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THE SPECIALIZATION OF MILK PRODUCTION IN THE VALE DO TAQUARI / RS REGION

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Abstract

Milk production is present in most of rural properties and can be found throughout the national territory, although it is concentrated in some regions and developed in different scales and production models, from subsistence to highly specialized. In this sense, the objective of this study was to analyze the existence (or not) of specialization of the dairy activity in the region of Vale do Taquari (VT) in comparison to other regions, since it is not located according to previous studies in the region of Rio Grande do Sul as of greater specialization. In order to achieve the proposed objective, the Locational Quotient (QL) method was used, with secondary data coming from the Municipal Livestock Research of the Brazilian Institute of Geography and Statistics (IBGE) and the Economics and Statistics Foundation (FEE). The results indicated a tendency of specialization of the activity in most of the municipalities of VT during the analyzed period, as a consequence of the increases in the yield and the productivity per cow, as well as in the value of the production. This last one has a wide representativeness in the constitution of the value added in agribusiness sector for most regional municipalities when compared to the state.

Keywords: activity-specialization; milk production; Vale do Taquari.

Resumo

A produção leiteira está presente em uma parcela significativa de propriedades rurais e pode ser encontrada em todo o território nacional, embora esteja concentrada em algumas regiões e desenvolvida em diferentes escalas e modelos de produção, desde a subsistência até altamente especializados. Neste sentido, o objetivo deste estudo foi analisar a existência (ou não) de especialização da atividade na Região do Vale do Taquari em comparação a outras regiões, uma vez que esta não se localiza geograficamente na região do Rio Grande do Sul como de maior especialização, conforme identificado em estudos anteriores. Para cumprir com o objetivo proposto foi utilizado o método do Quociente Locacional (QL), sendo os dados secundários provenientes da

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Pesquisa Pecuária Municipal do Instituto Brasileiro de Geografia e Estatística (IBGE) e da Fundação de Economia e Estatística (FEE). Os resultados indicaram uma tendência de especialização na atividade da maior parte dos municípios da região ao longo do período analisado, como consequência dos aumentos na quantidade produzida e na produtividade por animal ordenhado, assim como no valor da produção que possui uma representatividade maior na constituição do valor adicionado agrícola para a maioria dos municípios regionais se comparado ao Estado.

Palavras chave: especialização, produção leiteira, Vale do Taquari

Resumen

La producción lechera está presente en una parte significativa de las propiedades rurales y se puede encontrar en todo el territorio nacional, aunque está concentrada en algunas regiones y se desarrolla en diferentes escalas y modelos de producción, desde la subsistencia hasta altamente especializados. En este sentido, el objetivo de este estudio fue analizar la existencia (o no) de especialización de la actividad en la Región del Valle del Taquari en comparación a otras regiones, una vez que ésta no se ubica geográficamente en la región de Rio Grande do Sul como de mayor especialización, según lo identificado en estudios anteriores. Para cumplir con el objetivo propuesto se utilizó el método del Cociente Locacional (QL), siendo los datos secundarios provenientes de la Investigación Pecuaria Municipal del Instituto Brasileño de Geografía y Estadística (IBGE) y de la Fundación de Economía y Estadística (FEE). Los resultados indicaron una tendencia de especialización en la actividad de la mayor parte de los municipios de la región a lo largo del período analizado, como consecuencia de los aumentos en la cantidad producida y en la productividad por animal ordeñado, así como en el valor de la producción que posee una representatividad mayor en la constitución del producto, valor agregado agrícola para la mayoría de los municipios regionales si se compara al Estado.

Palabras clave: especialización, producción lechera, Valle del Taquari

Introduction

The milk production chain is one of the most important Brazilian agribusinesses, not only in economic terms, but also from a social and environmental perspective and, for Okano, Vendrametto and Santos (2013), is ahead of crops such as coffee and rice.

According to Martins and Faria (2006), initially, milk production was only developed for family consumption, as coffee and sugarcane production were the main activities of Brazilian agribusiness. According to the authors, it was only in the second half of the 1940s that a process of regulation of the productive activity began, which established sanitary rules to give consumers more security regarding the products being purchased and implemented price controls, through State intervention, which continued until the late 1970s. During this period, in the 1950s and 1960s, the market was boosted by the installation of the equipment industry, the opening of roads, and the arrival of multinationals.

Thus, since 1960, milk production has intensified, but poor infrastructure and unsatisfactory sanitary practices persist. By the 1980s, State intervention was evident in two forms: price regulation and, given the scarcity of food, in the inducement of increased production and productivity.

In the following decade, transformations in the world economy had a significant impact on both Brazilian agribusiness and dairy farming. Among the main changes were: the formation of economic blocs, the emergence of an even more globalized trade, the reduction of state intervention in milk price regulation, the opening up of the national market, which enabled increased imports and exports, with consequent modifications in consumption behavior of the Brazilian population, and the implementation of the Real Plan.

Duarte (2002) states that after forty years of State-controlled prices, little investment, a dependence on imports, a predominantly non-specialized herd and strong participation of the informal market, in the 1990s the milk production chain had to be reformulated. Along the same lines, Breitenbach (2012) notes that the end of State intervention in the dairy sector, combined with the opening up of trade, favored the increase of competition leading to a fall in prices, the emergence of new dairy products and a rise in the volume produced.

At the beginning of the twenty-first century, there was a growth of activity throughout the country, so that from 2011, Brazil became the fourth largest milk producer in the world, behind the United States, India, and China. In 2013, the country produced 35.67 million tons of cow's milk, representing 5.6% of world production (FAO, 2016). This production is concentrated in the states of Minas Gerais, Rio Grande do Sul, Paraná, Goiás, and Santa Catarina, which accounted for approximately 72% of national production in 2014, demonstrating a significant concentration in these states when compared to the rest. In the same year, the sector's economic and social impact was clear from the production value of R $ 33.786 billion (IBGE, 2016).

Also, the profile of dairy farming in Brazil shows that it is heterogeneous regarding the type of producers (specialized and non-specialized), the size of the herd and the technologies used. As it is dispersed throughout the national territory, it is impossible to have a single description, either at a country or a state level (HOTT; CARVALHO; OLIVEIRA, 2007; FERRO et al., 2007). According to Zoccal (2010), it takes place both in subsistence properties, where production is less than ten liters/day and in properties considered among the most efficient in the world.

In Rio Grande do Sul, the second largest milk producer in the country, primarily family farmers have developed the activity in small areas of land, and the volumes per property are low. The association of these elements means that for some of the farms, milk production is a complementary activity to other undertakings. However, this does not mean that some properties have not specialized in this area in recent times.

To illustrate this reality, data from the 2006 Census of Agriculture shows that 38.87% of the rural properties that produced milk in RS were less than 10 hectares in size, and 52.69% were between 10 hectares and less than 100 hectares. Also, the share of family agriculture in the state's milk production was 89% of rural properties and corresponded to 84.7% of the volume produced (IBGE, 2006).

These characteristics are also observed in the Vale do Taquari region, located in the central region of RS and the focus of this study (see item 2.1). In 2014, the area had the third largest production in the state, responsible for 7.9% of the output. Therefore, the objective of this study was to analyze the existence (or not) of specialization in comparison to other regions, since it is not located geographically in the most specialized region, as identified in previous studies (MARION FILHO; OLIVEIRA, 2011; SCHUMACHER; MARION FILHO, 2013).

To this end, this study has four parts, besides this introduction. We begin by outlining the methodological procedures; followed by a contextualization of milk production in the recent period, in Rio Grande do Sul and the region under study; next, the analysis of the results of the research is presented, and we end with the final considerations.

Methodological Procedures

The Vale do Taquari region in RS is made up of 36 municipalities and follows the geographical delimitation established by the Regional Development Councils of Rio Grande do Sul (COREDES). The description of milk production was carried out for all municipalities in the region through the collection of secondary data from the Municipal Livestock Research, published by the Brazilian Institute of Geography and Statistics (IBGE). Data were collected for 1985, 1990, 1996, 2000, 2005, 2010 and 2013.

To fulfill the objective of evaluating the specialization in the region under study we used the Locational Quotient (QL) method, which is a measure that compares the relative importance of an industry to a region and its relative importance in the state's economy (HADDAD, 1989; SUZIGAN et al., 2003). This calculation makes it possible to identify the sectors that are relatively more important in the region under analysis compared to those in the state as a whole, that is, if the QL is high in a region (or municipality), this demonstrates the specialization of the local productive structure (SUZIGAN et al. , 2003).

According to Paiva (2006, p.5), the locational quotient "seeks to translate "how many times more"(or less) a region engages in a given activity *vis-à-vis* all the regions that make up the reference macro-region ".

Thus, for activity i:

$$QL_i = \frac{X_i^R / X^R}{X_i / X}$$

Where: X_i^R and X^R represent the regional product and Xi and X are the national product.

According to this measure, if $QL_i>1$, this means that activity i is more important in the region than in the state economy. On the other hand, $QL_i<1$, demonstrates that the activity has a lower relative importance in the region compared to the state.

In this article, the calculation of the QL considered the relationship between the value of milk production and the agricultural added value in the municipalities of the region; the aggregate values for the region are compared with the results obtained by the State for the same variables.

However, it is worth emphasizing that overuse of the locational quotient should be avoided, as although this method allows a comparison of the regions, it does not give an overall picture of the imbalances that may exist. Consequently, the indicator should not be used in strict analyzes between regions, since "a region that is not industrially developed may have a high index of specialization simply because of the presence of one productive unit, even of modest dimensions" (SUZIGAN et al., 2003, pp. 46). The authors also point out that another limitation of the QL is associated with the "difficulty in identifying some type of specialization in regions (or municipalities) that have more diversified industrial structures, such as highly developed municipalities with a diversified industrial structure and high total employment" (SUZIGAN et al., 2003, p.46).

The context of milk production in Rio Grande do Sul in the recent period

Milk production in RS has an economic and social impact and is historically linked to the participation of family agriculture, especially small and medium properties, since dairy farming can be developed in different scales and production systems, unlike other activities such as swine and poultry, which require constant technological innovations and larger production scales. Also, it requires continuous daily work, which may hamper the use of salaried labor, making the family farming model a more favorable factor for the activity (SILVA NETO; BASSO, 2005).

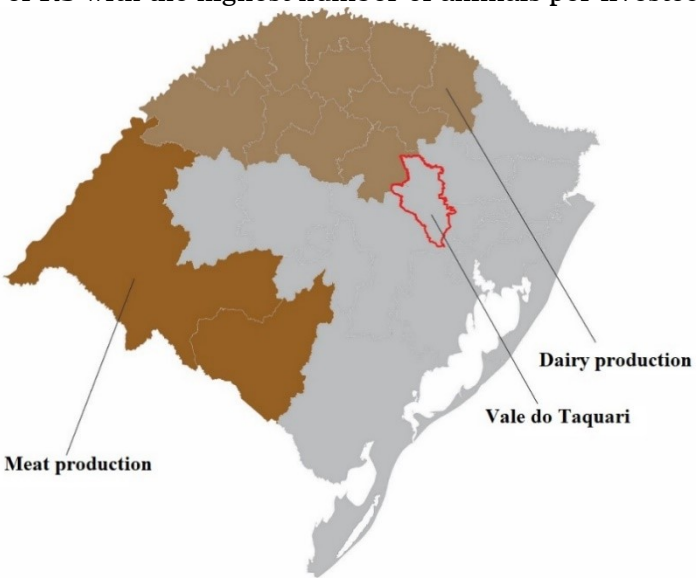
Finamore and Maroso (2006) complement that dairy farming is considered an alternative income for many families that grow cereals and can become the primary source of income between harvests or in dry periods.

On the other hand, it is evident that in the more specialized regions of the State, dairy farming has become the properties' main activity. According to a study carried out by Marion Filho and Oliveira (2011), these specialized regions are located in the Northwest region of RS, with the micro-region of Passo Fundo being the largest producer, followed by the micro-regions of Lajeado-Estrela[5], Três Passos, Erechim, Guaporé, Santa Rosa, Frederico Westphalen, Cruz Alta, and Caxias do Sul, which are responsible for 62% of the milk produced in the State. However, according to the authors, the growth in production in the last years has happened unequally, changing the regional map for the generation of the product. Among the 35 microregions, Passo Fundo has become a specialized region, and Lajeado-Estrela has become a non-specialized region.

In Figure 1, shows the main milk-producing regions, with a distinction being drawn between the regions regarding the predominance of livestock rearing. In addition, it is observed that the municipality of Passo Fundo makes up the region characterized as specialized in dairy farming while Lajeado-Estrela is outside it. These municipalities are located in the Vale do Taquari, a region with significant production, but which is considered unspecialized, according to Schumacher and Marion Filho (2013).

[5] The list of municipalities that compose this micro-region according to IBGE classification partially coincides with the municipalities belonging to Corede Vale do Taquari.

Figure 1: Mesoregions of RS with the highest number of animals per livestock activity

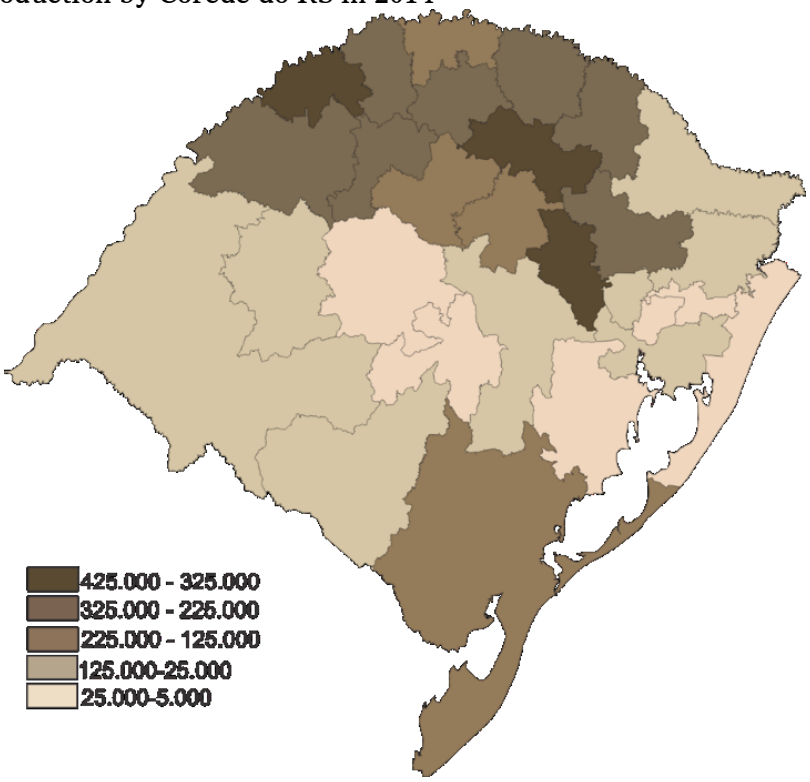


Source: adapted from Schumacher and Marion Filho (2013).

Livestock farming in the state is undergoing a "process of spatial relocation and reorganization of production" (SCHUMACHER; MARION FILHO, 2013, p.39) since the growth of the activity and specialization do not follow the same trend in all regions; in some of them, other economic activities predominate.

In 2014, milk production was concentrated in the northern region of RS. The main producing regions were those of the Coredes [6] Fronteira Noroeste (9.1%), Produção (8.8%), Vale do Taquari (7.9%), Serra (6.9%) and Norte (6.9%), respectively. There are significant regional disparities in the development of the activity, since in half the regions milk production only represents 20.7% of the total produced in the State (FIGURE 2) (IBGE, 2016).

Figure 2: Dairy production by Corede do RS in 2014



Source: Prepared by the authors.

[6] The Regional Development Councils (Coredes) are a political classification and were created in 1994 by the state government to serve as a forum for discussion and decision-making regarding policies and actions aimed at regional development.

For Gomes (2008), local advantages are responsible for the concentration of the dairy herd, such as the fertile soil and pastures, good availability of water and family labor, and the temperate climate. These factors also attracted large dairy producers to these regions, serving as a stimulus for the expansion of the activity.

On the other hand, Breintenbach and Souza's (2015) study of the milk production chain in Rio Grande do Sul found that competitive oligopsonies had established themselves in the most productive, qualified and easily accessible regions, where there were more competition and negotiation over price, demand, and supply between producers and industries. However, in areas where less-equipped farmers produce milk or in peripheral regions, monopsony predominates, due to the farm's lack of strategic attractiveness to the processing companies. This reality discourages new investments, both by farmers, who depend on a single processing industry and by businesses affected by low production per farm and difficulties in acquiring the raw material.

The concentration of milk production can also be observed from a municipal perspective. According to Table 1, which presents information about the primary milk producers in the RS in 2014, only half of the municipalities are in the five principal producing regions. The remainder are in regions with less participation, as in the case of the municipality of São Lourenço do Sul, which alone produced 25% of the milk output in Corede Sul. The municipality with the highest production was Santo Cristo with 62,640 thousand liters of milk, followed by the municipalities of Ijuí (60,000 thousand liters) and Casca (55,166 thousand liters). This ranking includes Estrela, located in Vale do Taquari, which was responsible for the production of 40,990 thousand liters of milk in 2014.

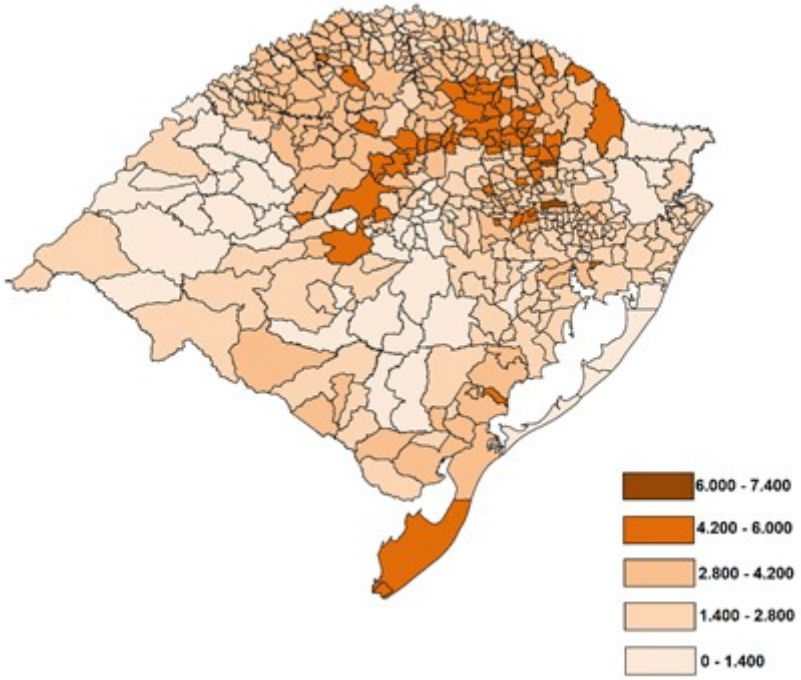
Table 1: Municipalities with the largest milk production in the RS in 2014

Municipality	Production (in thousand liters)	COREDE
Santo Cristo	62,640	Fronteira Noroeste
Ijuí	60,000	Noroeste Colonial
Casca	55.166	Produção
Ibirubá	51,722	Alto Jacuí
Palmeira das Missões	45,937	Rio da Várzea
Augusto Pestana	45.900	Noroeste Colonial
Marau	45,187	Produção
Três de Maio	44,146	Fronteira Noroeste
São Lourenço do Sul	41,475	Sul
Estrela	40,990	Vale do Taquari

Source: IBGE - Municipal Livestock Research (2016).

It is noteworthy that although Rio Grande do Sul is not the state with the highest production in the country, it has the highest productivity, which indicates the trend towards specialization. In Brazil, productivity was 1,525 liters per cow in 2014, compared to 3,034 liters in the RS, evidencing significant regional disparities (IBGE, 2016). Figure 3 shows the milk yield per municipality in RS in 2014.

Figure 3: Milk productivity by municipality in RS in 2014



Source: Prepared by the authors

Concerning the state ranking, Table 2 lists the ten most productive *Gaucho* municipalities. This ranking shows a significant change from the composition of Table 1 since Casca is the only municipality that is on both lists.

Table 2: Municipalities with higher milk yield of RS in 2014

Municipality	Productivity (liters / cow / year)	COREDE
Carlos Barbosa	6.827	Serra
Vila Flores	6.570	Serra
Alvorada	5.769	Metropolitano Delta do Jacuí
Fortaleza dos Valos	5.708	Alto Jacuí
Santa Vitória do Palmar	(5,513)	Sul
São José do Ouro	5,455	Nordeste
Casca	5,400	Produção
Chuí	5.375	Sul
Pejuçara	5.312	Noroeste Colonial
Nova Prata	(5.280)	Serra

Source: IBGE - Municipal Livestock Research (2016)

The municipalities with the highest productivity in Rio Grande do Sul were Carlos Barbosa, Vila Flores, and Alvorada, at 6,827, 6,570, and 5,769 liters of milk per cow, respectively, in 2014, which is four times the Brazilian average (if the first two places are observed). In addition, these municipalities' performance is also higher than countries such as Argentina, China, and Ukraine. In 2010, in the United States, the world leader, the average production / cow / year was 9,720 liters (USDA, 2010).

It is worth highlighting that productivity has increased in Brazil; in the period from 2010 to 2014 it rose by 13.8% (IBGE, 2016). According to Ferro et al. (2007), this growth results from several factors, including:

a) the expansion of the area of pasture;

(b) an increase in the number of cows being milked;

c) the influence of the adoption of new technologies on the factors of production

d) improvements in feeding the animals through the use of concentrates, pasture rotation techniques, and intensive production systems;

e) regarding management techniques, there are significant differences between the Brazilian regions, which do not allow the adoption of a single model;

f) health and genetics (Brazilian cattle are not specialized; most are the result of crossing with beef cattle).

In the same period, RS's productivity increased by 24.9% (IBGE, 2016). Finamore and Maroso (2006) state that this increase is directly related to the farmers' specialization, improved pastures and the type of cattle used (European origin), as well as to the technical and scale requirements of the processing industry, which has remunerated the producers using productivity criteria (SILVA NETO; BASSO, 2005).

From this context, despite studies indicating the existence of regions depicted as the leading milk producers in the RS, it is perceived that recently, production has occurred in a decentralized way since it is evident that the most prominent municipalities in terms of production and productivity are located in different regions.

Among these regions is the Vale do Taquari, which is not located in the macro-region with the highest milk production at a State level and has been classified as a non-specialized region in previous studies. Nevertheless, it has a high regional output and has one of the most productive municipalities in the state. The guiding question of this study is based on this regional context, as already described in the introduction. Therefore, the following section details the dairy production in the Vale do Taquari.

Milk in the Vale do Taquari

In the Vale do Taquari (VT), primary activities mainly take place on small farms, which are concentrated in the group with fewer than 100 hectares and with a high percentage of farmsteads in areas smaller than 10 hectares (IBGE, 2006).

Dairy farming in the region is an important source of family income and an input for the processing industry, making it one of the main productive activities. Milk production in the area began with the European colonizers and incentivized the installation of dairies to process it and produce by-products such as cheese, cream, and butter (BARDEN et al., 2001).

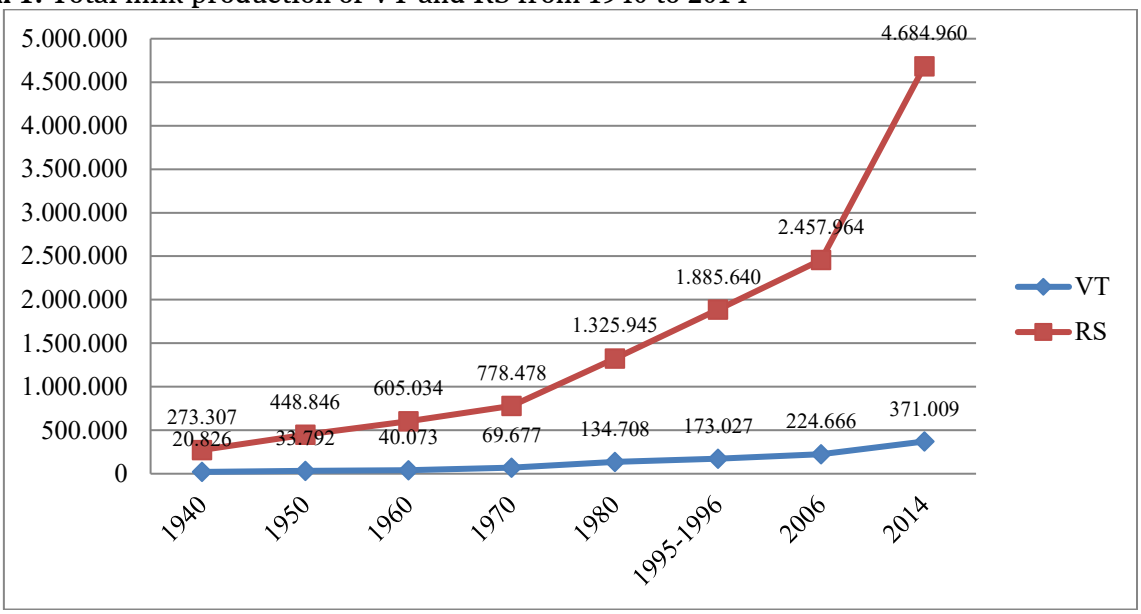
The region's primary production is closely linked to the process of agroindustrial transformation. Almost all the products of origin in the primary sector are processed by private companies or agroindustrial cooperatives located in the same region, among which dairy products are prominent. This agroindustrial sector is made up of two large cooperatives (Cooperativa de Suinocultores de Encantado and Cooperativa Languiru Ltda), several private industries (including Cotrilac Comércio, Transporte e Indústria de Lácteos Ltda; Laticínios Vale do Taquari Ltda; Quinta do Vale Alimentos Ltda; and BRF – Brasil Foods), among others.

In addition to the simple process of pasteurizing and packaging milk "*in natura*" for consumption, this agroindustrial sector produces different derivatives, which require the use of more qualified human resources and technologies, particularly milk powder. Cheeses, butter, yogurt, and other byproducts are also produced and sold to the urban centers of Rio Grande do Sul, other Brazilian states and overseas.

According to IBGE (2006), dairy production was present in 46.4% of rural establishments in the state of Rio Grande do Sul, 62.8% of which sold raw milk to agro-industries. In the VT region, these percentages are higher, 54.6% of the rural establishments were producing milk, and 74.9% of them commercialized milk, demonstrating that the activity is an important source of income for rural properties; in some municipalities, these percentages are even higher. In the municipality of Westphalia, 78.8% of the farms produced milk, of which 96.3% was sent to a dairy.

Analyzing the production from a historical perspective, using data available in the Agricultural Census (IBGE, 1940 - 2006) and the Municipal Livestock Research (2014), it is clear that between 1940 and 2014, dairy production increased significantly both in VT and the State (Chart 1). This is especially true in the last decades as a result of modernization and specialization, as well as the impact of changes in the sector, already highlighted in the previous section. In this respect, Finamore and Maroso (2009) observed that between 1990 and 2003 there was an increase in both milk productivity and production in the State, as a consequence of improvements in genetics, animal nutrition, and technology, with the stabilization of the dairy herds.

Graph 1: Total milk production of VT and RS from 1940 to 2014



Source: IBGE (1940/2014).

In 1940, milk production in the region was 20,826 thousand liters, which represented 7.6% of the state's output. By 2014, regional production had reached 371,009 liters (7.9% of RS), showing that the region maintained a relatively constant trend of participation in state production, although in the 1980s it reached 10.2%.

In 2014 the chief milk-producing municipalities in the region were Estrela, Teutônia and Arroio do Meio with a production of 40,990, 36,292 and 26,300 thousand liters of milk, respectively. This production represented 27.9% of the total produced in the region, demonstrating that there is regional inequality since the VT has 36 municipalities; the same occurs at a state level.

This disparity is also evident when analyzing municipal productivity. Although in 2014, in most cases this indicator was higher than the state average, and in all municipalities in the region it was above the Brazilian one, there are significant differences between them, since in seven municipalities this indicator was less than half the productivity of Estrela, which was 4,968 liters/milk/cow milked in 2014.

Moreover, according to Table 3 this productivity has changed significantly over time. In 1975, the yield was 1,041 liters/cow/ year in the VT, whereas in 2014, it had reached 3,453liters/cow/year. The table also shows that the region always presented results above the state average, which in turn is higher than the national average, demonstrating that there is more specialization since according to Marion Filho et al. (2014), dairy productivity only increases with investments and the professionalization of the activity. The authors also point out that the process of modernization of livestock production occurred in the 1990s, and these improvements have been observed mainly since the 2000s.

Table 3: Milk productivity (liters/milked cow/year)

	Year								
	1975	1980	1985	1990	1995	2000	2005	2010	2014
Brazil	646	676	715	759	801	1,105	1,194	1,340	1,525
RS	946	1,034	1,055	1,237	1,367	1,804	2,050	2.430	3,034
Corede VT	1,041	1.770	1,494	1,621	1,803	2,326	2,522	2,941	3,453

Source: IBGE - Municipal Livestock Research (2016).

It should be noted that changes in the dairy chain since the beginning of the 1990s, such as the deregulation of markets, the restructuring of the sector and greater specialization were responsible for high rates of growth in milk production in the three units analyzed (Brazil, RS, and Corede VT), especially in the late 1990s and early 2000s.

In relation to the herd, unlike Brazil and RS, in the VT region, beef farming is of less importance compared to milk production. When analyzing the ratio between the number of milked cows and the bovine population, it can be seen that this is higher in the region (TABLE 4) and has intensified in the last decades.

Table 4: Ratio between milked cows and the bovine population

	Year								
	1975 (%)	1980 (%)	1985 (%)	1990 (%)	1995 (%)	2000 (%)	2005 (%)	2010 (%)	2014 (%)
Brazil	11.99	13.88	13.15	12.97	12,76	10.53	9.96	10.94	10.86
RS	6.73	8.49	7.89	8.56	8.78	8.56	8.45	10.34	11.06
VT	27,14	37.68	7/28	31.40	32.33	30.68	31.32	40.84	42.65

Source: IBGE - Municipal Livestock Research (2016).

This intensification is due both to the process of specialization of dairy production, which was responsible for increased production in some municipalities, and the process of agricultural mechanization. As machines and tractors replaced animal traction, the participation of bovine animals on farms fell to such an extent that in 2014, 42.65% of the bovine herd in the VT region were milked cows. On the other hand, in RS and Brazil, where beef cattle were historically significant, this percentage was 11.06% and 10.86%, respectively.

When analyzing the municipal data, there was the same rise in the trend of milked cows in relation to the bovine population, but in some, like Anta Gorda (63.4%), Putinga (59.1%) and Arroio do Medium (58.4%), it was more intense. Besides, it is notable that in a third of municipalities this ratio was higher than 50%, demonstrating the importance that the activity has in the region.

It is worth mentioning that the factors that contributed to the development of regional milk production were associated with those already cited above, such as improvements to pasture, the availability of water and family labor, genetic changes and control of animal health, and the modernization of properties incorporating technology, among others.

An additional factor is associated with logistics, as the region has major multimodal transport routes that favor access to regional, state, national and external markets and reduce transportation costs. These include the hydro-railway axis formed by the Rio Taquari; BR 386 (Rodovia da Produção); railway routes to the north of the State and the Southeast of the country; and the RS 453 and RS highways (RIO GRANDE DO SUL, 2016). This characteristic brings together the producer and agro-industrial processors, as well as the flow of outputs to the consumer markets.

Analysis of the Results

The growth in production and productivity over time in the region, as well as the participation of milked cows in relation to the bovine population in some municipalities, in particular, guarantees a specialization in dairy activity in the region when compared to the State as a whole. The QL analysis shows that for most of the municipalities in the region, dairy farming has a higher relative importance in the constitution of agricultural GVA when compared to RS (Table 5). In 1985, only one municipality in the region had a QL of less than 1, and in 2013, this number had risen to five (14% municipalities).

In contrast, the location coefficients show that, despite the specialization of the activity, there are disparities between municipalities, since it is possible to find specialized producers and small subsistence producers, as occurs in other regions of Brazil and is highlighted by Lemos et al. (2003).

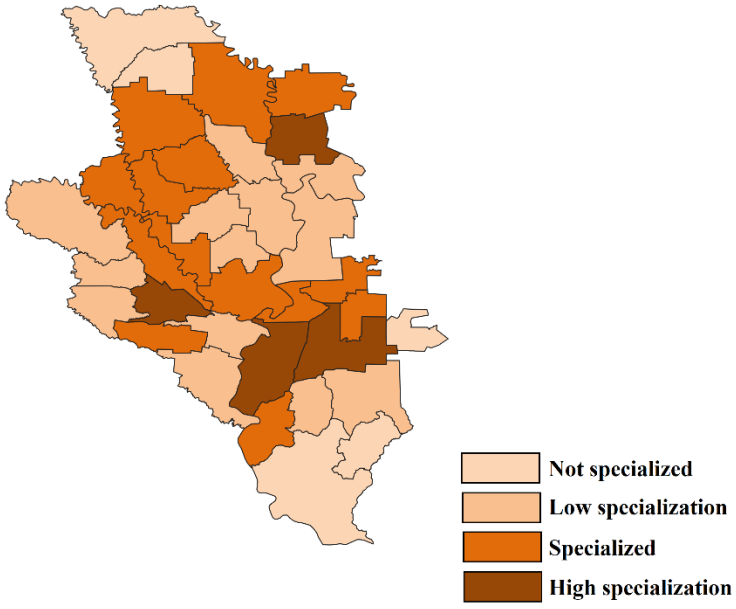
Table 5: Specialization in milk production of the municipalities of the Vale do Taquari (1985-2013)

	1985	1990	1996	2000	2005	2010	2013
Anta Gorda	0.95	0.67	0.72	2.32	1.62	2.71	2.74
Arroio do Meio	3.89	2.96	2.83	4.42	2.20	3.14	3.58
Arvorezinha	1.19	1.24	0.87	0.73	1.04	1.10	0.91
Bom Retiro do Sul	2.00	2.46	2.11	2.07	2.30	2.16	3.05
Canudos do Vale	-	-	-	-	0.96	1.72	1.99
Capitão	-	-	1.11	1,17	0.47	1.00	1.45
Colinas	-	-	2.87	5,91	2.47	2.58	2.83
Coqueiro Baixo	-	-	-	-	1.61	1.46	2.82
Cruzeiro do Sul	2.31	2.06	2.28	1.98	1.67	1.74	1.93
Dois Lajeados	-	0.74	0.90	0.86	0.83	1.64	2.52
Doutor Ricardo	-	-	-	1.24	1.20	1.51	1.50
Encantado	1.79	1.78	0.77	1.13	0.96	0.71	1.05
Estrela	2.24	4.07	4.70	4.86	2.34	2.78	4.23
Fazenda Vilanova	-	-	-	0.68	0.75	1.93	1.53
Forquetinha	-	-	-	-	1.97	3.44	4.29
Ilópolis	1.01	0.54	0.72	0.69	0.77	0.89	0.74
Imigrante	-	2.39	1.97	3.34	2.02	2.05	3.18
Lajeado	2.17	3.06	1.83	2.47	0.94	1.04	1.70
Marques de Souza	-	-	-	2.21	2.25	2.10	3.54
Muçum	1.77	1.63	2.67	2,36	1.18	1.38	1.40
Nova Bréscia	1.77	1.75	0.46	1.41	1.07	0.82	1.70
Paverama	-	2,65	2.46	2.76	1.12	0.61	1.23
Poço das Antas	-	0.78	2.45	1.69	0.69	0.53	0.58
Pouso Novo	-	0.99	0.07	0.83	1.61	2.37	3.00
Progresso	-	0.67	0.89	1.13	1.13	1.28	1.81
Putinga	2.03	1.14	1.34	1.29	1.66	2.57	3.19
Relvado	-	1.03	0.93	1.41	1.81	2.11	2,65
Roca Sales	2.39	2.38	1.78	1.89	1.07	0.99	1.51
Santa Clara do Sul	-	-	2.17	2.68	2.17	2.27	2.92
Sério	-	-	0.73	0.75	0.63	1.33	1.73
Tabaí	-	-	-	0.84	0.13	0.14	0.17
Taquari	3.34	0.86	1.50	0.71	0.23	0.14	0.15
Teutônia	2.98	4.51	3.45	5.45	2.88	3.25	4.59
Travesseiro	-	-	2.40	2.41	1.39	2.30	3.20
Vespasiano Correa	-	-	-	1.62	2.47	3.59	4.76
Westfalia	-	-	-	-	3.49	3.23	3,51
TOTAL	2.22	2.07	1.71	2.25	1.55	1.83	2.33
Total - RS	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: IBGE (1985/1990/1996/2000/2005/2010/2013).

According to the classification by Marion Filho et al. (2014) of the total specialized municipalities in 2013, 13 were classed as poorly specialized (QL between 1 and 2), 14 were specialized (QL between 2 and 4), and 4 were highly specialized (QL higher than 4); as can be seen in Figure 4.

Figure 4: Dairy specialization of VT Municipalities in 2013



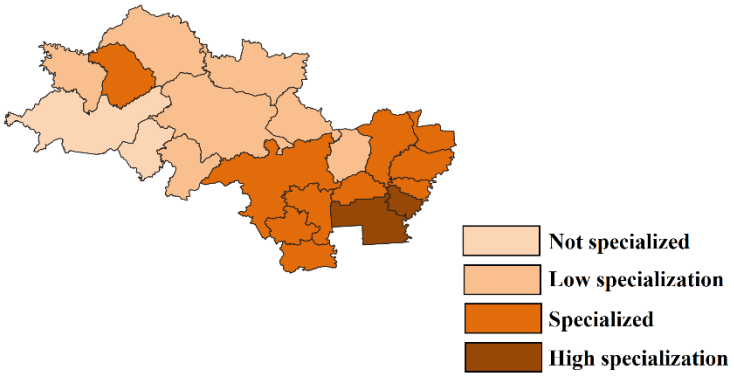
Source: Prepared by the authors.

Furthermore, although the coefficients have changed, the trend of specialization persists over time. In the municipalities of Arroio do Meio, Bom Retiro do Sul, Cruzeiro do Sul, Estrela, Muçum, Putinga, and Teutônia, specialization has occurred in all the periods under analysis. The is also the case for younger municipalities, such as Westphalia, where since its inception, the QL has indicated a specialization three times higher than that calculated for the State. In Vespasiano Corrêa, the QL was equal to 1.62 in 2000, and by 2013 it had risen rapidly to 4.76; it is the municipality with the highest degree of specialization of milk production in the region.

In 2000, the region had four highly specialized municipalities (Arroio do Meio, Colinas, Estrela, and Teutônia), but they did not all maintain the same level of specialization over time. This implies that the activity is still important in these municipalities, but there may be other activities whose production value is more significant (for example, poultry and pig farming), which reduces dairy's participation.

When a comparison is drawn with Corede Produção, which is responsible for the biggest milk production in 2013, similar regional disparities are observed. In this region, formed by 21 municipalities, it is also possible to find municipalities that do not specialize in milk production, such as Carazinho and Santo Antônio do Planalto (whose QL was 0.27 and 0.71 respectively, in 2013); while the municipalities of Casca (QL = 5.22) and São Domingos do Sul (QL = 5.08) are highly specialized (FIGURE 5).

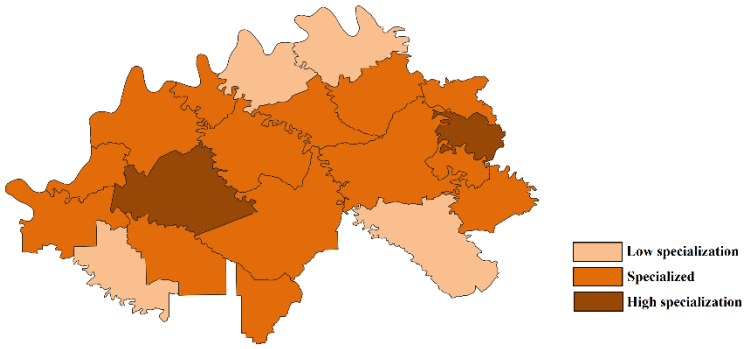
Figure 5: Dairy specialization of the Municipalities of Corede Production in 2013



Source: Prepared by the authors.

On the other hand, the analysis of the location coefficients of the municipalities belonging to Corede Fronteira Noroeste, which occupied the second position in milk production in RS in 2013, indicate a tendency of homogenization of the territory, since in this year all the municipalities were specialized (FIGURE 6).

Figure 6: Dairy specialization of the Municipalities of Corede Fronteira Noroeste in 2013



Source: Prepared by the authors.

It is significant that the Corede Fronteira Noroeste did not always have this profile. In 1985, one-third of the municipalities were poorly specialized, and two-thirds of the municipalities were not specialized, indicating that the activity was of limited importance in the region at that time.

Final Considerations

Milk production is present in different regions of RS, which allows it to be carried out with different objectives (commercial or for private consumption) and conditions (small family farms or bigger properties with salaried workers).

Despite its presence in different regions of the State, dairy production is not homogeneously distributed. The three main producing regions of the State are Fronteira Noroeste, Produção and the Vale do Taquari, respectively. The concentration in these regions is due to their locational advantages that impact on the attraction of other segments of the productive chain, such as the dairy derivatives sector.

On the other hand, the regions with the highest milk production are not necessarily the most specialized regions, as is the case of the Vale do Taquari. Although milk production in the region has contributed to the state's production since 1940, for some time it was not counted as a region that is specialized in milk production. However, according to the methodology applied here, the trend is for most of the municipalities of the region to have specialized during the period analyzed. The results of the locational coefficient indicate that most of the municipalities are specialized and for some the results far exceed the minimum established for this classification.

The results that identified the specialization in these municipalities also reflect the increases in the amount produced and the productivity per milked animal, as well as the production value that has greater representativeness in the agricultural added value for the majority of the regional municipalities when compared to the State. Additionally, these characteristics are evident in Coredes Produção and Fronteira Noroeste, which occupy the first positions in the state ranking.

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