

Coffee Production and Geographical Indications (GI): An Analysis of the World Panorama and the Brazilian Reality

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Abstract

Coffee cultivation is of great importance in the world economy. Due to consumers' demand for products with quality and geographic certification, the topic is relevant. The research objective is to portray the international and Brazilian scenario of the coffee production chain, based on production and Geographical Indications (GIs) for the product. The research is classified as exploratory and descriptive in relation to the approach, and as bibliographical and documental in relation to the means of investigation. It was found that the world's largest coffee producers are Brazil, Vietnam, Colombia, and Indonesia. There was a reduction in world production for the 2021/22 crop, due to the low production of arabica coffee in Brazil, but for the 2022/23 crop, an increase in this production is estimated. Most coffee-producing countries follow specific legislation to protect Geographical Indications and others protect them through trademarks. In Brazil, the definition of GI is explained by its species, Indication of Origin (IO), and Denomination of Origin (DO). Brazil is the second with the highest number of GIs for coffee in the world. El Salvador has a GI that represents the entire coffee value chain. Indonesia is the country with the highest number of GIs for coffee in the world and has state support for its promotion. Given this scenario, there is a need to develop public policies aimed at this product. It is indicated for future research the study of these policies and the performance of bodies responsible for the consolidation of GIs in their respective countries.

Keywords: coffee growing, geographical indications, brands, *sui generis* system

1. Introduction

The coffee tree is an evergreen plant that has grown in tropical and subtropical regions. One hundred and twenty-four coffee species have already been identified (Davis et al., 2011), but the two main ones commercialized worldwide are: *Coffea arabica* (arabica) e *Coffea canephora* (robusta). These species differ in terms of agronomic, biochemical, and sensory aspects of the grain, the market, and the use of their products (Ferrão et al., 2019).

Arabica coffee originates from Ethiopia. It had its botanical classification in 1737 and adapted to cold climates (Ferrão et al., 2019). Its production suffers fluctuations due to climatic factors (Schroth et al., 2009; Zullo et al., 2011) and the biennial, defined by variation of years with high and low production (Carvalho et al., 2004). It has the following varieties: Bourbon, Catuai, Catucaí, Icatu, Iapar 59, Mundo Novo, Obatã, Tupi, Topázio among others (Brazilian Service of Support for Micro and Small Enterprises [SEBRAE], 2013). It accounts for 53.34% of world coffee production (United States Department of Agriculture - USDA, 2022).

Robusta coffee originates from Guinea in the Congo Basin. It had its botanical classification in 1895-1897, with geographic distribution in the African continent (Ferrão et al., 2019), has greater heat tolerance (Bunn et al., 2015). Conilon is the most cultivated variety of this type of coffee, with the highest productivity potential (Busato, 2022; SEBRAE, 2013). It accounts for 46.66% of world coffee production (USDA, 2022).

Coffee is traded on the world's main future and commodity exchanges, such as New York and London. Its

cultivation is of great importance in world economy, as its processing, trade, transport, and marketing generate millions of jobs for people around the world. This importance is crucial for the economies of many developing countries (Grüter et al., 2022).

Since the 1990s, new world behaviors emerged, demanding quantity and quality of food (Brazil Specialty Coffee Association [BSCA], 2021). During this period, Brazilian coffee sector experienced a deregulation process resulting from the extinction of the Brazilian Coffee Institute (IBC). This institute defined the policy for the sector, coordinated, as well as controlled, production and commercialization strategies both inside and outside the country. Additionally, it offered technical and economic assistance, along with promotion of study and research on coffee (Brazilian Agricultural Research Corporation - EMBRAPA, 2021).

This deregulation led to a new trend, the appreciation of products with peculiar attributes, both in terms of tangible and intangible aspects (Zylbersztajn et al., 2001). Modernization in coffee production systems and the adoption of innovative techniques had to be adopted based on efficient and quality production (Carvalho et al., 2020). Thus, coffees with superior quality started to have more attractive prices in both national and international market (Carvalho et al., 2011).

With more demanding consumers, coffee producers had to increase the added value of their product, with the production of special coffees with quality and geographic certifications, new ways of selling the drink, and greater sensitivity regarding environmental sustainability (Borrella et al., 2015; Volsi et al., 2019) and social concern, such as conditions of labor used in production (Zylbersztajn et al., 2001).

Geographical Indications (GIs) seek to distinguish the geographical origin of a particular product or service (Ribeiro et al., 2020; Silva et al., 2022). They provide recognition and confidence about the origin of the product, standardization of production, and the possibility of inserting the territory in commercial competitiveness (Caldas et al., 2017).

GI in Brazil is recognized by the Industrial Property Law (Law nº 9.279,1996) (Valente et al., 2012) and standardized by the Brazilian National Institute of Industrial Property (INPI) and the Ministry of Agriculture, Livestock and Food Supply (MAPA) (Caldas, 2013). INPI is the responsible agent for analyzing the pertinence of the indication and carrying out the legal registration of GI (Law nº 9.279,1996) and MAPA encourages GI activities and actions for agricultural products (Ministry of Agriculture, Livestock and Food Supply [MAPA], 2017).

At the international level, GI is recognized by the TRIPS Agreement (Valente et al., 2012) and regulated by the World Trade Organization (WTO) and the World Intellectual Property Organization (WIPO) (Caldas, 2013).

On December 6, 2022, 126 GIs were registered for coffee in the world (Organization for an International Geographical Indications Network - ORIGIN, 2022a). Coffee production represented, in the 2021/2022 harvest, 167,134 million bags (60 kg). It is important to highlight that Brazil is the largest coffee producer in the world (USDA, 2022).

Given the importance of coffee cultivation for the world and Brazilian economy, this work addresses the world and Brazilian panorama of coffee production, relating it to climatic and fertilization conditions. It also considers how GIs for coffees are being protected worldwide, whether *sui generis* system or trademarks (registered, collective or certification marks).

Therefore, the research aims to answer the following question: How can climatic and fertilization factors affect world coffee production? And how are most producing countries protecting their coffee GIs?

Thus, the research aims to portray international and Brazilian scenario of the coffee production chain, based on the measurement of production and GIs for this agricultural product.

The article is structured in six sections, in addition to the introduction. The second section describes the methodology used in the work. The third section discusses GIs, their origins, and legal instruments at international and Brazilian levels. The fourth section, results and discussions, discuss the world and Brazilian coffee scenario and GIs. Finally, the research conclusions.

2. Method

This research is classified as exploratory and descriptive in relation to the approach, and as bibliographical and documental in relation to the means of investigation. Bibliographical research allows a greater coverage of phenomena, it is supported by the contributions of several authors on the subject. Documentary research relies on material that have not yet received analytical treatment (Gil, 2012).

Information from different sources was used, such as books, dissertations, articles, reports, legislation, and institutional websites. Regarding the international and Brazilian panoramas for coffee and GIs, data from

governmental and non-governmental bodies were used.

The research was divided into two phases. The first involved bibliographical research, prospected in the Scopus, Web of Science and Google Scholar databases, based on the keywords “Coffee” and “Geographical Indications”, without temporal delimitation. It was carried out with the contribution of several authors and legislation on the GI theme, its origin, and its legal instruments.

The second stage documental research was conducted, where information was extracted from the global panorama and Brazilian reality, as shown in Chart 1.

Chart 1. Stage of documentary research

Description	World Overview	Brazilian Overview
Identification of coffee production	Report “ <i>Coffee: World Markets and Trade</i> ” (USDA), of 06/23/2022 ¹	Bulletins of Monitoring of Coffee harvest (CONAB) ²
Identification of quantity of coffee GIs	Organization for an International Geographical Indications Network (ORIGIN) In 12/06/2022	National Institute of Industrial Property (INPI) In 12/06/2022

Source: Developed by the authors (2022).

¹ Available at governmental website of United States Department of Agriculture (USDA), observing the data of 2020/21, 2021/22 and 2022/23 harvests (estimative), verified at 12/06/2022.

² Available at governmental website of National Supply Company (CONAB observing the data of 2020, 2021 and 2022 harvests, according to September 2022, bulletin (3° survey) and December 2021 (4° survey).

3. Geographical Indications: Origins and International and Brazilian Legal

Although the use of the geographical name to indicate the quality of the product is outdated, the first intervention by the State regarding GI protection occurred in 1756 for Port Wine from Portugal (Cerdan et al., 2014).

Later, countries organized themselves to create a treaty that addressed other industrial property rights, and in March of 1883 the treaty of the Paris Convention for the Protection of Industrial Property was implemented (World Intellectual Property Organization [WIPO], 1998).

With insufficient protection for some of the signatory countries, a supplementary treaty was promoted to repress false indications of origin. In 1891, the Madrid Agreement was signed. The intention of the agreement was to guarantee a repression that produced more consistent effects against the use of misleading indications of origin. However, the number of countries that joined it was smaller than those that joined the Paris Convention for the Protection of Industrial Property (Cerdan et al., 2014).

As both agreements did not advance in protecting GIs, in 1958 the Lisbon Agreement was created, with the aim of protecting Denominations of Origin and their international Registration. However, adherence to the agreement by countries was very low, making it ineffective (Campinos, 2008).

In 1994, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) was approved. TRIPS is an agreement in which its members must protect or guarantee intellectual property in a minimum way possible and each one established the most effective forms of protection, not constituting an obstacle to trade. Some countries that adhered to it started creating and improving their internal legislation (Cerdan et al., 2014).

The article 22 of TRIPS Agreement defines a GI as a product originating in the territory of a member when a particular quality, reputation or other characteristic is attributable to its geographical origin (Decree N° 1.355, 1994).

Brazil adhered to the TRIPS Agreement, through Decree N° 1,355 of December 30, 1994. It occurred with the authorization of Law N° 9,279 of May 14, 1996, known as the Industrial Property Law (IPL), which deals with the protection of industrial property rights.

IPL establishes the general rules for the recognition of GI in articles 176 to 182 and defines the modalities of GI as: Indication of Origin (IO) and Denomination of Origin (DO), to designate products and services (Law n°

9.279,1996).

The IO relates to the local name that has become known and the DO to the local name in which the characteristics or qualities are due to the geographic environment (Barbosa, 2003). In IO, what is important is the peculiarity with the quality of the product, whereas in DO, the physical, human, and cultural aspects of the environment where it was obtained or produced (Anjos, 2013).

The concept of IO refers to what had already been foreseen in the Industrial Property Code of 1971 and to article 22 of the TRIPS Agreement. The DO refers to what was established in Article 2 of the Lisbon Agreement (1958) and in the European Regulation ER 2081/1992 (Cabral, 2019).

There are other legal provisions that guide GI recognition requests in Brazil: INPI Resolution nº 55 (2013); Normative Instruction INPI nº 95 (2018); INPI Resolution nº 233 (2019); INPI Ordinance nº 415 (2020); and INPI Ordinance nº 4 (2022).

In 2021, Ordinance nº 46 (2021) was published, and established the Brazilian seals of GIs and provided for their purpose and use. For each GI species there is a specific IO and DO seal (Figure 1).



Figure 1. Brazilian seal for Denomination of Origin (DO) and Indication of Origin (IO)

Source: Brazilian National Institute of Industrial Property [INPI] (2021b)

Producers who have Brazilian Geographical Indications registered with INPI can use the seal on their product packing free of charge (INPI, 2021a). The purpose of the seal is to identify products and services with high quality and national reputation and contribute to promoting and valuing small businesses, the majority among GIs (SEBRAE, 2021).

Several countries recognize the GI as an element of distinction, identification, and excellence of products and legally protect it (Valente et al., 2012).

The European Union, for example, protects GIs through regulations: Regulation (EU) nº 1151/2012; Regulation (EU) nº 1308/2013; and Regulation (EU) 2019/787 (ORIGIN, 2022f).

Regulation (EU) nº 1151/2012 specifies that in Protected Designations of Origin (PDO) all production steps must be carried out inside the delimited geographical area, and the emphasis of the product is on quality and typicality; in the case of Protected Geographical Indication (PGI), at least one step must take place inside the demarcated region and the emphasis of the product is on the link between its reputation and geographical origin (Cabral, 2019). This regulation brought the mandatory use of symbols on the labeling of products produced in the European Union commercialized under PDO or PGI (Figure 2) (Soeiro, 2018).



Figure 2. Community symbols (seals) for products with PDO or PGI produced in the European Union
Source: Adapted from Soeiro (2018)

4. Results and Discussions

4.1 World Coffee Scenario and Geographical Indications

In the 2021/22 harvest the world coffee production decreased by 5.2% compared to the 2020/21 harvest. This occurred because of the Brazil's low production of arabica coffee, as the country faced adverse weather conditions and the physiological effects of the negative biennial. The reduction was 12.4% for world production of arabica coffee, and as for robusta coffee, an increase of 4.5% (Table 1) (USDA, 2022).

For the 2022/23 crop, the total world coffee production is estimated at 175 million bags (60kg), representing an increase of 4.7% compared to the 2021/22 harvest (Table 1) (USDA, 2022). The reason for this increase is the estimative of greater production by Brazil, both due to the positive biennially of arabica coffee and the favorable climatic conditions in the robusta coffee producing regions (Brainer, 2022).

Table 1. World production of green coffee (millions of 60 kg bags)

Coffee type	Production	Period		
		2020/21	2021/22	2022/23*
Arabica	Brazil	49,700	36,400	41,500
	Colombia	13,400	13,000	13,000
	Ethiopia	7,600	8,150	8,250
	Honduras	6,500	5,400	6,000
	Peru	3,369	4,200	4,200
	Guatemala	3,810	3,700	3,600
	Mexico	3,095	3,300	3,300
	Nicaragua	2,485	2,680	2,680
	China	1,800	2,000	2,000
	Costa Rica	1,472	1,275	1,365
	Indonesia	1,300	1,280	1,350
	India	1,320	1,280	1,320
	Vietnam	950	1,100	1,100
	Uganda	730	950	900
	Papua New Guinea	650	700	750
	Other	3,596	3,734	3,689
	Total	101,777	89,149	95,004
Robusta	Vietnam	28,050	30,500	29,800
	Brazil	20,200	21,700	22,800
	Indonesia	9,400	9,300	10,000
	Uganda	5,900	5,300	5,750
	India	3,917	4,250	4,420
	Malaysia	2,000	2,000	2,000
	Ivory Coast	910	800	800
	Thailand	600	650	700
	Mexico	530	540	545
	Tanzania	650	550	525
	Other	2,427	2,395	2,606
	Total	74,584	77,985	79,946

Graphic subtitle: (*) Reports of June 23, 2022.

Source: Adapted from Foreign Agricultural Service – FAS/USDA (2022)

The world's largest coffee producers are Brazil, Vietnam, Colombia and Indonesia. The four countries together concentrate 67.8% of world production (USDA, 2022).

Brazil is the largest producer of arabica coffee and the second largest producer of robusta coffee, totaling 34.8% in the 2021/22 harvest. There was a 26.8% drop in Brazilian arabica coffee production, while robusta coffee production increased by 7.4% if compared to the 2020/21 harvest. For the 2022/23 harvest, an increase of 14% is estimated for arabica coffee and 5.06% for robusta (USDA, 2022).

Vietnam is the second largest producer of coffee in the world and largest producer of robusta coffee. For the 2021/22 harvest, production of robusta increased by 8.73% over the previous period. For the 2022/23 harvest, a drop in this production is expected, as a result of the reduction in use of fertilizers in coffee plantations by producers, due to rising prices (Brainer, 2022; USDA, 2022).

Colombia is the world's third largest producer of coffee and the second largest producer of arabica coffee. For the 2021/22 harvest, arabica production was reduced by 2.98% compared to the previous harvest. For the 2022/23 harvest, production should remain unaffected because producers have restricted the use of fertilizers in coffee

plantations, as the country is dependent on imported fertilizers, which have risen in prices (Brainer, 2022; USDA, 2022).

Indonesia is the fourth country in the world coffee production and third producer of robusta coffee. For the 2021/22 harvest, production of robusta coffee reduced by 1.06%. For the 2022/23 harvest, an increase of 7.52% is estimated (USDA, 2022).

In a global market context, with consumers increasingly looking for unique quality products, GIs bring beneficial effects to producers, consumers and local communities (Barjolle et al., 2017; Cei et al., 2018; ORIGIN, 2022b).

Worldwide, GIs are regulated by *sui generis* or trademarks. In *sui generis* system, laws are specifically designed to protect GIs. The legal effect is established from the registration, which is mandatory. In this system, protection is against direct commercial use of the GI (word for word). In trademarks system, the protection of GIs safeguards the protection of geographic names by trademarks, collective marks and certification marks based on private initiative. In countries that adopt this legislation, producers must pay attention to the periodic renewal of brands (generally every ten years) (ORIGIN, 2022c).

According to information from the Organization for an International Geographical Indications Network (ORIGIN) (2022a), the total GIs in the world for the agricultural product coffee is a total of 126, with 56 GIs in Asia, 29 GIs in Central America, 27 GIs in South America, 9 GIs in North America and 5 GIs in Africa. The records were 108 GIs (*sui generis*), 16 GIs trademarks, 1 standard and labeling rules and 1 as others kind of records. Asia has all its GIs for coffee protected by the *sui generis* system. Central America has its GIs registered as follows: 23 GIs (*sui generis*), 4 GIs (brands), 1 standards and labeling rules and 1 as others kind of records. South America has 25 GIs (*sui generis*) and 2 GIs by brands. North America has 3 GIs (*sui generis*) and 6 GIs (brands) and Africa has 1 GI (*sui generis*) and 6 GIs (brands). (Chart 2).

Chart 2. Total GIs on the world scenario for coffee

Continent	GIs	Legal Protection
Africa	5	1 <i>sui generis</i>
		4 trademarks
Asia	56	56 <i>sui generis</i>
		23 <i>sui generis</i>
		4 trademarks
Central America	29	1 other
		1 Labeling standards and rule
South America	27	25 <i>sui generis</i>
		2 trademarks
North America	9	6 trademarks
		3 <i>sui generis</i>

Source: Authors, based in data obtained at ORIGIN (2022a).

Indonesia is the country with the highest number of GIs (31) all by *sui generis* system (ORIGIN, 2022a). In the country, the Ministries of Justice, Agriculture, and Internal Affairs collaborate, since 2011, to promote the development of GIs. The State acts from the selection of candidate products for registration to the supervision of the implementation of the GI (Durand and Fournier, 2017).

Countries that registered their GIs by trademarks were United States (6 GIs), Ethiopia (3 GIs), Dominican Republic (2 GIs), Panama (2GIs), El Salvador (1GIs), Nicaragua (1GI) and Kenya (1 GIs) (ORIGIN, 2022a).

In the United States, GIs are protected as registered, as collective or certification marks, registered by the US Patent and Trademark Office (USPTO) or common law trademark (ORIGIN, 2022d).

In Kenya, GIs are registered as a collective or certification mark (Barjolle et al. 2017) by the African Regional Intellectual Property Organization (ARIPO), in accordance with the adoption of the Banjul Protocol on Trademarks (ORIGIN, 2022e).

In Ethiopia, GIs are protected as trademarks, as per Council of Ministers Regulation n° 273/2012 of December 24, 2012, on Trademark Registration and Protection (2012).

In El Salvador, GIs can be registered as trademarks, according to Art. 4° of the Law on Trademarks and Other Distinctive Signs (Modified by Legislative Decree n° 986 of March 17, 2006) and as *sui generis*. GI *Café de El Salvador* is registered as “of others”, as it is a brand that represents the entire value chain of Salvadoran coffee cultivation and is part of the National Coffee Policy, whose objective is to benefit all actors in this production chain (Consejo Salvadoreño del Café, 2021).

In Panama, the protection of GIs is based on Law n°35, of May 10, 1996, which provides for Industrial Property (1996). The authority responsible for granting the registration of Denominations of Origins is the General Directorate of Industrial Property Registration of the Ministry of Commerce and Industries (DIGERPI).

In Nicaragua, with Decree No. 25 of 2012 Reforms and Amendments to Decree No. 83 of 2001, provisions relating to trademarks became applicable to the registration of GIs (2012). GI *Café de Nicaragua* was registered as “Standards and labeling rules”, as industrialized and green coffee are regulated by legislation (Decree No. 408 of 1958 and Technical Standard No. 03 025-03). Decree No. 408 of 1958 prohibits the sale or distribution of adulterated coffee, whether roasted, grounded, powdered or liquid, when it is mixed with foreign matter (ICO, 2018). Technical Standard Green Coffee No. 03 025-03 (2003) establishes the specifications, characteristics and analysis methods for the commercialization of coffee for exportation and at the national level for green coffee.

In the Dominican Republic, marks may consist of national or foreign Geographical Indications, according to Art. 72 and item II of Law N° 20-00 of May 8, 2000 on Industrial Property (2000). This is applicable only if there are sufficiently arbitrary and distinctive in relation to the products or services to which they apply, and that they do not create confusion as to the origin, source, qualities or characteristics of the products or services for the codes of use of the marks.

4.2 Brazilian Coffee Scenario and Geographical Indications

In Brazil, two types of coffee are cultivated, arabica and robusta (conilon). According to the National Supply Company (CONAB) (2022) the state of Minas Gerais has 4 coffee producing regions (South and Midwest; *Triângulo*, *Alto Parnaíba* and Northwest; *Zona da Mata*, *Rio Doce* and Central, North, *Jequitinhonha* and *Mucuri*) and the state of Bahia 3 regions (*Cerrado*, Atlantic and *Planalto*).

The states that produce arabica coffee are Amazonas; Bahia (*Cerrado* and *Planalto*); Goiás; Minas Gerais (South and Midwest; *Tiângulo*, *Alto Parnaíba* and Northwest; *Zona da Mata*, *Rio Doce* and Central, North, *Jequitinhonha* and *Mucuri*); Espírito Santo; Rio de Janeiro; São Paulo, Paraná; Acre, Ceará; Pernambuco; Mato Grosso do Sul and Distrito Federal (National Supply Company [CONAB], 2022).

The states that produce robusta coffee are: Rondônia; Amazonas; Bahia (Atlantic); Mato Grosso; Minas Gerais (*Zona da Mata*, *Rio Doce* and Central, North, *Jequitinhonha* and *Mucuri*); Espírito Santo; Acre; and Ceará (CONAB, 2022).

According to CONAB Coffee Crop Bulletin, a total production of 50,380.5 thousand bags (60kg) of processed coffees estimated for the 2022 harvest, representing an increase of 5.6% in relation to the 2021 harvest, which presented reduction in production due to several producing regions facing physiological effects of the negative biennial and having adverse climatic conditions (long periods of drought and frost) (CONAB, 2022),

Arabica coffee production is estimated to be 32,410.2 thousand bags (60kg) processed, equivalent to 64.33% of total Brazilian production, indicating an increase of 3.1% if compared to the 2021 harvest. (Table 2) (CONAB, 2022).

Table 2. Arabica coffee production estimative for the 2020 to 2022 harvests in Brazil

Region/UF	ARABICA COFFEE PRODUCTION (thousand bags benefited)		
	Harvest 2020	Harvest 2021	Harvest 2022
NORTH	30.6	30.6	30.6
AM	30.6	30.6	30.6
NORTHEAST	1,866.7	1,229.0	1,232.0
BA	1,866.7	1,229.0	1,232.0
<i>Cerrado</i>	350.0	250.0	276.0
<i>Planalto</i>	1,516.7	979.0	956.0
MIDWEST	247.8	231.6	280.0
GO	247.8	231.6	280.0
SOUTHEAST	45,654.0	29,036.9	30,282.0
MG	34,337.3	21,858.9	21,750.0
<i>Sul e Centro-Oeste</i>	19,152.2	11,751.9	9,761.7
<i>Triângulo. Alto Paranaíba e Noroeste</i>	6,000.8	4,777.5	4,212.1
<i>Zona da Mata. Rio Doce e Central</i>	8,589.6	4,735.5	7,072.4
<i>Norte. Jequitinhonha e Mucuri</i>	594.7	594.0	704.8
ES	4,765.0	2,945.0	4,341.0
RJ	371.0	224.0	288.0
SP	6,180.7	4,009.0	3,903.0
SOUTH	967.5	876.3	558.4
PR	967.5	876.3	558.4
OTHERS (*)	26.8	32.9	27.2
NORTH/NORTHEAST	1,866.7	1,259.6	1,262.6
MIDSOUTH	46,843.7	30,144.8	31,410.2
BRAZIL	48,737.2	31,437.3	32,410.2

Subtitles: (*) Acre, Amazonas, Ceará, Pernambuco, Mato Grosso do Sul and Distrito Federal.

Source: Adapted from CONAB (2022).

Robusta coffee (conilon) production is estimated at 17,970.3 thousand bags, equivalent to 36.67% of total Brazilian production, showing an increase of 10.3% when compared to the 2021 harvest (Table 3). This increase is due to the fact that there were good temperatures and adequate precipitation in crucial phenological stages of the crop (CONAB, 2022).

Table 3. Conilon coffee production estimate for the 2020 to 2022 harvests in Brazil

REGION/UF	CONILON COFFEE PRODUCTION (thousand bags beneficiated)		
	Harvest	Harvest	Harvest
	2020	2021	2022
NORTH	2,489.6	2,307.7	2,845.1
RO	2,444.9	2,263.1	2,800.5
AM	44.7	44.6	44.6
NORTHEAST	2,120.0	2,240.0	2,333.0
BA	2,120.0	2,240.0	2,333.0
<i>Atlântico</i>	2,120.0	2,240.0	2,333.0
MIDWEST	158.4	194.2	227.9
MT	157.1	194.2	227.9
SOUTHEAST	9,502.8	11,504.4	12,517.1
MG	309.8	283.4	283.1
<i>Zona da Mata. Rio Doce e Central</i>	201.4	184.2	184.0
<i>Norte. Jequitinhonha e Mucuri</i>	108.4	99.2	99.1
ES	9,2	11,221.0	12,234.0
OTHERS (*)	40,0	46.2	47.2
NORTH/NORTHEAST	4,609.6	4,547.7	5,178.1
MIDSOUTH	9,661.2	11,698.6	12,745.0
BRAZIL	14,310.8	16,292.5	17,970.3

Subtitles: (*) Acre and Ceará.

Source: Adapted from CONAB (2022).

The largest coffee producing state in Brazil is Minas Gerais, with total production estimated at 22,033.1 thousand bags, in the 2022 harvest, accounting for 43.73% of Brazilian production. The second is Espírito Santo, with 16,575 thousand bags produced, representing 32.9% of production (CONAB, 2022).

Leadership in coffee production in Minas Gerais began in the 1970s (Santos et al., 2009). During this period, the IBC proposed the Plan for Renewal and Reinvigoration of Coffee Fields (PRRC), with the aim of expanding coffee production capacity, since the largest producing states at the time, São Paulo and Paraná, faced climatic adversities (frosts), compromising Brazilian production. With government subsidies for the installation and expansion of the productive area, coffee expansion took place in Minas Gerais state (Vale, 2014).

Since then, Minas Gerais has shown greater productivity in relation to other producing states, as a result of efforts made from research, technology transfer and the region's natural aptitude, related to climate conditions, terrain and soil varieties (Peregrini and Simões, 2011). Currently, the state accounts for 45,109 coffee growers spread across 451 municipalities and productive area of approximately 1.3 million hectares for coffee cultivation, being the main agricultural export product (Agência Minas, 2022).

The state of Espírito Santo occupies first place in the ranking of Brazilian production of conilon coffee and third in the production of arabica coffee. Coffee growing is the main agricultural activity of Espírito Santo, developed in almost all municipalities, with the participation of 131,000 producing families (State by the *Capixaba* Institute for Research, Technical Assistance and Rural Extension [INCAPER], 2022).

Programs to increase productivity and improve the final quality of the product are carried out in the state by the *Capixaba* Institute for Research, Technical Assistance and Rural Extension (INCAPER). This institute promotes various educational, technological, training, and structuring actions, aimed at producing excellent coffee in the state. In 2008, *Renovar Café Arabica* program was announced, with the objective of renewing and reinvigorating the coffee park by adopting current technological bases. In 2012, the *Renova Sul Conilon* program was launched,

with the same goal as the previous program, but the focus was on contributing to sustainable development in the state (Frederico, 2013; INCAPER, 2022).

The coffee production chain is extremely important for the Brazilian economy, as it has been the country's export agenda for years. With more demanding consumers (Pires et al., 2003), who value the origin and quality of the product, producers have been improving their production to reach the new special coffee market (Giesbrecht et al., 2014). As a result, they are obtaining GI recognition for their products, which add value and identify the characteristics of the producing region (EMBRAPA, 2021).

Coffee is the largest agricultural product with GI records at the INPI. On December 6, 2022, 100 Brazilian Geographical Indication were registered at the INPI, with 24 DOs and 76 IOs. Of this total, 14 GIs refers to coffee, 9 IOs and 5 DOs. (INPI, 2022) (Chart 3).

The first GI recognized for coffee was in 2005, the IO *Região do Cerrado Mineiro* (IG990001). In 2014, the region was also recognized as the first Brazilian DO for coffee, DO *Região do Cerrado Mineiro* (IG2010111). Coffee produced in regions with GI have unique attributes in relation to the production method, quality from cultivation, harvest, appearance of the grain, origin, type of preparation, variety and built history (INPI, 2022).

Chart 3. Brazilian Geographical Indications for coffee registered with the INPI

GI	Species/ year of register	State	Total municipalities	Coffee Varieties	Characteristics
<i>Alta Mogiana</i>	IP/2013	SP	15	Arabica coffee	Coffee with a velvety and creamy body; strong and fruity aroma with soft notes of chocolate and dry fruits; medium and balanced acidity
<i>Campo das Vertentes</i>	IP/2020	MG	17	Arabica coffee	Sweet coffee, with a balanced body and hints of chocolate and nuts
<i>Caparaó</i>	DO/2021	ES, MG	16	Arabica coffee	Coffee balanced between acidity, sweetness and aroma
<i>Espírito Santo</i>	IP/2021	ES	78	Conilon coffee	Coffee with creamy body, balanced modulated acidity and smooth finish; intense aromas and flavors
<i>Mantiqueira de Minas</i>	DO/2020	MG	25	Arabica coffee	Sweet and light coffee with citrus acidity. <i>Terroir</i> favorable to the production of specialty coffees
<i>Matas de Minas</i>	IP/2020	MG	64	Arabica coffee	Recognition for the production of specialty coffees
<i>Matas de Rondônia</i>	DO/2021	RO	15	Amazonic robusta	Full-bodied and sweet coffee with aromas of chocolate, wood, fruit, spice, herbs
<i>Montanhas do Espírito Santo</i>	DO/2021	ES	16	Arabica coffee	Coffee with an aroma of chocolate, cane molasses, red fruits and caramel, in addition to a smooth flavor and a medium finish.

<i>Norte Pioneiro do Paraná</i>	IP/2012	PR	45	Arabica coffee	Sweet coffee with a creamy body, pleasant citric acidity, aromas ranging from chocolate, caramel, floral and fruity citrus fruits
<i>Oeste da Bahia</i>	IP/2019	BA	11	Arabica coffee	Coffee with a pleasant taste, with good fragrance and a slightly fruity and floral aroma, with excellent sweetness and good acidity
<i>Região de Pinhal</i>	IP/2016	SP	7	Arabica coffee	Coffee balanced between body, acidity and sweetness, with an intense aroma and long finish
<i>Região do Cerrado Mineiro</i>	DO/2014 e IP/2005	MG	55	Arabica coffee	Coffee with intense aromas ranging from caramel to nuts, with delicate citrus acidity and long lasting
<i>Região de Garça</i>	IP/2022	SP	15	Arabica coffee	Coffee with notes of dark chocolate, hazelnut, almonds and roasted chestnuts, sometimes floral and fruity, with a light citric acidity

Source: Adapted from MAPA (2021).

5. Conclusions

Given the importance of coffee cultivation for both the world and Brazilian economy, this study aimed to verify international and Brazilian scenario for the coffee cultivation, based on production and Geographical Indications of the product.

Brazil is the world's largest coffee producer and second in terms of quantities of GIs. The state of Minas Gerais is ranked first in coffee production and in the number of GIs for the product in the country, followed by Espírito Santo. According to Law nº 9.279/1996, GI is used to designate products and services, and uses the IO or DO species for this definition.

In the European Union, the concept of GI is defined by Regulation (EU) nº 1151/2012 as: IGP, in which at least one production step must take place in an outlined region and the emphasis of the product is on the link between its reputation and geographical origin; and PDO, in which all stages of fabrication of the product must be carried out within the delimited geographical area, and the emphasis is on quality and typicality.

It was observed that the two most commercialized types of coffee in the world are arabica and robusta. World production showed a reduction for the 2021/22 harvest, due to the low production of arabica coffee in Brazil, because of adverse weather conditions and physiological effects of the negative biennial. For the 2022/23 harvest, an increase is estimated, as Brazil had favorable weather conditions in robusta coffee producing regions and production is in positive biennial period.

Most coffee-producing countries follow specific legislation to protect GIs (*sui generis* system), but there are those that protect them though trademarks (registered, collective or certification marks).

In El Salvador, a brand represents the entire coffee value chain in the country and benefits all actors in that chain.

In Nicaragua, GI is registered in a unique way, as "Standard and labeling rules", through legislation and regulations on the commercialization of industrialized and green coffee.

Indonesia is the country with the highest number of GI for coffee in the world, it is the third producer of robusta and has the State's role in the development of GIs.

Given this scenario, there is need to develop public policies aimed at the Geographical Indications of coffee in the world and in Brazil. It is indicated for future research the study of these policies and the performance of bodies responsible for the consolidation of GIs in their respective countries.

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PRPGI-IFBA: Pró-Reitoria de Pesquisa de Inovação do Instituto Federal da Bahia.

CNPq: Conselho Nacional de Desenvolvimento Científico e Tecnológico.

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