Models to aid studies on territory delimitation for Brazilian geographical indications

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Abstract

A geographical indication (GI) seal granted to a product certifies its territorial origin as well as the link between its quality and human and natural characteristics of its production environment (terroir). An existing challenge in the process of setting up a GI for a product is delimiting the geographic area that properly represents the terroir and generates the expected territorial development after the grant of this protection seal. This article presents tools that can contribute to studies on the delimitation of the territory of GIs in Brazil. Through a bibliographic search, we compared models for delineating GI areas compared with the standards used for this purpose in Brazilian GIs. Our findings show that the process of delimiting GI areas in Brazil is different for each type of indication, and distinct characteristics are also present in each type of GI intended, whether it be an Indication of Source or a Denomination of Origin. Only two of the analyzed models exhibited structures close to these characteristics, so they are recommended to aid studies on the delimitation of the area of Brazilian GIs. However, they cannot be used as a standard to this end.

Keywords: Denomination of origin; GI area delimitation; Indication of source; Model.

1. Introduction

Geographical Indications (GIs) are labels, or distinctive signs, granted to products that are recognized by the specific identities associated with the environmental and cultural characteristics of their territory of origin (MILANO; GAZELLA, 2021).

The link between a product and its production environment is given by the concept of *terroir*, which served as the basis for the geographical indications of the European Union, the Protected Designations of Origin (PDO) granted to agricultural products. The term *terroir* also has a cultural aspect, according to which the product is linked to the community and culture of the region by the traditional means of production and local knowledge (TURBES et al., 2016). It is this notion of terroir that underpins the concept of Denomination of Origin (DO), which determines that the quality or characteristics of a product are mainly or exclusively due to the geographical environment, considering the influence of natural and human factors (CABRAL, 2018).

Denomination of Origin (DO) and Indication of Source (IS) are the two types of GI used in Brazil, which can be used not only for products, but also services. Brazilian GIs are also used for non-agricultural products, such as handicrafts and ores (CABRAL, 2018).

Setting up a GI for a product is aimed not only at acquiring a seal of recognition, but also at protecting and valuing terroir. According to D'Alexandria (2020), GIs give value to know-how and highlight the particular characteristics of products based on geographic elements present in the region. For the successful implementation of a GI—i.e., increased product sales—, its regulation must be based not only on the promotion of partnership or the delimitation of a production area, but also on the aim of preserving the authenticity of the product and the appreciation of the community's know-how in the face of a demanding market, which may or may not generate development for the territory.

Discussions and political actions in Brazil regarding territorial development as fostered by GIs are incipient compared with other countries, especially those of the European Union and some Latin American countries, which exert a policy that regards the recognition of GIs as a territorial development tool (DUPIM, 2015).

There is a need for discussions of this kind in Brazil, particularly with respect to the delimitation of geographical areas, to generate territorial development as well as to preserve and enhance the value of terroir. For Nascimento et al. (2012), the implementation of a GI can foster territorial development in several sectors, including tourism. As stated by Felisberto and Guerroué (2019), both GIs and Brazilian rural tourism have potentialities that need strategies for mutual benefit to occur, and GIs still have little influence on rural tourism in Brazil. The same authors also argued that GIs with large areas cover a number of municipalities where tourist development is very heterogeneous, such as the "Manguezais de Alagoas" DO, which is one of the obstacles preventing Brazilian GIs from influencing Brazilian tourism.

Sá and Lima (2018) presented another problem in delineating the area of Brazilian GIs. According to these authors, some GIs in Brazil have never achieved the benefits expected from their implementation. One of the reasons for this is that some of them cover an extensive geographic area, which makes it difficult to trace products that would receive the GI seal.

In general, the larger the geographic area of a GI, the higher the number of producers established within its territorial limits that use it. As mentioned by Velloso et al. (2014), a greater number of producers can

increase territorial dynamics and development, but also increase the possibilities of conflicts and hinder the work of defining the GI group.

In view of the above considerations, this paper presents tools that can contribute to studies on the delimitation of GI areas in Brazil through an analysis of models for delineating the size of GI territories mapped by Rosário, Lima and Santos (2021), by comparing them with the standards used for delimiting the territory of Brazilian GIs.

2. Methodology

This study was developed from a bibliographic search which allowed us to analyze the area-delimitation patterns for Brazilian GIs by comparing them with GI area-delimitation models mapped by Rosário, Lima and Santos (2021), following the scheme illustrated in Figure1.

Figure 1. Study framework
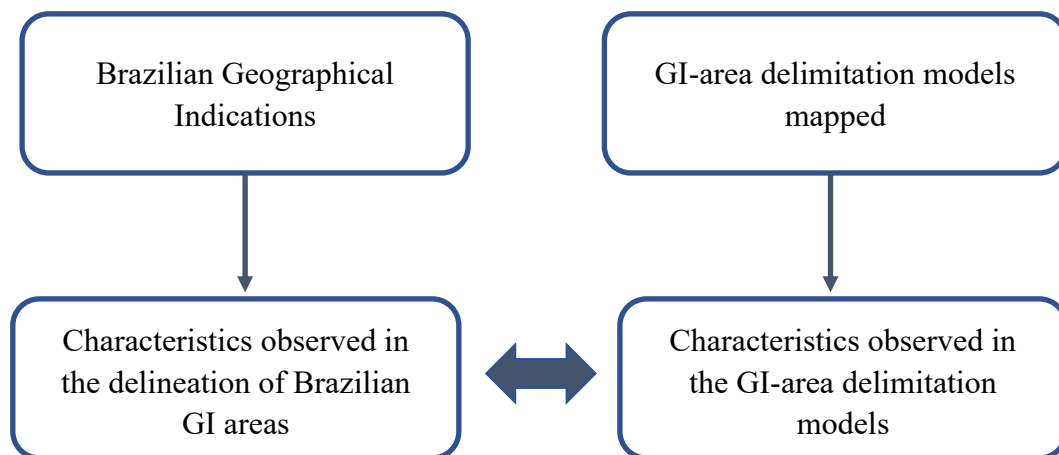
Source: the authors (2022).

Firstly, we described the area-delimitation patterns of Brazilian GIs and identified the characteristics observed in the process. Then, we read the GI area-delimitation models mapped by the afore-mentioned authors. Subsequently, we analyzed the characteristics present in them and compared them with the particular characteristics of territorial delimitation of Brazilian GIs.

3. Results and Discussion

3.1 Brazilian GI area-delimitation standards

In Brazil, two types of GIs are used, namely, Indication of Source (IS) and Denomination of Origin (DO). An IS is granted to products notoriously originating in a certain region that has become known for the production, manufacture, or extraction of a certain product or service provision. A DO is granted to products originating in a certain geographic location with characteristics exclusively or essentially found there, including natural and human factors (MAPA, 2021). The unique difference between these forms of GI relates to the physical and human characteristics and peculiarities enhanced by the territory: for IS, the

product or service must be linked to the geographic space, whereas for DO, the product must possess characteristics and qualities intrinsically linked to the geographic territory (LAGARES; LAGES; BRAGA, 2006).

Such characteristics present in the territory are crucial for delimiting the geographic areas of GIs without necessarily taking into account the municipal, regional, state, or national political-administrative borders. This allows the delimited territorial extension of a GI to be a place of coexistence of producers located in territories with different tax, political, and regulatory systems, provided that such characteristics are proven in these territories and the product is recognized in the market with the same geographical name (MAPA, 2021).

The process of delimiting the geographic area of Brazilian GIs does not follow a single pattern, but is rather different for each particular case. Differences in this process are due to factors such as the type of GI intended, whether it be IS or DO, and the degree of transformation and natural and human factors that make the product differentiated (VALENTE; PEREZ; FERNANDES, 2013).

Human factors are considered to be the characteristics of communities that influence the specific quality of a product, which encompass know-how; historical and current economic reality; and use of the geographic name to market the product over time. Natural factors, in turn, are understood as the physical-biological characteristics of the environment that differentiate a product from similar products from other regions, according to the criteria of interactions between climate, type of rock, soil, relief, and vegetation; presence of microorganisms in the territory that can influence some of the product's processing stages; and the origin of the raw material (MAPA, 2021).

According to Valente, Perez and Fernandes (2013) the process of delimiting the area of an IS takes into account human factors, whereas proof of the influence of natural factors is not required. On the other hand, in the case of a DO, in addition to proof of human factors, proof of the influence of the geographical environment on the quality of the product is also required. For this type of GI, the delimitation must be approached more carefully, requiring deep knowledge of the natural characteristics of the region.

3.2 Mapped models for GI area delimitation

Rosário, Lima and Santos (2021) mapped five articles that describe models for delineating the area of GIs, as shown in Table 1.

Table 1. Approaches of GI area delimitation models

N	Title of paper	Reference	Year of publication
1	The size of terroir: a theoretical note on economics and politics of geographical indications	Deconnink & Swinnen	2020
2	Vineyard zonation based on natural terroir factors using multivariate statistics - Case study Burgenland (Austria)	Karlik, Gabor, Faltan & Havlicek	2018

3	Rent seeking and political economy of geographical indication foods	Landi & Stefani	2015
4	Collective reputation, social norms, and participation	Saak	2012
5	Agricultural production clubs: viability and welfare implications	Langinier & Barbock	2008

Source: adapted from Rosário, Lima & Santos (2021).

Next, observing the enumeration of models in Table 1, we will analyze the characteristics of each of these models and compare them with the Brazilian GIs.

3.2.1 Deconinck and Swinnen's model

The model developed by Deconinck and Swinnen (2020) describes the effect of altering a GI area on product quality. One characteristic observed in the delimitation of the area of Brazilian GIs, in the case of DOs, is that it also considers the distribution of the GI costs between the members and rent, in addition to describing how lobbying can influence the territorial delimitation of a GI, deviating it from its optimum (a size that provides social welfare).

For Deconinck and Swinnen (2020), expanding the territorial size of a GI leads to a reduction in product quality. As also stated by the authors, the model describes the perceived quality, $s(q)$, of the product protected by a GI as being equal to its average quality in a GI of size q, according to equation 1.

$$s(q) = \frac{1}{q} \int_0^q \sigma(i) di \qquad (1),$$

where i is the distance from a producer to the core of the GI; $\sigma(i)$ is the quality of the product; q represents the size of the GI region and also a producer situated on the border of the GI.

According to the same authors, consumers have a utility function given by $u = u(q,s) + y$, with numeraire y, where $u_q > 0, u_{qq} < 0, u_s > 0$, and $u_{ss} < 0$. The consumer surplus is given by $\prod^C = u(q,s) - pq$, and the aggregate producer surplus is given by $\prod^P = pq - F - cq$, where p indicates production, F fixed costs, and c the variable costs of managing the GI region.

Although the authors describe the effect of altering the GI area on consumer and producer surplus in the model, for the purposes of this text, we will not describe it but rather the effect of altering the GI area on product quality. As proposed by the researchers, expanding the territory of a GI causes a reduction in product quality. The authors come to this conclusion based on social welfare, W, which is defined as the sum of consumer surplus and aggregate producer surplus, as shown in equation 2.

$$W = u(q,s) - F - cq. \qquad (2)$$

Equation 3 describes the effect of altering the GI area on social welfare:

$$\frac{\partial W}{\partial q} = u_q + u_s s_q - c \qquad (3)$$

Consequently, an expansion of the GI area would generate all three effects:

(a) Increases utility through increased production, since $u_q > 0$;

(b) Reduces utility through a reduction in average quality, since $u_s s_q < 0$; and

(c) Leads to additional variable costs, c.

The authors also consider the optimal maximum size of the GI, q^{SO}, that balances these effects. One condition for social welfare to reach its maximum value is that $\frac{\partial W}{\partial q} = 0$, which allows obtaining the relationship given in equation 4.

$$u_q - c = -u_s s_q \qquad (4)$$

By considering $u_q = p$, in equation 4, we have the relationship given in equation 5:

$$p - c = -u_s s_q \qquad (5)$$

Therefore, the optimization of a GI area has the following characteristics:

- Without quality effect $(s_q = 0$ or $u_s = 0)$, optimization requires an increase in the GI area until production drops to the level of variable cost;

- With quality effect $(s_q \neq 0$ and $u_s \neq 0)$, then the GI area should be smaller.

The authors also comment that, following these characteristics, if demand is more elastic (that is, if p is higher and declines more slowly), if the negative quality effect on utility is smaller, and if variable costs are smaller, then the ideal area of a GI will be larger.

As described in the previous section, in the characteristics observed in the process of area delimitation for Brazilian GIs, the DO type considers the effect of territory on the quality of the product. Thus, although the current model cannot be considered a standard for delineating the area of Brazilian GIs, due to specific differences for each GI case, it is as a great tool to aid studies on the territorial delimitation of these GIs aiming at territorial demarcations that promote the appreciation of the terroir and favor territorial development, through the GI.

3.2.2 Karlik et al.'s model

This is a methodological model for the study of resizing GI territories, using statistical techniques, for the Austrian wine-growing area protected by a GI of wine. At the time of the study, Austria had 16 wine regions with a GI for wines, which were subdivided into two groups: the first was formed by seven regions, which protected only wines made from selected and typical varieties of the region; and the second group consisted of nine regions specifically designated for more expensive and higher-quality wines, which also considers

the processing prescribed in the techniques established by the GI regulatory commission in addition to the factors observed in the first group. The study described in the article referring to model two specifically considered four regions of this second group, located in Burgenland. In conclusion, the authors suggest the creation of five regions instead of four, as well as the inclusion of other areas—some crossing administrative borders, omitted in the original delimitation (KARLIK et al, 2018).

The methodology followed in this study is based on statistical techniques of factor analysis and multiple discriminant analysis. Factor analysis was used to reduce dimensionality and discover common relationships in the dataset, whereas discriminant analysis was used to create new regions via cluster analysis. Topographic, climatic, soil, and substrate data were analyzed in the study. Topographic data were not used in the resizing of the GIs' territories, as they were statistically insignificant. The following climatic data variables were investigated: potential evapotranspiration, average temperature of the atmosphere during the vegetative season, Huglin index, growing degree-days, diurnal air temperature variation, cool night index, total precipitation during the vegetative season, potential global irradiance, and average wind speed. Soil and substrate data were analyzed for the following variables: percentage of organic matter, soil reaction (pH), percentage content of clay, percentage content of silt, percentage content of calcium, percentage content of sand, soil depth, and soil water content (KARLIK et al., 2018).

Considering the factors observed in the execution of this study and the characteristics identified in the delimitation of Brazilian GI areas, as described in the previous section, there are possible similarities of human factors, e.g. typicality and regional know-how, and mainly of natural factors, such as climate and soil. There are also similarities in terms of the possibility of a GI territory exceeding regional administrative boundaries. However, the study developed was specific to some GIs in the European Union, which are under legislation that regulates them and concession standards different from those of Brazilian GIs (CABRAL, 2018). Furthermore, according to Karlik et al. (2018), the results obtained in this particular case can be applied, with the necessary changes, to other states of the European Union, especially those in which the regional system of Protected Designation of Origin is not yet implemented.

Therefore, despite the existence of some similarities in human and natural factors between the GIs studied in this model and the Brazilian GIs, for the latter, in addition to the different legal regimes that regulate them, one must take into account the specific particularities of area delimitation for each distinct case of GI, as described before. However, for Brazilian wine GIs, it would be interesting that area-delimitation studies be developed using the methodology proposed in this model.

3.2.3 Landi & Stefani's model

The model developed by Landi and Stefani (2015) focuses on the political economy of determining the size of a GI territory in three stages, through a dynamic Bayesian game with incomplete information, that is, players do not know exactly the payoffs, which are influenced by the action of nature and the type of opponent they are facing. In the model, the players represent producers willing to acquire a GI and/or expand its territory. The model considers the resulting optimal political area of a GI and compares it with the optimal social size and concludes that lobbying strength, together with quantity supplied and market potential, play a major role in explaining deviations from the social optimal size of a GI (LANDI; STEFANI, 2015).

According to the same authors, the model has the following assumptions:

Table 2. Model assumptions

Assumptions
$a)$ $X_H = A_H x$ with x as a constant;
$b)$ $c_H > c_L$;
$c)$ There is a geographical ordering of players;
$d.1)$ $p_H \geq c_H$;
$d.2)$ $p_L = c_L$; and
$e)$ q_H is constant with enlargement.

Notes:

(a) X_H represents high-quality production and is equal to the high-quality territory size, represented by X_H, multiplied by the production of each player (x);

(b) c_H represents the average and marginal costs of high-quality production, while c_L are the average and marginal costs of low-quality production; and

(c) q_H represents high quality.

Source: adapted from Landi & Stefani (2015).

In the model, two types of producers were considered: player Y, located in the core, and player Z, located in the neighboring area. Thus, the main assumptions of the model are: a) the players manufacture x units of a product in a unit of area; b) the average production costs are the same for each quality, c_H and c_L, respectively, with $c_H > c_L$; c) there is a geographical ordering of the players, where player Y is the first to make the request and then player Z requests to be included in the protected area; d) there are no profits in the market outside the area protected by the social planner, so the price of low quality is equal to the marginal cost of low quality; e) up to certain limits, the enlargement of the resulting GI protected area does not affect the quality of the product.

The model was developed in three stages, whose framework is illustrated below:

Figure 2. The structure of the game

Source: adapted from Landi & Stefani (2015)

where, according to Landi and Stefani (2015), p indicates the probability of decision of the nature of social welfare and $(1-p)$ the probability of its decision if the social planner maximizes it; L represents the request for a large area; S is the request for a small area; and SQ represents the *status quo*, i.e. no request is submitted. In the first period, without knowing the attitude of the social planner, player Y chooses the extent of the required area, then player Z, taking into account player Y's request, chooses the enlargement extent. In the last stage, the social planner decides whether or not to allow the enlargement. In Figure 2, the dotted lines indicate sets of information; the left one denotes the ignorance of player Y about the move of nature, whereas the right ones represents that player Z observes the player Y's move, but not the move of nature.

3.2.4 Saak's model

The model developed by Saak (2012) considers economic factors in the delimitation of a group; in this case, the GI. In the model, the GI area and the social welfare of participants are related to the sale, the policy, and the promotion of the product, with the ideal size of a GI territory being larger when negotiations are more frequent, the public information is disseminated more quickly, and customer information regarding product quality is more accurate.

We will not present a more detailed description of this model in this text, as it clearly does not address the characteristics observed in the territorial delimitations of Brazilian GIs and nor does its framework

resembles theirs.

3.2.5 Langinier & Barcock's model

In the model developed by Langinier and Barcock (2008), the GI is analogous to a club, where costs are divided between the members. However, in some situations, depending on the costs of the GI, this can lead to losses to both high- and low-quality producers. Regarding the territorial delimitation of a GI, the model describes that there is an ideal size at which members can control the entry of new participants in the GI. For the same reason presented in model number four, we will not give a more detailed description of model number five, either.

3.3 Analysis and comparison of the characteristics observed in the models with the Brazilian GIs

In view of the characteristics observed in the delimitations of Brazilian GI areas, as described in the previous section, and the five models presented, only models one and two, developed by Deconnink and Swinnen (2020) and Karlik et al. (2018), respectively, are close to the characteristics of Brazilian GIs.

The model by Deconnink and Swinnen describes the effect of altering the size of a GI territory on product quality. As described by Valente, Perez and Fernandes (2013), this effect is observed in the delimitation of Brazilian GI areas for the DO category.

According to MAPA (2021), this effect contributes to the difficulty in delineating the area of a DO because, in addition to the human factors observed in the delimitation of a IS area, this category also considers natural factors and product quality.

Thus, considering the previously mentioned differences in each distinct case of Brazilian GIs in the process of territorial delimitation, the Deconnink and Swinnen model cannot be adopted as a standard for delineating the area of these GIs. However, it can be used as an auxiliary tool in the delimitation of the DO area, mainly concerning the effect of territory expansion on product quality, so that the territorial demarcations promote the appreciation of the terroir and favor territorial development through the GI.

By comparing the characteristics of territorial delimitations of GIs in the model by Karlik et al. and those of Brazilian GIs, mentioned previously, we found that the latter include human factors such as typicality and local know-how. In addition to these, natural factors such as climate and soil were also observed in the model. Moreover, this model considers the possibility of a GI territory exceeding regional administrative boundaries, which also occurs with Brazilian GIs.

Nonetheless, the study by Karlik et al. (2018) was specific to some GIs in the European Union. According to Cabral (2018), these GIs are under regulatory legislation and concession standards that are different from those of Brazilian GIs. The results obtained in the Model by Karlik et al. can be applied, with the necessary changes, to other states of the European Union, especially those in which the regional system of Protected Designation of Origin is not yet implemented.

Therefore, despite some similarities of human and natural factors between the GIs studied in the model by Karlik et al. and the Brazilian GIs, and once again considering their specific particularities in territory delimitation for each distinct case and the differences in the laws that regulate them, the model cannot be adopted as a standard for delineating the territory of Brazilian GIs. For the case of Brazilian wine GIs, however, studies that aid their territorial delineation should be carried out using the methodology proposed

in this model.

On the other hand, the models developed by Landi and Stefani (2015), Saak (2012), and Langinier and Barcock (2008) exhibit patterns that are not similar to the characteristics observed in the delimitation of the area of Brazilian GIs. It is important to mention that despite the similarities mentioned in the models developed by Deconnink and Swinnen (2020) and Karlik et al. (2018) and Brazilian GIs, they cannot be adopted as the standard for delimiting the area of these GIs. Consequently, the other analyzed models definitely cannot be used for the delineation of Brazilian GI territories either.

The analysis of the framework and hypotheses present in the model by Landi and Stefani (2015) indicates that, of the characteristics found in the delimitation of the area of Brazilian GIs, the model only addresses the current economic reality, referring to one of the natural factors observed in these GIs. However, it does not take into consideration the historical economic reality of territorial delimitation for Brazilian GIs.

According to MAPA (2021), the delimitation of a GI area should observe the historical economic reality (location of the first producers that developed the reputation of the region—the historical criterion may warrant the insertion of territories that apparently would not be considered as belonging to the geographic area of the GI) and the current economic reality (economic activities present in the current territory, such as identification and assessment of producers, organization of the production chain, and scale of production).

In addition, the model does not consider the other human factors in the territorial expansion of Brazilian GIs (e.g. know-how, typicality, product recognition by geographic name) or natural factors.

According to Normative Instruction 095 of 2018 of the National Institute of Industrial Property (INPI), associations, unions, or any other entity that can act as such by virtue of the law can apply for the registration of a GI in Brazil as procedural representatives. The request can also be made individually, in the event that there is a single producer or service provider in the region who has legitimacy to use the Geographical Indication (INPI, 2018).

As described by Souza (2013), unless there is only one producer established in the geographic area, requests for GIs are usually collective, with a view to obtaining and sharing benefits among all producers established within the territorial limits of the geographic region. In other words, instead of there being competition between producers established in regions protected by GI, benefits are shared through it, which is considerably different from the competitive nature proposed by Landi and Stefani (2015).

Model four, by Saak (2012) explores economic characteristics; however, similarly to what Landi and Stefani (2015) described, these are not observed in the standards of Brazilian GIs. It is worth mentioning that the economic characteristics indicated by Saak (2015) are much less equivalent to Brazilian GIs than those mentioned by Landi and Stefani (2015). Additionally, model four does not address the other characteristics observed in the delineation of Brazilian GI territories.

Finally, the model by Langinier & Barcock does not take into account the human and natural factors considered in the territorial delimitation of Brazilian GIs. Moreover, for these GI, the control of entry of new participants into the group is very limited. According to Article 6 of INPI 095 of 2018, any producer established within the territorial limits of a GI is able to join its group provided that they comply with the provisions of the technical specification and are subject to said control.

4. Conclusion

This study revealed that research on the delimitation of the area of Brazilian geographical indications is still in its infancy when compared with that of other countries, which have already undertaken some systematizations on this topic. In Brazil, there is an emerging perception that although some benefit is expected for the region where a GI is implemented, through the promotion of territorial development provided by this protection label, some sectors lose this benefit when the GI has a very large geographic area. Furthermore, an overly large GI territory implies difficulties for its management.

However, models of studies that help in the process of delimiting areas of Brazilian GIs have not yet been systematically considered. One of the reasons for this is that this process differs for each case of GI in Brazil, with each category having its peculiarities. Of the models analyzed in this study that address this topic, only two appear to be close to Brazilian GIs, although they cannot be adopted as a standard for the delineation of Brazilian GI areas. One of them is suggested to aid studies for this purpose in the DO category and the other for GIs aimed at the protection of wines.

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