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LOCATIONAL DYNAMICS OF
BRAZILIAN WINEGROWING: NEW
REGIONS IN RIO GRANDE DO SUL
AND IN THE SÃO FRANCISCO RIVER
VALLEY AREA

Luciane Schneider, Márcia Azanha Ferraz Dias
de Moraes and Pedro Valentim Marques

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Locational dynamics of Brazilian winegrowing: new regions in Rio Grande do Sul and in the São Francisco River Valley area

Luciane Schneider, Economics, Management and Sociology Department, "Luiz de Queiroz" Higher School of Agriculture/University of São Paulo (USP), e-mail: luciane_schneider@yahoo.com.br

Márcia Azanha Ferraz Dias de Moraes
Economics, Management and Sociology Department of the "Luiz de Queiroz" Higher School of Agriculture/University of São Paulo (USP), e-mail: mafdmora@esalq.usp.br

Pedro Valentim Marques, Economics, Management and Sociology Department of the "Luiz de Queiroz" Higher School of Agriculture/University of São Paulo (USP), e-mail: pvmarque@esalq.usp.br

Abstract

The objective of the research is to identify the locational factors that influenced the decision to expand winemaking activity into other regions of Brazil. In recent years, winemaking has expanded into new regions in the state of Rio Grande do Sul (*Serra do Sudeste* and *Campanha*) and into the São Francisco River Valley (states of Bahia and Pernambuco) - regions where this activity had not previously been carried out. Rio Grande do Sul, the state with the largest production volume, produces around 90% of all Brazilian wine. Expansion has taken place both inside and outside the state. Primary data were collected through direct interviews with winemakers for the purpose of identifying the factors that drive the locational decision-making process. It was shown that the Brazilian winemaking activities are conditional to the spatial distribution of the productive resources: the companies are concerned about the quality of the end product (wine), which is optimized by the quality of the raw materials (grapes). This, in turn, depends on the edaphic and climatic conditions in the productive region. Another factor that is considered important in winemaking expansion decision-making activities in the country has arisen from the current physical constraints in *Serra Gaúcha*: a large part of the available land lies in Permanent Protection Areas (APP), and the rest would be very expensive to acquire. This has had also an influence on the decision to shift activities to other regions.

JEL Classification: **Q13, R12, R3**

Key words: Brazilian Winemaking; Geographic expansion; Locational decision factors.

1. INTRODUCTION

The main object of this study was to identify the locational factors that have influenced decisions to expand investments in the winegrowing activity on the part of businesses operating in the *Serra Gaúcha* Mountains in Rio Grande do Sul – the main winegrowing region in the country. The territory used for winegrowing has been observed to expand into new regions in Rio Grande do Sul (the *Serra do Sudeste* Mountains and *Campanha*) and to the São Francisco river Valley in Bahia and Pernambuco, which are regions where previously these crops had not been grown.

Brazilian winegrowing has expanded significantly over the last decade. Domestic wine production has increased from 200 million liters in 1995 to 272 million liters in 2005, representing an approximate growth of 36% over the period. The importance of wine on the domestic market can, in economic terms, be seen by looking at the annual turnover of the sector which was around U\$600 million.

The preparation of wines in Brazil is divided into fine and ordinary wines. Fine wines are prepared using wine grapes of European origin, whereas ordinary wines use American or hybrid grapes in their preparation.

Rio Grande do Sul is the most important wine-producing state, responsible for around 90% of domestic wine production. Around 57% of the total area planted with grapevines is in this state. The winegrowing activity has been going on in the *Serra Gaúcha* region since Italian immigrants arrived there in 1875. As the years went by, production improved until it reached a satisfactory level of development and was transformed into the Brazilian winegrowing region. Nowadays, there are more than 600 wine related establishments¹ proving that the area is suited to this activity brought in by the immigrants.

Nevertheless, the number of improvements² which have made the development of the wine production process easier, there has been a locational change in Brazilian winegrowing: a growth in production of wines made outside the traditional region (*Serra Gaúcha*). The expansion has taken place both inside and outside the state, with the most important places being the São Francisco river valley, in Pernambuco and Bahia, and the *Campanha* and *Serra*

¹ There are organizations that prepare wine for trading on the market (rural cantines, cooperatives and wineries) and others intended for study and research (for example: Embrapa Uva e Vinho (Embrapa Grape & Wine), and the Federal Technological Education Center (CEFET) in Bento Gonçalves).

² The benefits arising from the geographic concentration, or agglomeration, of an industry result from the fact that the activities of an industry are tied to other industries by their products. In the case of the winegrowing industry, there are the shipping and handling industries, distribution channel, infrastructure, institutes related to the grape and wine agribusinesses, etc.

do Sudeste regions in Rio Grande do Sul. In other words, even with all the benefits that have accrued from the geographic concentration of the productive chain, new winegrowing centers are emerging in the country.

This expansion movement in the Brazilian winegrowing activity can be corroborated by the expansion in the area planted with grapevines in the country. Over the period from 1990 to 2004, the area planted with grapevines in Brazil increased by 22%. The accumulated expansion in the South Region of the country was 5% over the period, whereas in the Northeast Region, the area planted with grapevines expanded by 370%.

Table 1 shows the changes in the area planted with grapevines in Brazil and in the North, Northeast, Southeast, South and Midwest Regions. It can be seen that there has been an increase in the area planted with grapevines in Brazil over the 1990 – 2005 period of around 24.6%. Furthermore, there has been an increase in the area planted with grapevines in all the regions of the country.

Table 1 – Changes in the area planted with grapevines in Brazil and the regions (in hectares)

Year	Brazil	North	Northeast	Southeast	South	Midwest
1990	58,764	0	1,759	9,510	47,494	1
1991	59,218	0	2,116	9,870	47,232	0
1992	60,170	0	3,138	10,217	46,811	4
1993	60,231	0	3,958	10,282	45,985	6
1994	60,396	0	4,085	9,979	46,319	13
1995	61,339	0	4,871	10,371	46,076	21
1996	56,247	0	4,882	10,046	41,268	51
1997	57,036	0	3,870	10,206	42,793	167
1998	61,099	0	5,272	12,259	43,304	264
1999	60,528	0	5,614	11,380	43,245	289
2000	59,838	0	5,339	11,237	42,930	332
2001	63,325	1	6,690	11,982	44,337	315
2002	66,308	41	6,238	13,120	46,602	307
2003	68,461	38	6,912	13,325	47,856	330
2004	71,640	24	8,261	12,928	50,117	310
2005	73,222	27	8,712	11,878	52,277	328

Source: Prepared from information taken from the Brazilian Geography and Statistics Institute - IBGE (2007)

The South region, which is the main producer of grapes and wine in the country (especially the state of Rio Grande do Sul), has an growth rate of 10% in the area planted over the period. However, this region's share of the total has fallen: in 1990, 81% of the area given

over to grapevines was located in the South region but by 2005, this share had dropped to 71.4%. In spite of this decrease, the region is still the most important grapevine growing region in Brazil.

The Northeast of Brazil has significantly increased its share (over the 1990 – 2005 period, the accumulated growth in this region was 395.28%). At the start of the 1990s, the region contributed 3% of the total area but by 2005, this share had increased to 12%. The states of Pernambuco and Bahia are located in this region.

Both the *Serra do Sudeste* and the *Campanha* region in Rio Grande do Sul and the São Francisco river valley offer the right conditions for growing grapevines. Wine is a product that is directly related to the quality of the grape processed, in other words: the grape that is intended for wine production is characterized by a specific asset. However, grapevines do not adapt to just any climate or region: it is a delicate crop that demands careful handling and it is very sensitive to changes in climate. Hence, it is understood that the edaphic and climatic conditions directly influence the quality of the grape and, consequently, the wine.

In the economic literature, some authors³ have pointed out that the sources of raw materials can be attractive forces which are capable of moving industries to the geographic locations where these are to be found. So, if the industry is dependent on raw materials with specific characteristics, as is the case of grapes, the ideal location for the industry is as near to the source of raw materials as possible.

Nevertheless, it is known that other factors can be highly relevant in the locational decision making processes of an industry or agro-industry, such as, for example: labor, infrastructure, transport costs, proximity to the consumer market, environmental questions etc. These can be more or less important, depending on the type of industry.

In the wine production process, it is believed that raw materials are an important attractive force that is capable of moving the location of the processing factory (winery) to the source that they are located.

2. THEORETICAL REFERENCES

Bowersox (1978) has made an important contribution to the field of classical location theory ever since he became interested in production sites in 1978, when he presented a study on logistics. The author updated Weber's theory of location and added some locational factors

³ Weber (1909) and Bowersox (1978), for example

that were capable of influencing the final decision on where to produce. This author's theory is enriched by the addition of intangible factors into the process for deciding on the best place for production.

In Bowersox's opinion (1978), these location factors can be grouped into three broad categories: minimum cost factors, maximum profit factors and intangible factors. The minimum cost factors are divided into two groups: transfer costs and production costs. The costs of the first group are those that result from moving the raw materials to the place of production (the industrial plant) and that are related to the costs of shipping the end products to the market. The transfer costs can be divided into costs associated with the accumulation of raw materials (resulting from the movement of raw materials or intermediates to the place where they are processed) and the distribution costs (derived from the shipping of end products to the consumer markets, through intermediate stages). The production costs include all the other costs related to the operation of the industrial unit. The sum of the transfer costs and the production costs give the location costs, which must be minimized (Bowersox, 1978).

According to the author, the intangible factors covers the personal preferences, desires and human needs which influence the selection of the ideal location. These essentially human factors can be of extreme importance in the location of an industrial plant. In other words, by adding in intangible factors, the author showed that the variables involved in the choice of location go beyond the economic variables normally considered.

This means that the market, the proximity to the source of raw materials and personal factors can influence the location of an industrial unit; this decision will depend on the minimized sum of the accumulation and distribution costs, associated to the personal preferences of the owner of the business. In some cases, a location somewhere between the source of raw materials and the market can result in the lowest costs.

Bowersox (1996) pointed out that extraction industries such as farming, mining and the timber industry must be located at the place where there are sufficient raw materials for production. In the case of farming, the supply and the amount of land must be adapted to the main functions; in mining, the location must be near to the deposits, whereas in the timber industry, it must be in the forests.

In industries where, due to the nature of the product, a lot of weight is lost during the production process, it is necessary for the plants to be located near to the source of the raw materials⁴. The result of such a location is a reduction in transfer costs, because the weight

⁴ Good examples are the sugar and beet refining industry and the cotton ginning industry (Donda Júnior, 2002).

that is shipped to market is considerably less than the weight of the raw materials. Another factor which leads productive units to be installed near to the source of the raw materials concerns the perishable nature of these materials.

Therefore, it can be concluded that there are several forces which are capable of influencing the transfer costs for private industries and which lead to a place of lowest cost lying in the proximity of the raw materials. These forces are: loss of weight of raw materials during the production process, raw material availability for extractive industries and perishability.

Despite the present study not analyzing the influence of transport costs on the location of winegrowing activities, Bowersox's theory (1978 and 1996), which is intimately connected to Weber's theory, has been shown to be very suitable, as it highlights raw materials related issues (location, perishability).

In the winegrowing process, the quality of the raw material (grapes) is of extreme importance, since the quality of the grape is the dominant factor in the grape supply. The quality of the grape will directly influence the final product – the wine. Furthermore, it is the edaphic and climatic conditions which affect the quality of the processed grape and, consequently, the wine.

Listing all the locational decision factors that are capable of influencing the production site of a company is infeasible, because of the range of types of production activities and the different focuses within them. Whereas many factors can be considered to be of a general nature, companies can have their own features (intangible factors) which affect the production site selection processes.

Even though the emphasis to be given to each factor can vary according to the specific characteristics of the region, Carlos (2000) emphasized that the analysis must be carried out starting from a general proposition (macro) and moving to a specific situation (micro). In macro terms, the author highlights: polarization, urbanization, and the type of industry (polluting and non-polluting). In the regional context, there is infrastructure, the services available (water, electrical energy, fuels), communications (transport – railroads, highways, etc. and non-transport – telecommunications, postal service, amongst other factors), human resources (population, educational level, specializations), the market (raw materials supplier, consumer).

As far as local factors are concerned, these include: land costs (historical value), land conditions (slope, transport conditions), environment (industrial waste, atmospheric pollution,

acoustic level), micro climate (rain, temperatures, humidity, wind), incentives (from the government)⁵.

Motta (1988) showed that locational factors can influence an industrial activity in two ways: by directing industries towards more beneficial geographic points and by agglomerating or dispersing industrial activity within a geographical area.

Firstly, the geographical benefits of transport and labor costs operate as forces for industrial centralization in given places. The cost reductions in industrial activities are a consequence of increased scales of production and the concentration of several industries in the same area. This agglomeration can be the result of the fact that the activities of certain industries are linked to other industries, through their being connected by their products.

Another force vector that can direct and attract investments to a given region is the local infrastructure. Peck (1996) defined local infrastructure as the facilities that supply the collective bases (according to the idea that they are used by a wide range of activities and individual users) and their integration (supplying the means necessary whereby companies and or (agro)industrial complexes can interact) to economic activities. According to the author, infrastructure is an important factor for the development of any productive activity, whether this is more or less dependent on localized raw materials or processes that involve high technology. However, in his studies, Peck (1996) concluded that infrastructure was rarely a decisive factor in the choice of a productive site (being necessary, but not sufficient).

To complement this analysis, in their studies Moore, Tyler and Elliott (1991) tried to detect the importance attributed to the infrastructure factor (considering the items gas/electricity/water, public transport, roads, highways, airports, education, the environment, accommodation/health, commerce/leisure) in the selection of places to install or relocate new productive plants by middle-sized companies in Europe. The authors concluded that the question of infrastructure only seems to arise after companies have become established in the area and start to face difficulties.

One important phenomenon is worth highlighting: the redirecting of the location of productive activities, which sets off a movement towards economic deconcentration, where a

⁵ For these factors, Carlos (2000) emphasized that the stimuli for industrial deconcentration include land donations, infrastructure facilities, financing terms and tax incentives.

new trend needs to be added: that of polarization induced by the flow of innovations. Technological changes mean that industries that used to be labor intensive become capital intensive with the aim of improving their quality (and may move to less-developed regions). On the other hand, technologically more complex industries tend to concentrate in areas which are well equipped with knowledge infrastructure, reaping the benefits of industrial agglomeration⁶.

It is also worth stressing the role that regional development policies and tax incentives play in attracting investments in determined areas. In the opinion of Clemente and Higachi (2000), regional development plans are a typical example of planning region demarcation by the public sector. In this case, one can also think of regions with greater regional inequalities where the public sector strives to operate in such a way that it increases the quality of life and promotes economic development.

Thus, the theoretical reference that underlies this study focuses on two axes. On the one hand, the theory presented by Bowersox (1978 and 1996), which is an extended version or Weber's theory, as well as adding the business owner's personal preferences approach into the decisions that are taken. The author also highlighted the issues of raw material perishability, which is of fundamental importance when dealing with winegrowing.

On the other hand, the different theories, which list locational factors and their relevance to the decision of the productive site, enable the variables to be used in the interviews to be identified. Furthermore, by combining the theoretical contributions of a number of authors, it was possible to draw up a model to explain the location of the winegrowing activity.

$$\text{Locational decision in the agro-industry} = \text{function} \left(\begin{array}{l} \text{raw materials, labor, infrastructure, regional} \\ \text{development policies, tax incentives,} \\ \text{environmental issues, transport costs,} \\ \text{distance from the consumer market,} \\ \text{business owner's personal preferences,} \\ \text{family ties} \end{array} \right)$$

Source: Prepared by the authors

⁶ Regions that are already industrialized are capable of attracting new creations thanks to the infrastructure that they offer: organized energy distribution, transport, skilled labor, amongst other things.

In other words, it is believed that the locational decision in any branch of agro-industry is connected to the factors described in the model above, which brings together, not only the traditional locational factors (raw materials, transport costs and labor) and general, regional and local factors (infrastructure, environmental issues, regional development policies, tax incentives, family ties) but also intangible factors (business owner's personal preferences).

The magnitude of each factor in the decision on where the production site is to be installed depends on the type of agro-industry, when some factors will be seen to be more or less relevant. Furthermore, one factor (alone) or a set of factors can influence a business owner's decision on where the company is to be installed.

The model described above was applied to the winegrowing agro-industry, during the field study, in an attempt to show the locational factors which were most important for the wine growers interviewed.

3. METHODOLOGY

To investigate the locational dynamics of the wineries, an analysis of the primary data was carried out, through direct interviews with wine growers. The aim was to identify the factors that drove the locational decision making process. The survey focused on wineries with investments in the new winegrowing regions of the country (the Northeast Region of Brazil, *Serra do Sudeste* and *Campanha* in Rio Grande do Sul) and which also have investments in the traditional region (*Serra Gaúcha*) as well as those that have directly invested in the new regions.

The *Serra Gaúcha* is the traditional place in the country for the preparation and production of wine. Out of the 613 wine producing establishments (wineries, cantines, etc), 9 also have investments in other regions of the state of Rio Grande do Sul and Brazil. During this survey, 8 of these 9 wineries were interviewed.

There are currently 6 wineries installed in the São Francisco river valley in the Northeast of Brazil. These are in cities in the states of Bahia and Pernambuco. During this survey, 3 of these 6 wineries were interviewed.

Therefore, combining the wineries interviewed in the South and Northeast of the country, it can be seen that 73.3% of the survey's target population was interviewed.

In spite of there not being any information on the exact production of the new regions in Rio Grande do Sul and the São Francisco river valley, an analysis was carried out with

sectoral institutions and with the wineries themselves to reach an approximate value. It was found that the total wine production in the new regions was approximately 13.2 million liters in 2005. Considering only the wineries that took part in this survey, their combined production was 9.3 million liters, that means that in terms of the volume produced, the companies interviewed in this survey are responsible for 70.4% of the total produced in the new regions in the South and Northeast of the country. In the São Francisco river valley, the total wine production is 6 million liters/year⁷ produced by 6 wineries⁸. The three wineries interviewed that operate in the Northeast produce a total of 2.95 million liters, that is: 49.2% of the local production.

For the state of Rio Grande do Sul, there is no official information on the production of each region individually. However, as far as the wineries that are investing in these new regions are concerned, it was possible to arrive at the approximate total volume produced. In the Campanha region, there are three wineries in operation, of which two were interviewed during this survey. The total estimated volume for the three wineries⁹ is 5.6 million liters/year. The sample included 85% of the total produced, that is: the two wineries that were interviewed together produced 4.8 million liters of wine per year. The production volume in the *Serra do Sudeste* region is estimated to be around 1.6 million liters of wine per year. This survey interviewed 6 of the 7 wineries with investments there which together produced 1.37 million liters/year.

In the *Serra Gaúcha* area, only companies with investments outside this region were interviewed. The traditional winegrowers are expanding their activities into other regions in the State of Rio Grande do Sul (*Serra do Sudeste* and *Campanha*) and also into the Northeast region of the country.

A winery that belong to an international group was interviewed in the *Campanha* region of Rio Grande do Sul, more specifically in the city of Santana do Livramento. In Petrolina/PE, three distinct kinds were interviewed: a small winegrower, an international

⁷ THE VALES DO SÃO FRANCISCO E DO PARAÍBA DEVELOPMENT COMPANY – CODEVASF. Available from: <<http://www.codevasf.gov.br>>. Accessed on: 25 May 2006

⁸ According to SEBRAE/PE, there are 6 wineries in operation.

⁹ The Aliança winery, located in the Campanha region, was not interviewed for the company's own reasons. However, it was possible to get information about its productive capacity.

group and a winegrower from Rio Grande do Sul which has investments in four (4) different grape growing regions in the country.

In this study, the winegrowers are represented by letters, to keep them anonymous. Code letters have been added to identify the origin and expansion of each winegrower, as shown in Table 2: for example, the company A originates from the *Serra Gaúcha* region (SG) and has expanded its activities into the *Serra do Sudeste/RS* (SS), so the final nomenclature/code will be represented by $A_{SG/SS}$.

Table 2 – Nomenclature adopted for the winegrowers interviewed

Company	Region of Origin	Code	Region of Expansion	Code	Final Code
A	Serra Gaúcha	SG	Serra do Sudeste/RS	SS	$A_{SG/SS}$
B	Serra Gaúcha	SG	Serra do Sudeste/RS	SS	$B_{SG/SS}$
C	Serra Gaúcha	SG	Serra do Sudeste/RS	SS	$C_{SG/SS}$
D	São Francisco river valley /PE	VF	-	-	D_{VF}
E	São Francisco river valley /PE	VF	-	-	E_{VF}
F	Serra Gaúcha	SG	Serra do Sudeste/RS	SS	$F_{SG/SS}$
G	Serra Gaúcha	SG	Serra do Sudeste/RS	SS	$G_{SG/SS}$
H	Campanha/RS	CA	-	-	H_{CA}
I	Serra Gaúcha	SG	Campanha/RS São Francisco river valley/PE Campos de Cima da Serra/RS	CA, VF, CC	$I_{SG/CA,VF,CC}$
J	Serra Gaúcha	SG	Serra do Sudeste/RS	SS	$J_{SG/SS}$
K	Serra Gaúcha	SG	Campanha/RS	CA	$K_{SG/CA}$

The companies D, E and H are presented only with the region of origin. It is pointed out that company D started to invest directly in the São Francisco river valley (D_{VF}) region, as did the foreign company E (E_{VF}). Winery H, which also belongs to an international group, invested directly in the Campanha Gaúcha region (H_{CA}). Winegrower I also stands out from the others as it has expanded into three regions: Campanha (CA), São Francisco river valley (VF) and *Campos de Cima da Serra* (CC).

4. RESULTS AND DISCUSSION

In the analysis of the primary data, the companies had been asked about the status of the establishments (if they could be described as a new business, an expansion or a relocation). Out of the 11 companies interviewed, 10 were *expansions*, that is: the companies operated in the winegrowing activity before expanding into new regions. Of these 10 winegrowers, 2 invested directly in the new regions and are characterized by foreign investments (company E, in the São Francisco river valley and company H, which has set up in the Campanha region). In other words, the groups to which the wineries E and H belong already operated in the winegrowing activity, however in other countries.

Company D is not characterized as an expansion, but as a “new business”. The partners in this company used to work with winegrowing in the *Serra Gaúcha* region, but decided to set up their own winery in the São Francisco river valley.

Table 3 brings together information received during the interviews, which is taken from the answers to questions about the main aim of the business owners when they took the decision to expand their activities. By analyzing Table 3, it can be seen that 10 of the 11 companies (A, B, C, D, E, F, G, H, J and K) mentioned issues relating to raw materials (grapes).

Table 3 – Aim of the business owner at the time of taking the decision to expand

Company	Objective
A _{SG/SS}	To obtain grapes with specific qualities
B _{SG/SS}	To overcome the shortage of wine-producing grapes and escape from the environmental impact on the <i>Serra Gaúcha</i>
C _{SG/SS}	To overcome the shortage of wine-producing grapes
D _{VF}	To obtain grapes with specific qualities (in the new business)
E _{VF}	To obtain grapes with specific qualities
F _{SG/SS}	To overcome the shortage of wine-producing grapes
G _{SG/SS}	To obtain grapes with specific qualities and escape from the environmental impact on the <i>Serra Gaúcha</i>
H _{CA}	To obtain grapes with specific qualities
I _{SG/CA,VF,CC}	Strategic differential compared to competitor companies, to escape from the environmental impact on the <i>Serra Gaúcha</i> and the high cost of the land that was still available
J _{SG/SS}	To obtain grapes with specific qualities
K _{SG/CA}	To overcome the shortage of wine-producing grapes

Source: Survey data

The companies (A, D, E, G, H and J) said that it was to look for raw materials (grapes) with specific qualities. One of these wineries (G) said that the other aim of the expansion was to escape from the environmental impact caused to the *Serra Gaúcha*¹⁰. The other 4 wineries (B, C, F and K) pointed to the shortage of grapes at the time as being the main reason for expanding the activity into the other region, which also takes into consideration the need for good quality grapes (the aim of 36.4% of the wineries interviewed). Of these wine producers, one (B) revealed that it was concerned about the environmental impact on the *Serra Gaúcha*.

¹⁰ As far as the environmental impact is concerned, the interviewees revealed that nowadays there is not sufficient physical space in the Serra Gaúcha for the expansion of local activities. The large majority of the lands that are not being used for winegrowing are classified as Permanent Protection Areas – APP.

Finally, company I stands out from the rest because it disclosed that its main reason for expanding its winegrowing investments into new regions was to give itself a differential when compared to its competitors. Avoiding from the environmental impact on the *Serra Gaúcha* and the high cost of the land still available there also motivated this company to expand its investments.

From the information supplied by the interviewees, the aims of the wine producing activity at the time of taking the decision to expand its activities can be summed up as connected to the raw materials (either their shortage or the need to obtain a specific quality), the environmental impact on the *Serra Gaúcha* or the personal choice / intangible factor of the business owner (strategic differential compared to other winegrowers).

In other words, the main factors that influenced the choice of production site, are in accordance with Bowersox's theory (1978).

As far as the locational factors are concerned, the survey was steered by the model presented, in an attempt to identify the importance given to these factors by the interviewees. Table 4 presents the list of locational factors, together with their corresponding average scores.

Generally speaking, it can be seen that the locational factors that had the greatest influence on the decision-making process for the winegrowers interviewed were raw materials (average score – 2.48) and the environment (average score – 1.82).

It can be seen that the variables *grape quality, edaphic and climatic conditions* (relating to the raw materials locational factor), *problems with expanding in other regions* and *good conditions for future expansion* (relating to the environment factor) and an *intangible* factor (Company I's own strategy) had the greatest influence over the grape growing activity's decision-making process when expanding to a new production site.

Table 4 – Factors and variables that influence the locational decision-making process

Factor / Variable	Average score	Standard deviation
1 Raw materials	2.48	
• Grape costs	1.36	1.21
• Grape quality	2.82	0.60
• Edaphic and climatic conditions	3.27	0.79
2 Environmental issues	1.82	
• Problems with expanding in other regions	1.73	1.68
• Good conditions for future expansion	1.91	0.83
3 Infrastructure	0.86	
• Infrastructure quality	0.73	0.65
• Service availability	1.00	0.89
4 Labor	0.85	
• Salary costs	0.64	0.50
• Labor quality	0.91	0.30
• Labor availability	1.00	0.45
5 Other factors	0.32	
• Business owner's personal preference	0.37	1.21
• Family ties in the region	0.09	0.30
• Others	0.00	0.00
• Proximity to consumer markets	0.82	0.75
6 Concession of tax incentives	0.00	0.00
• State tax incentives	0.00	0.00
• Municipal tax incentives	0.00	0.00

Source: Survey data

Note: 0 - no importance, 1 - little importance, 2 - a lot of importance, 3 - one of the decisive factors and 4 - the only factor involved in the decision-making process.

Bowersox's theory (1978) highlights the fact that agro-industries must be located at the point where the raw materials are available in sufficient quantities for production. In the case of winemaking, it can be seen that the expansion of the production plants (wineries) is a function of the new grape producing areas. If the wineries were not located close to the grape producing areas, the raw material (grape) transfer costs to the industrial plants could exceed the production and distribution costs. Furthermore, as they are dealing with perishable, transport-sensitive raw materials, the winegrowers chose to expand their activities into a region which offered good climate conditions, enabling grapes of the quality desired to be produced.

It can be seen that companies in the winemaking activity are concerned about the quality of the final product (wine), which is influenced by the edaphic and climatic conditions presented by given regions.

Bowersox (1978) pointed out the importance of business owner's intangible or behavioral factors. In this survey, it can be seen that one of the wine growers has adopted a strategy that is different from the others: mapping the country and setting up processing units in all the regions that are suitable for growing grapes. This wine growers' aim was to stand out from the competition and on the (domestic and international) consumer market by being the only Brazilian wine producer with investments in 4 different regions. In other words, it was a factor of behavioral origin that was intrinsic to the business owner at the time of the expansion decision.

It can be seen that the local factors mentioned by Carlos (2000) were important in the winegrowing activity's locational decision-making process, especially those related to the environment and micro-climate factors (edaphic and climatic conditions).

The results obtained with respect to the infrastructure aspects agree with Peck's conclusions (1996). The author states that infrastructure is necessary, but that it is not generally considered relevant or sufficient to affect the localization of industrial activity. As has been pointed out earlier, the author stressed that the infrastructure conditions at a site rarely become one of the decisive factors in the choice of a production site.

The survey asked the interviewees about some aspects of the new regions, with the aim of qualifying different items, as shown in Table 5.

Table 5 – Infrastructure aspects at the new location

Factor	Average Score	Standard Deviation
1. Environment	2.87	0.77
2. Gas/Electricity/Water	2.30	0.65
3. Education	1.86	0.77
4. Labor	1.86	0.67
5. State/ Municipal highways	1.86	0.67
6. Public transport	1.86	0.47
7. Commerce/Leisure	1.72	0.75
8. Accommodation/Health	1.57	0.65
9. Intermunicipal highways	1.43	0.47
10. Airports	0.00	0.00

Source: Survey data

Scores: 1 - precarious, 2 - fair, 3 - good, 4 - excellent.

From table 5, it can be seen that the environment¹¹ was the aspect with the highest average score (2.87 - meaning that it is considered good). This result is in agreement with what would be expected on considering the expansion problems that are currently to be found in the *Serra Gaúcha* region, a factor pointed out by the companies interviewed.

The availability of gas/energy/water was considered fair. The interviewees disclosed that the cities are fairly well developed (commerce, leisure, schools, health, transport). With respect to the condition of the highways, which is the main method used for transporting wine: they were considered from fair to precarious, because there are stretches of the intermunicipal highways that are in poor condition. As far as airport services are concerned, the main issue mentioned was the bureaucracy that exists.

As for labor, the companies disclosed that it had been necessary to train the local labor, generally sourced from rural settlements. Unlike the traditional region, in the new regions, working in vineyards was not a part of the local culture. Normally company technicians were sent to live in the cities during the training period, and nowadays, there is a person responsible (called the “foreman”) who is in charge of the performance of all the workers at the grape plantation.

As for the regional development programs, about 20% of the companies interviewed said that they were involved, but that they had not received any benefits from them. Company A highlighted that there were promises of agricultural credit lines. Company F got the help of the local city hall with machinery, electricity and highway services and received the use of a pavilion for 20 years.

It can be seen in the current survey that infrastructure items performed only fairly well or badly. These results were also found by Moore, Tyler and Elliott (1991), who concluded that the problems found in the local infrastructure only became apparent after the industry had been installed.

Despite the infrastructure problems, all the companies considered themselves to be satisfied with the places that they had chosen for expanding their activities. The main varieties of grape grown in the new regions are: *Pinot Noir*, *Chardonnay*, *Merlot*, *Cabernet Sauvignon*, *Tannat*, *Nebiolo*, *Malbec* and *Moscato*, which are all used in wines.

¹¹ This involves issues of problems linked to the environment (pollution, water quality etc.) and is also associated with the problems of expansion in other regions.

Thus, it can be seen that infrastructure factors are essential for the winemaking activity; however they were not responsible for the production site that was decided on, and are not directly related to the activity's performance.

After analyzing the data and the observations presented by the winemakers interviewed, it could be seen that the proposed model applies¹² for understanding the spatial location of the winegrowing activity.

As this is a sample that includes 73% of the total population, the variables have been classified as relevant or negligible (unimportant). Variables relating to the following locational factors were seen to be relevant: raw materials, the environment, behavior, infrastructure, labor, proximity to the consumer market and regional development programs. Variables relating to tax incentives, family ties and transport costs were seen to be negligible for the winegrowers interviewed in this survey.

5. CONCLUSIONS

The main object of this study was to identify the locational factors that have driven the expansion of the winegrowing activity into new regions in Rio Grande do Sul and in the São Francisco river valley. It was shown that the Brazilian winegrowing activity is conditional to the spatial distribution of the productive resources, with special emphasis on edaphic and climatic factors, raw material (grape) quality and supply, the business owner's behavioral focus and the availability of land.

The survey has shown that companies are concerned about the final quality of the product (wine). This is optimized by the quality of the raw materials (grapes) which, in turn, depends on the edaphic and climatic conditions in the productive region.

It has also emphasized the influence for an important domestic winegrower of his preference in the decision-making process. The option to invest in four different regions of the country was, to a large extent, due to the company's intention to stand out from the competition on both the domestic and the external markets.

Another factor that has influenced winegrowing activity expansion decisions in the country is the physical restriction currently imposed by the *Serra Gaúcha*: a large part of the

¹² It must be made clear that the model and the significance of the variables have not been tested statistically.

This remains, however, a proposal for future surveys.

land available is in Permanent Protection Areas (APP), and the remainder is very expensive to acquire. This has influenced the redirecting of the activity to alternative regions.

The observation of classical and intangible factors, along with the relevance of the environment question in answers received during the direct interviews carried out with the winery representatives, is in agreement with the theoretical basis of this study. On the one hand, classical locational factors have been important and relevant during the decision-making process, to which one business owner's individual strategic decision has been added in. Similarly, matters related to the environment, infrastructure, etc., which are included in the theories of locational factors, are also important.

It can be seen that the wineries operating in the *Serra Gaúcha* – the country's traditional winegrowing area – have expanded their investments into the *Serra do Sudeste* and *Campanha* regions, in the state of Rio Grande do Sul, and into the São Francisco river valley region, in the states of Pernambuco and Bahia. The *Campanha* region, in Rio Grande do Sul, and the São Francisco river valley region have also been the targets of foreign investments in this activity.

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