as temperature and rainfall, directly influence the development of the plant.
- **Soil**: the fertility and characteristics of the local soil contribute to the high productivity and properties of guaraná.
- **Vegetation**: The surrounding vegetation is part of the ecosystem and can influence the microclimate and growing conditions.
- **Relief**: the topographic characteristics of the region, including altitude and slope, affect drainage, solar incidence and crop management.

In short, the differentiation of the property, a central element of Table 2, results from the synergistic interaction between human factors (knowledge, culture and tradition of the producers) and natural factors (physical and geographical conditions of the territory of Taperoá). This unique combination gives local guaraná its specific qualities, high productivity and reputation, justifying its potential for recognition as a GI.

The Lower South Identity Territory is composed of 15 municipalities, with emphasis on the municipality of Valença, which exerts great influence over the other surrounding municipalities because it is the largest commercial center in the region and has significant economic power as a result of the various business segments installed there. The municipality also has agricultural and tourist relevance, fundamental factors for regional development.

Agricultural diversity is present in the Lower South Identity Territory, being made up mostly of small farmers who use the know-how learned from their ancestors and transmitted orally between generations. This factor is decisive for the management of agricultural culture and contributes to the increase and improvement of product productivity, as occurs with Taperoá guaraná, which, in a recent period, has stood out as one of the largest producers in the world. Other crops present in the region include oil palm, cajá, pineapple, passion fruit, black pepper, cloves, rubber, among others, with agriculture being an activity of great economic relevance.

In Maués, in the state of Amazonas, guaraná is already recognized as a GI, since local producers, especially native indigenous people, have a greater tradition in the management of the product. The first descriptive record of guaraná occurred in 1669, more than 300 years ago, giving it superior quality when compared to other similar ones, a condition that directly influences the commercialization price. The Sateré-Mawé indigenous people cultivate guaraná, using it both as food and in rituals.

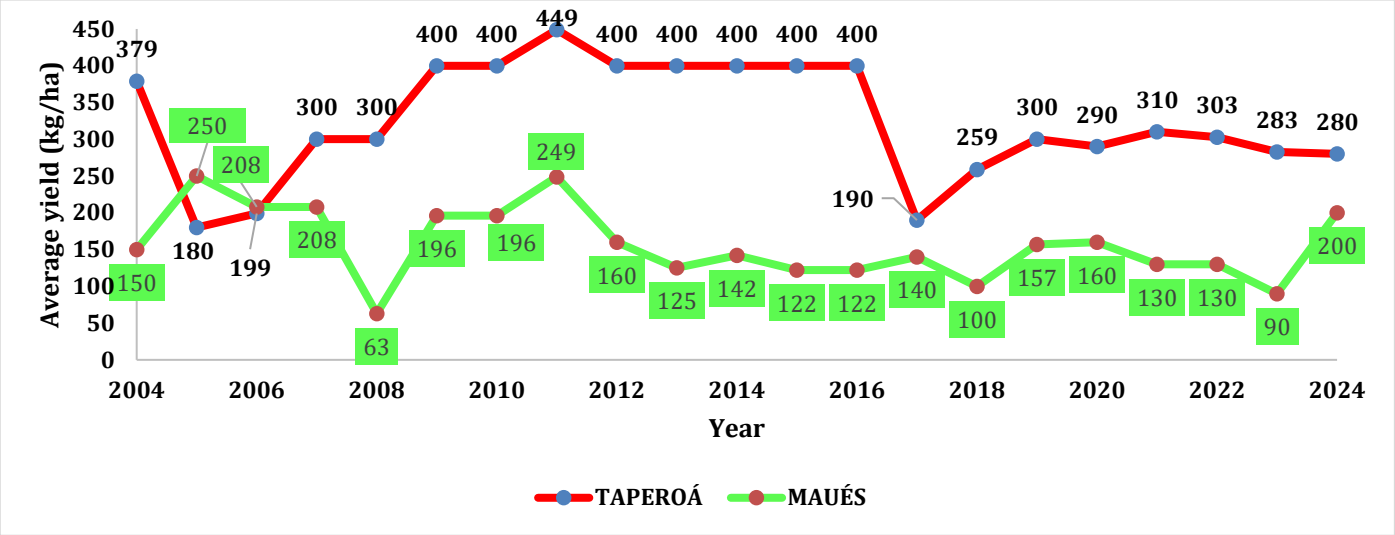
PRODUCTIVITY

Taperoá has a relatively high and stable yield (average close to 300-400 kg/ha), falling in 2017, but maintaining levels higher than Maués in most years. In turn, Maués has a lower yield, a negative highlight in 2008 (63 kg/ha) and recovery in 2024 (200 kg/ha). Therefore, Taperoá demonstrates

greater productive efficiency per hectare, while Maués compensates for lower productivity with greater planted area and greater economic appreciation of the product.

In Taperoá (BA), the management of the product is more recent, but the techniques used were adapted from other agricultural crops, a factor that contributed to its high productivity, as can be seen in Figure 3.

Figure 3 – *Guaraná productivity in Taperoá and Maués*



Source: Authorship based on IBGE data (2022)

Figure 3 shows that the productivity of guaraná in Taperoá is, on average, about 47.50% higher than that observed in Maués. Among the factors associated with this performance, the edaphoclimatic conditions favorable to the adaptability of the crop in Bahian soil stand out. The climate of the region is humid tropical, with high temperatures ranging between 21 ºC and 25 ºC and rainfall distributed throughout the year. In turn, the climate of Maués is classified as tropical rainy, with an average temperature of 28 ºC and variations between 26 ºC and 32 ºC.

The comparative analysis of guaraná productivity data (kg/ha) in the municipalities of Taperoá (Bahia) and Maués (Amazonas), in the period from 2004 to 2024, reveals distinct patterns that corroborate the discussions presented about the potential of GI.

The municipality of Taperoá has a significantly higher productivity than Maués throughout almost the entire time series. The average annual productivity of Taperoá is approximately 332.12 kg/ha, often remaining in the range between 300 and 400 kg/ha and reaching peaks of 449 kg/ha in 2011. In contrast, Maués rarely exceeds the 250 kg/ha mark, with a peak in 2005 of approximately 250 kg/ha.

In addition, Taperoá demonstrates more stable and consistent production, with several consecutive years remaining at the level of 400 kg/ha in the period from 2009 to 2016. Maués, on the other hand, shows sharper fluctuations and a more pronounced downward trend in recent years.

Although management in Taperoá is more recent, techniques adapted from other agricultural crops have resulted in significant productivity gains. Data from 2004 to 2016 strongly support this hypothesis, with Taperoá consistently and significantly outperforming Maués. This suggests that local agricultural practices, combined with favorable soil and climatic conditions, were highly efficient in maximizing production.

A critical point revealed by the data is the sharp and sustained drop in productivity in Taperoá from 2017 onwards. Before this period, the municipality operated at a high level, above 350 kg/ha in most years. After 2016, productivity fell to 190 kg/ha in 2017 and, although it showed partial recovery, it did not return to previous levels, oscillating between 259 and 310 kg/ha, values lower than the average observed between 2004 and 2016, estimated at approximately 350 kg/ha. In 2017, there was a reduction of 14.50% in the area destined to guaraná planting, which may have influenced productivity, as well as the price, which decreased by 56.65%. Other factors that may have contributed to this drop include phytosanitary problems, changes in management practices, adverse weather conditions, and lack of adequate renewal of aged guaraná plantations.

The municipality of Maués, holder of the GI of guaraná, presented lower average productivity and higher volatility. The peak recorded in 2005 is an exception, and the general trend, especially after 2012, is one of reduced productivity, often below 150 kg/ha. This result reinforces the understanding that the value of Maués guaraná is more associated with tradition, typicity and ancestral know-how - human and cultural factors - than with large-scale

productivity. The top price probably reflects this immaterial value and reputation built over centuries.

Therefore, Taperoá presents a relevant productive differential, especially in the period from 2004 to 2016, which can be attributed to the interaction between natural (edaphoclimatic) and human (adapted management techniques) factors. This high productivity and successful adaptation are important pillars to support a GI application, particularly in the Indication of Origin species, by recognizing the region as a producing center.

The traditional stages of guaraná processing include fermentation, pulping, washing, roasting, crushing, baking, and smoking. The main actors involved in the production chain are the producer, the intermediary and the processing industry.

In the guaraná production industry, the company Proelin Indústria e Comércio de Bebidas Ltda, founded in 2006 in Taperoá, stands out, whose economic activity consists of the manufacture of fruit, vegetable and vegetable juices.

The compositional difference between the Bahian and Amazonian guaranás are as follows: "[...] samples of guaraná from Bahia had a higher content of caffeine, catechin, and epicatechin in their composition, while in the samples from Amazonas, fatty acids were the main responsible for their discrimination in principal component analysis (PCA)" [21, p. 9]. This condition demonstrates that the Bahian product has characteristics that can be attributed to the natural factors of the production territory.

To compete with the "Guaraná of the Amazon", preferred by soft drink industries, pharmaceutical companies and extract importers, Bahian producers could develop the brand "Guaraná da Mata Atlântica". The difference in the production process lies in the fact that, in the Amazon, production is predominantly artisanal and drying is carried out in ovens, while in Bahia it is dried in the sun, giving a different flavor to guaraná powder. These production conditions allow the price of guaraná from Taperoá (BA) to correspond to approximately one third of the values paid for guaraná from Maués [32].

The practice of drying in the sun is a human factor, in which know-how is determinant, and can also be associated with the natural factors of the territory.

The comparative synthesis between the municipalities can be seen in Table 3.

Table 3 – Comparative summary

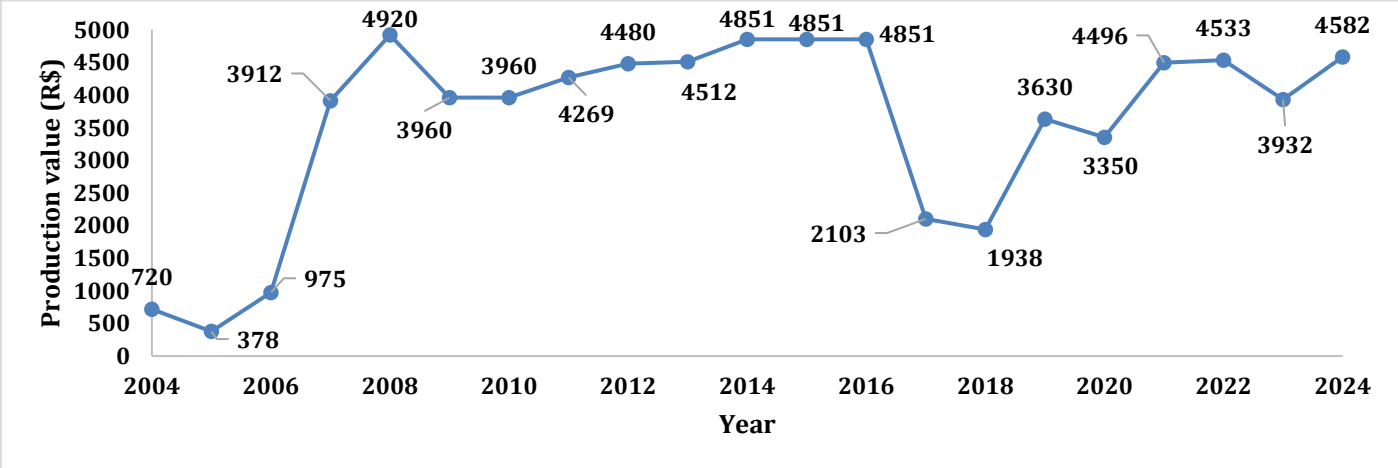
Aspects	Taperoá	Maués
Territorial scale	Minor	Largest
Productive stability	More stable until 2016	More volatile
Added value	Minor	Significantly higher
Productivity (kg/ha)	Superior in most years	Lower and more unstable
Recent trend (2020-2024	Moderate recovery	Strong economic appreciation

Source: Authorship (2026)

PRODUCTION VALUE

The municipality of Taperoá (BA) maintains modest values, with relative stability between 2012 and 2016 (R$ 4,800 thousand), a drop in 2017 and 2018 and a gradual recovery until 2024. Figure 4 shows the value of production of guaraná produced in Taperoá (BA).

Figure 4 *– Value of guaraná production in Taperoá (BA)*



Source: Authorship based on IBGE data (2022)

The value of guaraná production is higher in Maués than in Taperoá, and one of the reasons can be attributed to the drying process, which in the city of Bahia occurs naturally (in the sun), while in Maués it is carried out by means of ovens.

Figure 4 shows a clear trajectory of growth and appreciation of production over the period analyzed.

Initial period (2004-2006): the values were relatively low, ranging between 378 thousand and 975 thousand reais, indicating an initial phase of consolidation of the crop in the region.

Accelerated growth (2007-2016): from 2007 onwards, there was a significant jump, with the value of production exceeding 3.9 million reais. This high level remained consistent until 2016, with values ranging between 3.9 million and 4.8 million reais, demonstrating a period of maturity and high appreciation of production.

Sharp drop (2017-2018): the years 2017 and 2018 registered a significant reduction, with the value of production falling to approximately 2.1 million and 1.9 million reais, respectively. This retraction coincides with the drop in productivity observed in Figure 2 for the same period.

Recovery and stabilization (2019-2024): as of 2019, the values recovered and stabilized at a new level, between 3.3 million and 4.5 million reais, approaching the best moments of the previous period, still with some fluctuations.

Statistical measures provide a detailed picture of data behavior:

Average (3,724.15 x 1000 R$): the average value of production over the 20 years was approximately 3.72 million reais, evidencing the economic relevance of guaraná for the municipality.

Median (4,114.50 x 1000 R$): the median is higher than the average (3,724.15 million reais), indicating asymmetry in the distribution of data. Half of the years presented a production value above 4.11 million reais, while the other half remained below this level.

Standard Deviation (1,330.33 x 1000 RS) and Variance (1,769,779.08): these high values indicate great dispersion in relation to the mean, reflecting significant fluctuations over the analyzed period, alternating between low (2004-2006), high (2007-2016) and fall (2017-2018) phases.

The production of guaraná represents an economic activity of great relevance for the municipality, with an average of more than 3.7 million reais per year and peaks that exceed 4.9 million reais. The existence of a prolonged period of high production value, especially between 2007 and 2016, strengthens the argument of the notoriety and economic relevance of Taperoá guaraná, fundamental requirements for recognition as a GI. However, the recent instability reinforces the need for organization of the productive sector to ensure economic sustainability and the continuous appreciation of the product.

Guaraná is a product present in the daily life of the local population and is part of the composition of several products, such as syrup (an exclusive product of industries that require a high level of technology and capital), guaraná powder (roasted and ground grain), guaraná stick (crushed and piled guaraná in a stick, molded into a stick format, dry and smoked), soft drinks, among others, in addition to being appreciated for its energetic and gastronomic qualities [21].

The hot and humid climate, acting on an area of relief on the rise, enabled the development of rounded hills, whose tops have an altitude close to 100 meters in the eastern portion and exceed 400 meters a little more than 20 km to the west. The estimated population of the municipality for 2025 is 18,556 inhabitants, according to 2022 data from the IBGE [10].

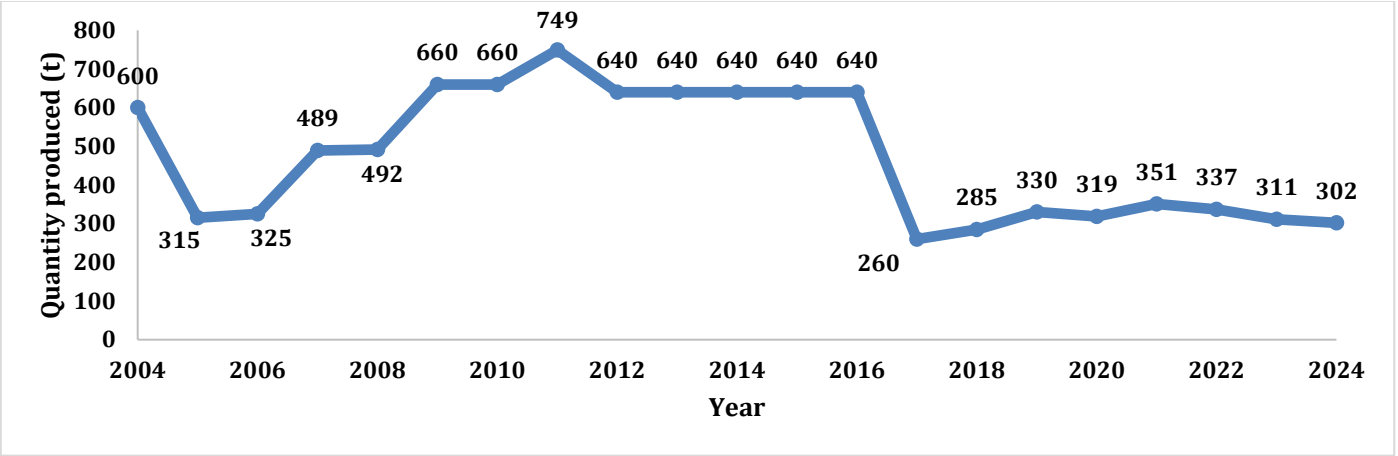
The predominant vegetation is the Atlantic Forest, with a great diversity of soils. The region has a natural wealth of water resources, including waterfalls, mangroves and underground aquifers. In the rural area, the economy is characterized by the predominance of diversified agriculture, while on the coast, activities related to fishing and tourism prevail [6].

These factors may have influenced the productivity and production of guaraná in Taperoá (BA), but there is a need for more in-depth studies to conclusively substantiate this relationship.

ANNUAL PRODUCTION

The municipality of Taperoá (BA) has relatively stable production between 2004 and 2016, around 600-640 t. Figure 5 shows the annual production of guaraná between 2004 and 2024, according to data obtained from the IBGE.

Figure 5 *– Annual production of guaraná in tons*



Source: Authorship based on IBGE data (2022)

Figure 5 reveals three distinct phases in guaraná production in Taperoá (BA).

Consolidation Phase (2004-2006): initial period with relatively low production, ranging from 315 to 600 tons. The year 2004 stands out with 600 tons, however, there is a decrease in the following two years, possibly reflecting the process of crop adaptation and the stabilization of management practices.

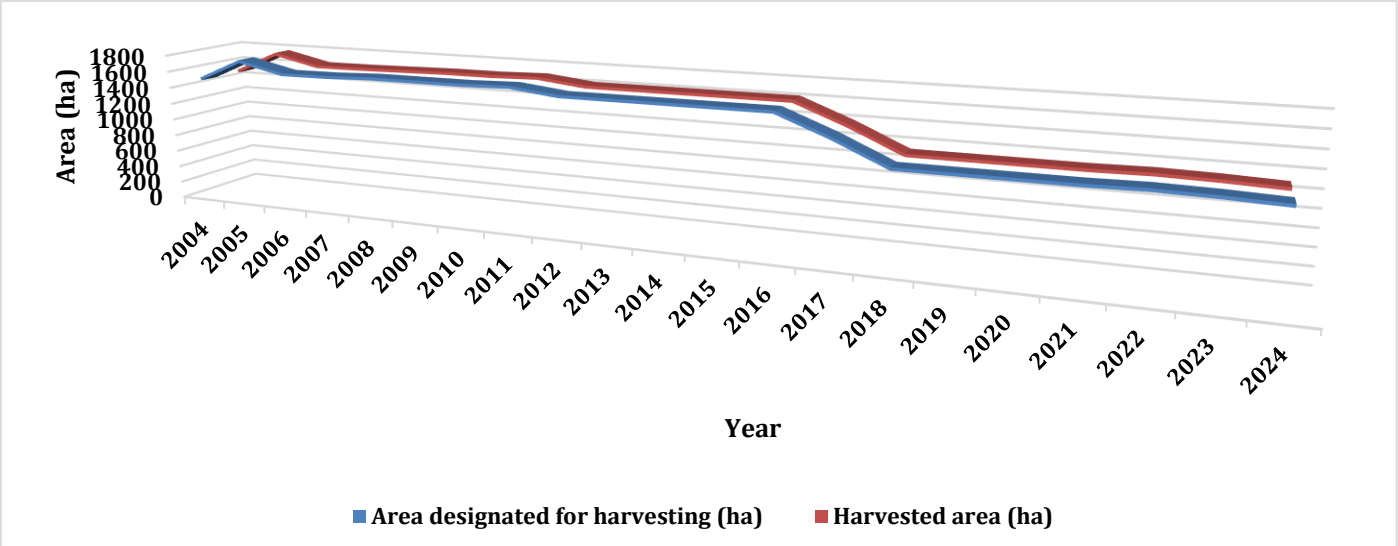
Expansion and Stability Phase (2007-2016): this period represents the productive peak of guaraná in Taperoá. Production grows consistently, reaching a peak of 749 tons in 2011. Between 2012 and 2016, there was a remarkable stability, with production remaining constant at 640 tons/year for five consecutive years, demonstrating maturity and production consistency. This period coincides with the moment of highest production value, confirming the economic importance of the crop. The production peak in 2011 does not exactly correspond to the value peak (4,920 thousand reais in 2008), which suggests that factors such as market price and added value also influence revenue.

Phase of Decline and Partial Recovery (2017-2024): from 2017 onwards, there is a sharp drop, with production reducing to 260 tons, the lowest value in the time series. This drastic reduction represents a loss of approximately 60% of production capacity. In the following years, there was a slow and modest recovery, with production oscillating between 285 and 351 tons, a level significantly lower than the golden period (2007-2016).

AREA INTENDED FOR PLANTING AND HARVESTED AREA

Taperoá maintains a relatively stable target area and harvested area until 2016 (~1,600 ha), a significant reduction from 2017 (about 1,100 ha) and a small retraction until 2024 (1,078 ha). The area destined for harvesting and the area effectively harvested of guaraná in the municipality of Taperoá (BA) are shown in Figure 6.

Figure 6 *– Area destined for planting and harvested area*



Source: Authorship (2026)

Figure 6 shows that, in almost the entire historical series, the areas allocated and harvested are identical, indicating that practically the entire planted area is effectively harvested. The only exception occurs in 2008, when the area allocated (1,600 ha) was slightly higher than the harvested area (1,640 ha), suggesting a small loss or impossibility of harvesting in that specific year.

The historical series reveals three distinct phases in the territorial occupation of the guaraná crop.

Expansion Phase (2004-2005): initial period of growth, with the area increasing from 1,500 ha (2004) to a maximum peak of 1,750 ha (2005), representing the largest territorial extension destined to the crop in the entire historical series.

High Level Stability Phase (2006-2016): after a small reduction in 2006 (1,626 ha), the area remained relatively stable at high levels, oscillating between 1,600 and 1,665 ha for an extended period of 11 years, demonstrating the consolidation of the crop in the region.

Accelerated Retraction Phase (2017-2024): from 2017 onwards, a drastic and continuous reduction in the cultivated area is observed:

- 2017: 1,368 ha remaining.
- 2018-2023: reduction to 1,100 ha (level maintained for six years).
- 2024: further reduction to 1,078 ha (lowest value in the series)

This retraction represents a loss of approximately 38% of the cultivated area in relation to the peak of 2005 (from 1,750 ha to 1,078 ha). This condition constitutes an alert that demands diagnosis and strategic actions to reverse the situation, objectives that can be strengthened through GI.

The reduction in the cultivated area from 2017 onwards (from approximately 1,600 ha to 1,100 ha) coincides temporally with the sharp drop in the amount produced (from 640 t to 260 t in the same period), indicating that the territorial retraction is one of the explanatory factors for the decrease in production.

Despite the reduction in the area, production did not fall in the same proportion in all years, suggesting possible productivity gains (production per hectare) in certain periods.

Finally, the almost perfect correspondence between the destined area and the harvested area – with only a small difference in 2008 – demonstrates efficiency in the use of planted areas and indicates that productive losses associated with non-harvesting are practically non-existent in the municipality throughout the historical series analyzed.

NOTORIETY

Product awareness can be demonstrated in several ways, as shown below:

The municipality, being a major national producer of guaraná, has also become an exporter to countries such as Germany, France, Italy. United States of America, among others. In this way, the external public already has knowledge about guaraná and its qualities, as well as about its differences in relation to similar ones produced in other places.

There are television and journalistic reports at local, regional and national level, which attests to the fame of guaraná from Taperoá (BA). In the television media, the following records are available on digital platforms:

- TVE Bahia presented the *Rural Productive* program in 2022, addressing the Onça Project, from the Mixed Cooperative, specifically on family farming in guaraná production.
- In 2018, the Rede Globo rebroadcaster showed, in the *Conexão Program*, the city and rural tourism, highlighting the municipality's title as the largest guaraná producer in Brazil [33].
- TV Record, in 2016, presented the program *A Bahia que a gente gosta* in Taperoá, reporting on the local guaraná and its producers [34].

In the written media, some highlights were the following:

- In 2018, Globo's website published a report on rural tourism through the *Conexão* program, showing a guaraná plantation and showing that Taperoá (BA) is the largest Brazilian producer [33].
- In 2011, the Jornal Grande Bahia reported the condition of Taperoá (BA) as the largest Brazilian producer of guaraná.
- In 2010, the Portal do Baixo Sul announced the Expo Inter Guaraná, which takes place in parallel with the Guaraná Festival, an event that contributes to the dissemination of the municipality's product, making it known nationally and internationally.

On the part of academia, there are several works published in scientific journals and events, such as those listed below:

Baqueiro, A. U. P., Sena, C. F., Lima, Â. M. F., Lopes, J. M., & Silva, M. S. (2023). Potencial de Indicação Geográfica para o Guaraná de Taperoá–Bahia. *OBSERVATÓRIO DE LA ECONOMÍA LATINOAMERICANA*, *21*(3), 1422-1441.

Baqueiro, A. U. P. et al. (2019). Potential for Geographical Indication for guaraná from Taperoá-Bahia. In: *10th International Symposium on Technological Innovation*.

Brito, C. O. (2023). *Geographical indication of palm oil and tourism in Taperoá – BA: possibilities for territorial development*. (Doctoral Dissertation), Federal University of Bahia.

D´Alexandria, M. A. B., Silva, A. S., & Souza, W. C. (Apr./June 2015). Dendê de Valença e guaraná de Taperoá: potenciais de indicação geográfica no Território do Baixo Sul da Bahia. *Cad. Prospec*. Salvador, 8(2), 375-382.

da Silva Junior, A. L. S., Santos, H. M., Coutinho, J. P., & de Jesus, R. M. (2018). Evaluation of the quality of guaraná (*Paullinia cupana*) as a function of postharvest processing, using caffeine as a marker. 70th Annual Meeting of the SBPC - July 22 to 28, 2018 - UFAL - Maceió / AL.

Oliveira, V. C., Reis, A. S., Leal, T. T. B., Gonzalez, S. D. P., Oliveira, F. É. R., Silva, R. M., & Silva, F. (2013). 13696-Interação agroecológica no Baixo Sul: relato de experiência em Taperoá, Bahia. *Cadernos de Agroecologia [Volumes 1 (2006) a 12 (2017)]*, *8*(2).

Piovesan, J. C. (2011). Análise comparativa da sustentabilidade de pequenas propriedades rurais sob manejos agrícolas convencional e agroecológico no baixo sul da Bahia**.** (Doctoral dissertation), Federal University of Bahia.

Oliveira, G. G., Matos, E. N., & Santos, A. P. (2006). Economic viability of organic agroforestry systems in the Southern Bahia Lowlands – the case of the Onça Project. XLIV SOBER CONGRESS.

Saldanha, C. B., Rocha, U. B., & Santos, W. P. C. (2022). Analysis of territorial development in the scenario of recognized geographical indications in Bahia. *Cadernos de Prospecção*, 15(2), 649-666.

CONCLUSION

The results obtained throughout this study show that the municipality of Taperoá (BA) has a consistent set of technical, productive, historical and territorial elements that support the potential for the recognition of local guaraná as a Geographical Indication (GI), especially in the Indication of Origin (IP) modality.

The analysis of natural factors shows that the edaphoclimatic conditions of the region – characterized by a humid tropical climate, favorable soils and relief compatible with cultivation – contributed significantly to the adaptation of the crop and to productivity levels higher than those observed in other producing regions, including in traditionally recognized areas, such as Maués (AM). This productive advantage, particularly evident in the period between 2004 and 2016, indicates a strong interaction between the territory and agricultural performance, a fundamental element for the characterization of products with geographic identity.

With regard to human factors, it was verified the existence of local know-how, adapted production practices, consolidated agricultural tradition and regional productive organization, in addition to the presence of cultural events, media notoriety and economic relevance of guaraná for the municipality. These elements reinforce the construction of a territorial identity associated with the product, an essential requirement for obtaining a GI.

The notoriety of Taperoá's guaraná is also manifested by its insertion in national and international markets, by its presence in the media and by the existing academic production on the subject, factors that contribute to the public recognition of the product. The existence of a structured production chain, involving producers, intermediaries and the local processing industry, is another positive aspect for the consolidation of a territorial governance system necessary for the recognition process.

Despite the high potential identified, relevant challenges were observed, such as the reduction of the cultivated area and the drop in production from 2017 onwards, indicating structural vulnerabilities that may compromise the economic sustainability of the activity in the long term. In this context, the recognition of GI can act as a strategic instrument for territorial enhancement, value addition, productive organization, and strengthening of local governance, contributing to the resumption of growth in the sector.

Thus, it is concluded that guaraná from Taperoá presents favorable conditions for recognition as a GI, with strong evidence for the IP modality and future evolutionary potential for Denomination of Origin (DO), provided that technical studies are deepened that prove in a more robust way the causal relationship between the characteristics of the product and the natural factors of the territory.

As limitations, the predominant dependence on secondary data and the absence of more in-depth comparative laboratory analyses that allow the relationship between the chemical composition of the product and the territory to be established with greater precision. In addition, institutional aspects of governance, collective organization of producers and quality control structure, essential elements for the formal recognition process, were not analyzed in detail.

As future prospects, it is recommended to structure an association or regulatory council of producers; the preparation of the Technical Specifications Specification (CET); the carrying out of comparative agronomic and chemical studies between guaraná from Taperoá and that of

other producing regions; economic studies on value addition and territorial impact of GI; and, market evaluations and positioning strategies, with the construction of an identity linked to the concept "Guaraná da Mata Atlântica".

It is expected, for the municipality, the consolidation of the price premium, the integration with the regional bioeconomy and the expansion to international markets. For Brazil, the aim is to expand the national GI policy, strengthen strategies for valuing national products and promote sustainable territorial development.

The recognition of the GI of guaraná can act as a vector of territorial economic transformation, contributing to the reduction of regional inequalities and to the strengthening of an economy based on cultural and natural assets.

Finally, the recognition of Taperoá guaraná as a GI can represent a strategic opportunity to promote sustainable development, strengthen territorial identity and expand the insertion of the product in differentiated markets, contributing to the generation of income and improvement of the living conditions of the local population.

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