v. 3, n. 24, 2023

Scientific Journal of Applied Social and Clinical Science

INDEX OF AGRICULTURAL PUBLIC POLICIES OF THE MUNICIPALITIES OF THE STATE OF RIO GRANDE DO SUL

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Abstract: From sugar cane, passing through coffee to today's soybeans, Brazil has always had agriculture as an engine of its development and, over the years, several public policies have been implemented in order to support this valuable sector of the economy. Based on this, the present study aimed to build an index to measure agricultural public policies in the municipalities of Rio Grande do Sul. Through factor analysis it was possible to construct the index and through exploratory spatial analysis it was possible to verify a cluster of municipalities with high indices in the northern region of the state and a cluster of low index of agricultural public policies in the metropolitan region of the capital of Rio Grande do Sul. It is concluded that the clusters coincided with the region of the state where there is a higher incidence of formal employees in agriculture and with the region where there is low production, respectively. The results obtained allowed making inferences about the correlation of the index created with the agricultural scenario in Rio Grande do Sul.
Keywords: Agriculture and livestock. Public policy. Index.

INTRODUCTION

Obtaining food that ensures the survival of the species is one of the basic principles of humanity. Throughout history, this paradigm has evolved, aiming to achieve ever-increasing productivity in order to feed a growing population. During the 20th century, the tireless search for ways to increase productivity could be observed, in such a way that Malthus' Law could be subverted and the amount of available food grew at a greater rate than the increase in population (GEBLER; PALHARES, 2007).

In addition to providing subsistence, agriculture is a very important source of income for several Brazilian families and a driver of the country's economy and exports. According to the Brazilian agribusiness survey for the first quarter of 2022, it is estimated that agribusiness alone is responsible for 26.24% of the Brazilian GDP (CEPEA; CNA, 2022).

In this regard, the government plays a key role in the development of a country's economic sectors. For Ferreira, Silveira and Garcia (2001), Brazilian agricultural policy was oriented towards modernizing its agricultural production structure, with a special focus on productivity based on technological advances, targeting the capitalizable rural enterprise, which is characterized over large tracts of land and enjoys tax and credit subsidies. According to Silva (2008), over the years, productive support policies (microcredit) aimed at family farming have also been adopted, which seek to reduce poverty and social inequalities arising from programs aimed at large producers. Monetary resources arising from such policies inject considerable liquidity to boost internal relations of production and market. These obtain better results as the institutional arrangement is more developed around the implementation of the policy.

In order to measure the agricultural development of Brazilian municipalities, in April 2022 the National Confederation of Municipalities launched the Municipal Agricultural Development Index, IDAM, which is a tool for evaluating agricultural activity in the municipal economy, aiming at sustainable municipal development, being built based on a series of indicators to measure the degree of development of activities linked to the countryside. IDAM takes four dimensions into account: Production, employment, revenue and credit (CNM, 2022). In this sense, the present study seeks to complement and provide another agricultural assessment tool in Brazilian municipalities.

Bearing in mind the relevance of the sector for Brazil and the impacts that public policies can cause, the following question arises: Is it possible to measure public policies in the agricultural sector?

Seeking to answer the problem raised, it was defined as the general objective of the present study to build an index of agricultural public policies of the municipalities of the state of Rio Grande do Sul. In order to achieve the general objective, the following specific objectives were established: to survey actions taken by government bodies to encourage and monitor agriculture in municipalities; develop an index of public policies in the municipalities of Rio Grande do Sul; verify the existence of spatial clusters of this index in regions of Rio Grande do Sul.

Thus, taking into account the importance of the sector for the Brazilian economy and the relevant role played by public policies in its development, the present study is justified, as it aims to contribute to the new IDAM index by building an index capable of measuring the agricultural public policies in the municipalities of the state of Rio Grande do Sul. From the construction of the index, different inferences can be made, such as evaluating the existence of regions in the state with greater government incentives in the sector, comparing the index between different municipalities, evaluating the the need to implement more agricultural incentive policies in certain municipalities, to make business decisions, among others. In addition, Embrapa (2012) conducted studies on the rate of return on investments in agricultural research and through this estimated an average rate of return of 45.1%, which shows that investments made in research have proven to be rewarding, Therefore, it is important to continue agricultural research. For the construction of the index, the MUNIC survey of 2020 will be used, chosen in view of being the most recent published that covers the theme of agriculture and includes all municipalities in Rio Grande do Sul to be evaluated.

After this introduction, the second section of this study will address the theoretical framework that guided the research. In the third topic, a review of the literature that underlies and supports the article will be presented. In the fourth section the methodology will be presented, bringing together the database used, presenting the econometric model used as well as the tests carried out. In the last two sections of the study, the results obtained and the conclusion of the research will be treated.

THEORETICAL FRAMEWORK

We live in a world where everything is apparently being measured, compared and mapped. Managers demand numbers and metrics to make their decisions, justify their strategies or monitor their peers, and this need to measure and compare is evident when the focus is on governments or companies. One area where this trend is particularly notable is the area of public policy monitoring and evaluation, where there has been a great increase in efforts in recent times to establish metrics of these policies and compare them across different governments and countries. These analytical tools facilitate the evaluation of a multiplicity of dimensions related to a specific issue within a single measure, comparable between agents (SURMINSKI; WILLIAMSON, 2012).

Between 2016 and 2018, public agricultural policies in 53 countries studied, including Brazil, injected more than 700 billion dollars per year into this sector. However, government support is still distorted and uneven across different regions and across different types of production (OECD, 2019).

Considering the impact, both positive and negative, that public policies can have on the sector, it became important to build ways to measure and compare public policies in different countries. Thus came the Agricultural Policy Monitoring and Evaluation, an annual report developed by the

Organization for Economic Cooperation and Development (OECD) that aims to identify and evaluate public agricultural policies in different countries.

Observing the relevance of establishing parameters for comparing public policies in this sector presented in the OECD report, the present study is based on this, however, with differences in the construction of its own index and in the comparative approach between municipalities of the same country, and not between countries. Added to this, the present study is also based on IDAM and seeks to provide one more tool to complement it. In the following topic, knowledge on the subject will be deepened from a literature review.

LITERATURE REVIEW

The following block will initially address agriculture from the perspective of the municipalities and then some indices already used in the sector will be treated.

AGRICULTURE FROM THE PERSPECTIVE OF MUNICIPALITIES: RELEVANCE AND ACTIONS FOR ITS PROMOTION

Agriculture is consolidated as an engine of the Brazilian economy, representing more than 20% of the country's GDP, generating income and moving trade in the municipalities. Brazilian municipalities, especially the small ones, have a very important promoting role for agriculture, mainly aiming to generate jobs and increase their tax collection. This action must be directed based on the demands of the population, not restricted to the priorities of the federal government, which are not always the most appropriate for the local reality (CNM, 2022).

According to Rocha (2014), in 2011 approximately 32% of Brazilian municipalities had rural production as their main economic activity, surpassing industry and services. It is also notorious "that the growth of rural activity contributes to the generation of jobs and quality of life, acting as a brake on the rural exodus" (p.43). To ensure the development of this area, the municipal manager must diagnose the municipal rural profile in order to define the products and priority areas of action, which in turn allows the definition of dissemination and incentive actions, eliminating bottlenecks in production or legal barriers that may impede economic development.

In the document "Agricultural Management in Municipalities - Paths to sustainable development" the National Confederation of Municipalities presents guidelines and public policies to be developed by municipalities in order to guide managers on how to plan and organize municipal actions to encourage production development rural. The highlights here are the municipal plan for rural development, the national register of family farming, the national school feeding program, technical assistance and rural extension, municipal inspection service, guarantee-crop program, Terra Brasil - national land credit program and the program titles Brazil. (CNM, 2022).

It is therefore necessary to carry out strategic planning at the municipal level and mobilize different actors linked to the agricultural sector, aiming to increase the autonomy of managers in decision-making for territorial development. Local actions of great importance that can be adopted by municipal management are highlighted here, such as encouraging access to rural credit, identifying and expanding marketing channels and defining standards for health certification (ROCHA, 2014).

AGRICULTURAL INDEXES

Efficient agricultural policies are essential to meet the growing demand for safe and nutritious food in a sustainable way. This growing demand represents an opportunity for the sector, however, governments must ensure policies that address the challenges of increasing production while reducing environmental impact, greenhouse gas emissions and improving the resilience of production to face adverse weather and other unforeseen shocks. (OECD, 2019).

Government support for agriculture has increased in recent years in response to global crises, but only a small amount has been directed towards long-term goals such as climate change and other food system challenges. The OECD Agricultural Policy Monitoring and Evaluation report monitors these efforts, based on different indices, and provides governments with policy solutions (OECD, 2019).

Locally, the National Confederation of Brazilian Municipalities believes that the economic driving role of Brazilian agriculture must be accompanied and supported by municipal management, aiming to generate jobs, increase revenue and productivity. This way, the Municipal Agricultural Development Index (IDAM) was created to support managers in planning and organizing municipal actions to encourage the development of rural production (CNM, 2022).

Idam is a tool for evaluating agricultural activity in the municipal economy, aiming at sustainable municipal development built from a series of indicators to measure the degree of development of activities related to the countryside. This index, when evaluating rural activity, is a management support tool, capable of highlighting municipal priorities and positioning municipalities in relation to other Municipalities with characteristics similar to a desirable future scenario (CNM, 2022).

METHODOLOGY

In this section, the methodology used in this study will be presented. Initially, the data, variables and their source will be presented. Subsequently, the econometric model and the tests used to define the model, followed by the factor analysis model and the tests used to verify the factorability of the data and, finally, the construction of the Agricultural Public Policy Index (IPPA).

SOURCE, DATABASE AND DESCRIPTION OF VARIABLES

In the present study, data from the agricultural section of MUNIC, Survey of Municipal Basic Information, conducted in 2020 in all Brazilian municipalities were used. The year of the survey was chosen considering that it was the most recent survey with agricultural data from the municipalities conducted and published by the Brazilian Institute of Geography and Statistics, the IBGE. The study was restricted to constructing the index and evaluating the formation of clusters in Rio Grande do Sul, therefore, only data on municipalities in Rio Grande do Sul were used in this study. The variable used for the spatial analysis was the Agricultural Public Policy Index, constructed in the present study.

The data collected refers to the 497 municipalities in Rio Grande do Sul. About these, 17 variables related to different agricultural public policies developed in Brazilian municipalities were selected. The selected variables had two possible answers: Yes or No, which for analysis purposes were replaced by binaries 1 and 0, respectively. Therefore, the selected variables are presented in table 1.

From the variables mentioned above, the Index of Agricultural Public Policies (IPPA) will be built using factorial analysis, as described in the next topic.

Variable	Description
X1	Existence of Municipal Council for Rural Development
X2	Existence of a program or action to make machinery available to agricultural producers developed by the city hall
X3	The city hall develops a program or action to stimulate the agroindustry
X4	The city hall promotes or supports periodic festivities related to agricultural activity
Variable	**Description**
X5	The city hall promotes or supports Awards or a form of recognition for the best agricultural producers in the municipality
X6	The city hall develops a program or action to prevent climate problems for the agricultural sector
X7	Existence of a public agency that provides technical assistance and/or rural extension in the municipality
X8	Existence of service providers of technical assistance and/or rural extension for the agricultural sector, contractors or partners of the city hall
X9	The city hall develops a program or action of a social nature in specific support to the agricultural producer
X10	The city hall develops a program or action to promote handicrafts in rural communities
X11	Existence of associativism entities or representation of agricultural producers with official registration in the city hall
X12	Existence of associativism entities or representation of agricultural producers that work in the municipality
X13	Existence of marketing infrastructure and exhibition of agricultural products in the municipality
X14	Existence of a program or action for the acquisition of agricultural products from the municipality developed by the city hall
X15	Existence of program or action for herd vaccination
X16	The municipality has implemented the Municipal Inspection Service (SIM) in order to control the quality of products of animal origin
X17	The city hall is not aware of the existence of plant extraction activity in the municipality

Table 1 – Description of model variables

Source: IBGE (2020)

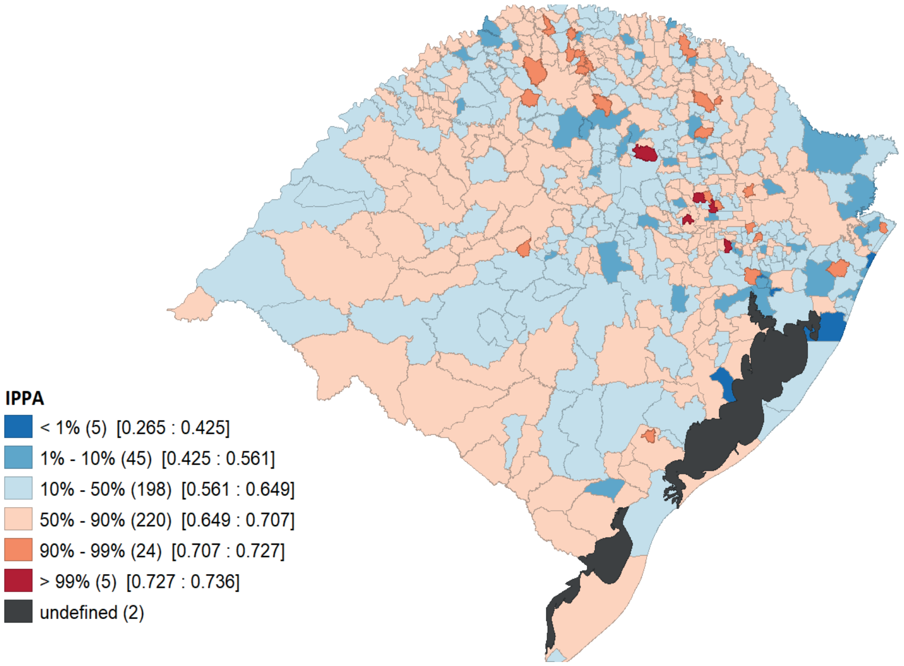

Figure 2 - Public Policy Index of the municipalities of Rio Grande do Sul

Source: Author

THE FACTOR ANALYSIS MODEL

Factor analysis is used to investigate patterns or relationships for a large number of variables in order to determine whether information can be summarized into a reduced set of factors. The factors represent the constructs that summarize the original set of variables, maintaining the representativeness of the original variables. Factor analysis is a method of interdependence, where all variables are considered simultaneously, and can be exploratory or confirmatory. In the exploratory model used in this study, the observed data determine the underlying factorial model a posteriori. Here we seek to discover which factors are intrinsic to the variables under analysis, generally being used in more embryonic phases of research, exploring the data set seeking to identify correlation patterns (MATOS; RODRIGUES, 2019).

According to Mingoti (2005, p.99)

> Factor analysis has as its main objective to describe the original variability of the vector of variables *X*, in terms of a smaller number *r* of random variables, called common factors and which are related to the original vector *X* through a linear model. In this model, part of the variability of *X* is attributed to common factors, and the rest of the variability of *X* is attributed to variables that were not included in the model, that is, to random error.

This way, the individual variance of each variable can be obtained according to the following equation:

Variação Total de X = Variação Comum + Variação Específica + Erro(1)

Where the common variance is the part of the total variance of the *i* -th variable explained by the common factors; specific variation refers to part of the total variance of the *i* -th variable explained by a specific factor, that is, it is the unique proportion of the variable not shared with the other variables; and the error is the part of the variable's total variance that is ignored. Theoretically, it is possible to separate the variance of each variable by common factors, specific factors and errors. However, in practice these last two constitute the residue. Thus, in matrix terms, the general model of factor analysis can be represented according to the equation below:

$$X_{px1} = A_{pxr}F_{rx1} + \varepsilon_{px1}\text{(two)}$$

Where:

X = Vector of original variables;

F = Vector of common factors;

A = Matrix of factor loadings;

ε = Vector of random residuals (specific factors plus error)

r = Number of factors

p = Number of variables

From this, the application of two tests begins: Bartlett's sphericity test and the KMO test. Barlett's test serves to verify whether the model is adequate, testing the hypothesis that the correlation matrix is equal to the identity matrix, bearing in mind that to consider the model adequate the matrices need to be different, rejecting the null hypothesis. In turn, the Kaiser-Meyer-Olkin (KMO) test is a criterion to identify whether a factor analysis model being used is properly adjusted to the data, testing the overall consistency of the data (MINGOTI, 2017). The result values for this test range from 0 to 1, as shown in figure 1 below:

KMO	Suitability
0,9 - 1,0	Great
0,8 - 0,9	Excellent
0,7 - 0,8	Good
0,6 - 0,7	Regular
0,5 - 0,6	Bad
0,0 - 0,5	Inappropriate

Figure 1 - Adequacy of the KMO test

Source: Lima (2011)

Henceforth, the number of factors capable of explaining the model is observed, using an eigenvalue greater than one as a criterion, as suggested by Kaiser. Lima (2011) recommends using the number of components corresponding to the eigenvalues that are greater than the average variance of the X's, which is the average of the eigenvalues. In other words, we must disregard the components with a variance lower than the mean variance of the original variables. In order to determine which variables would compose each of the extracted factors, factor loadings were used

Finally, Cronbach's alpha coefficient was used, which provides a reasonable measure of reliability in a single test, with no need for repetitions to obtain a consistent estimate. The coefficient varies from 0 to 1, with the accepted lower limit being 0.70, which can be relaxed to 0.60 in case of exploratory research (Hair *et. al,* 2009).

INDEX OF AGRICULTURAL PUBLIC POLICIES

In order to construct the index, factorial analysis by principal component analysis was used, and for this the Stata *software was used.* Then, the factors that adequately explain the model are observed, selecting the factors with eigenvalues greater than unity. Next, Bartlett's and KMO's sphericity tests were performed.

Next, the varimax orthogonal rotation method was used, which for Lima (2011) is the most used rotation method "allows the correlation coefficients between variables and factors to be as close as possible to zero or 1, in absolute value, facilitating the interpretation" (p.51).

Having determined the factors, the factor scores are obtained. Lima (2011) states that the factorial scores are the values of each factor for each sample observation. They are important for mapping analysis of observations, creating indices and for use in other techniques, such as cluster analysis and regression.

We then proceed to build the index. It allows you to condense various information into a single value. For this purpose, the variance explained by a factor was divided by the total variance explained by the set of defined factors, and then multiplied by the factor scores of each municipality. Formalizing we have:

$$IPPA_m = \sum_{i=1}^{p}\left(\frac{\sigma_i^2}{\sum_{i=1}^{p}\sigma_i^2}\,F_{im}\right)(3)$$

where:

IPPA$_m$represents the Municipal Agricultural Public Policy Index ^{m} ;

σj 2 is the variance explained by factor j;

p is the number of factors chosen;

$\Sigma\ \sigma j\ p\ 2\ j$ =1 is the sum of the variances explained by the p selected factors; It is

Fjm is the factorial score of municipality m, of factor j.

In order to avoid high and negative scores, the indices were standardized, facilitating their interpretation. Standardization is performed as follows:

$$IPPA_m = \frac{IPPA_m - IPPA_{min}}{IPPA_{max} - IPPA_{min}}(4)$$

Where:

and are the smallest and largest values found in the index, respectively. Thus, there is one between 0 and 1. The *software* used to build the index was Excel. The public policy index is used as a variable in the spatial analysis, which is described below.

SPATIAL ANALYSIS AND EXPLORATORY ANALYSIS OF SPATIAL DATA

Spatial econometrics is a branch of econometrics that aims to specify, test and predict theoretical models influenced by spatial effects, using cross-section or panel data. It differs from classical econometrics as spatial effects are incorporated here. Spatial effects are divided into spatial dependence, which occurs when there is interaction of a given phenomenon in a region with others, and spatial heterogeneity (ALMEIDA, 2012). In the present study, the Queen contiguity criterion was used to sort the information.

In turn, the exploratory analysis of spatial data (AEDE) is intended to help specify the spatial econometric model. Exploratory data analysis is used in order to visualize spatial distributions, spatial outliers, spatial clusters. To avoid potential spurious correlations, it is recommended to use comparable data (intensive variables), such as per hundred thousand inhabitants, per capita, productivity, percentage rates (ALMEIDA, 2012).

Next, we seek to observe whether the observed variable follows a random spatial distribution, or whether it follows a systematic spatial pattern. If there is no randomness, there is spatial autocorrelation (AE). The spatial autocorrelation coefficient is constructed using a spatial weighting matrix and the ratio of the covariance to the total variance of the data. For spatial analysis, Geoda *software will be used.* We then proceed to the spatial autocorrelation test, and for this, the univariate global I of Moran and the I of Local Moran will be used (ALMEIDA, 2012).

UNIVARIATE GLOBAL MORAN'S I AND LOCAL MORAN'S I

The Global Moran index (i) is one of the most used ways to measure spatial autocorrelation. Its result varies between -1 and 1 and provides a general measure of the linear association between vectors. Values close to zero indicate the absence of significant spatial autocorrelation. A positive value indicates a positive correlation, while a negative value indicates a negative correlation (VIEIRA, 2009).

The Moran scatterplot compares the normalized attribute values in an area with the normalized mean of the neighbors. The coefficient I of moran presents four quadrants or possibilities of spatial local association between the regions and their neighbors. The first quadrant is the High-High, where the region has a high value for the variable as well as its neighbors. The second quadrant is Low-High, and has low values assigned in its specific region, but its neighbors have high values. The third quadrant is called Low-Low, and presents a low value in relation to the attributes analyzed together with neighbors that also present low values. The last quadrant is characterized as High-Low, where the region studied has high values and is surrounded by neighbors with low values (VIEIRA, 2009). Next, the results obtained in this study will be analyzed.

PRESENTATION OF RESULTS

Based on the principal component analysis performed on the 17 variables mentioned at the beginning of the previous topic, it was possible to identify 6 factors with eigenvalues greater than unity. The 6 factors explain 52.52% of the variance and are arranged according to table 2:

Factor	explained variance	Accumulated Variance
factor 1	0.1034	0.1034
factor 2	0.0946	0.1979
factor 3	0.0901	0.2881
factor 4	0.0891	0.3772
factor 5	0.0758	0.4530
factor 6	0.0721	0.5252

Table 2 - Factors and Percentage of explained variance

Source: Author

Once the factors were delimited, Bartlett's sphericity test was performed, where the null hypothesis of the correlation matrix being equal to the identity matrix was rejected. Subsequently, the KMO test was performed, obtaining a result of 0.745, which, in line with Figure 1, is considered good suitability. Cronbach's alpha test was also performed, obtaining a result of 0.68, which according to Hair *et. al* (2009) is an acceptable value for exploratory research.

According to Lima (2011), based on the principal component equations, scores can be obtained. These can be used like any other variable to, among other things, build an index. The index for each of the 497 municipalities of Rio Grande do Sul was then constructed and can be seen more clearly as shown in Figure 2.

Redder regions have a higher (better) index than blue-toned regions. The five municipalities that presented the highest index of agricultural public policies, in order, were: Capitão, Maratá, Ibirapuitã, Santa Tereza and Vespasiano Corrêa, therefore, it is considered that these municipalities have the best set of public policies in the sector. On the other hand, Alvorada, Esteio, Capão da Canoa, Arambaré and Palmares do Sul had the worst public policy indexes. Most municipalities (418) had average rates between 0.561 and 0.707.

To perform the spatial analysis, the Moran Global index was first calculated. To evaluate the most suitable contiguity matrix, the Tower (*Rook*), Queen (*Queen*) and n-neighbors (*K-Nearest Neighbors) matrices were analyzed.* All matrices obtained positive values, however, the Queen matrix had the highest explanatory capacity, resulting in a global Moran I of 0.117, as shown in the scatterplot in figure 3:

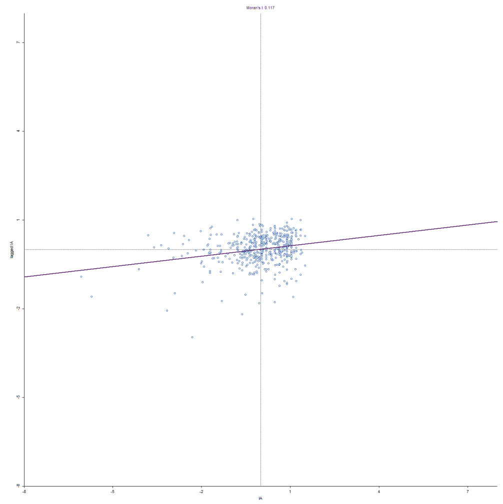

Figure 3 - Diagram of the global Moran Index of the Agricultural Public Policy Index

Source: Author

Subsequently, the municipal indices were observed from the perspective of spatial analysis to verify potential clusters, allowing to assess whether there is a grouping of nearby municipalities with similar indices. For this, the Univariate Local Moran I was used, as shown in figure 4:

Figure 4 demonstrates that High-High clusters with 30 occurrences predominate, that is, there is a predominance of municipalities with a high index of agricultural public policies surrounded by neighbors with an equally high index.

A cluster of Alto-Alto municipalities in the northern region of Rio Grande do Sul stands out here, comprising the municipalities of Palmeira das Missões, Dois Irmãos das Missões, Erval Seco, Seberi, Frederico Westphalen, Redentora, Tenente Portela, Palmitinho, Vista Gaúcha, Pinheirinho do Vale and Vista Alegre.

On the other hand, it is possible to visualize a Baixo-Low cluster in the metropolitan region of the state, encompassing the capital Porto Alegre and the municipalities of Canoas, Esteio, Sapucaia do Sul, Alvorada and Viamão.

Next, the result obtained will be confronted

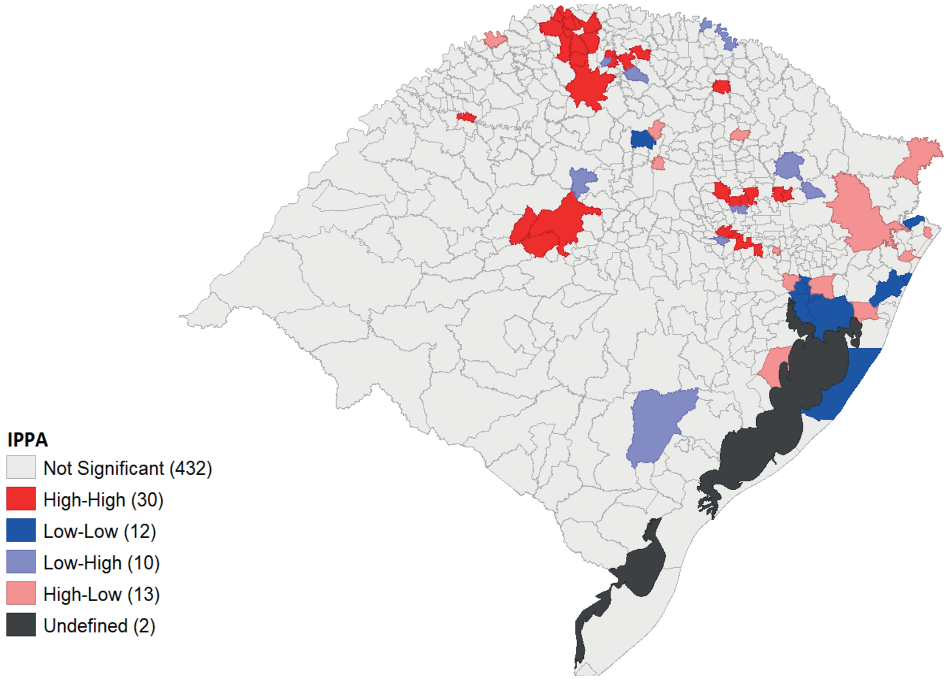

Figure 4 - Cluster map of the univariate local Moran Index of the Agricultural Public Policy Index

Source: Author

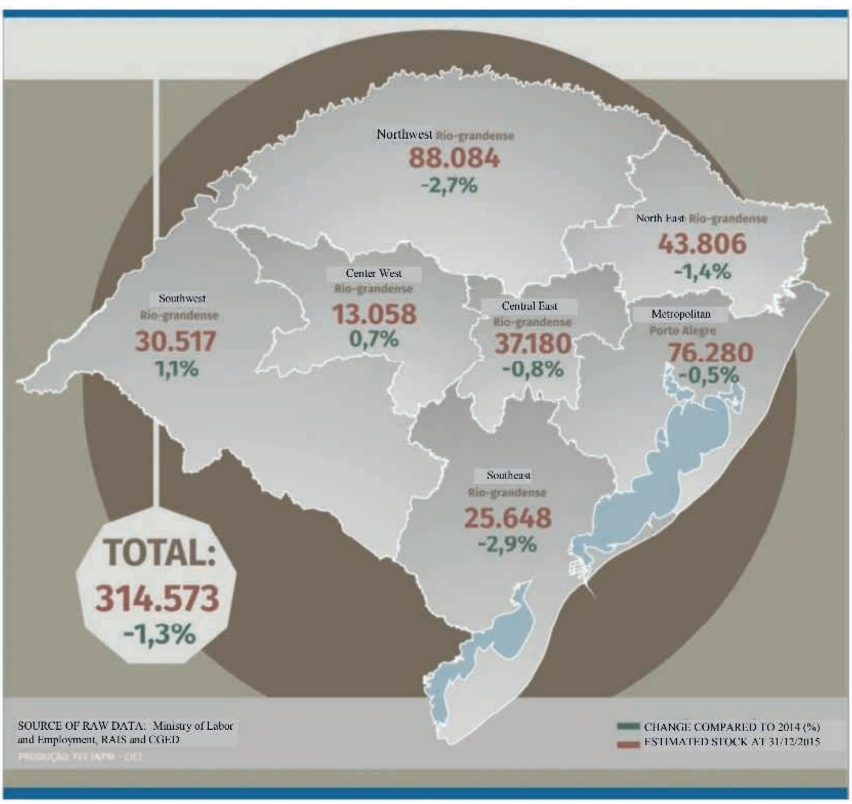

Figure 5 - Distribution of formal CLT employment in agribusiness in the mesoregions of Rio Grande do Sul

Source: FEIX; LEUSIN JUNIOR; AGRANONIK, 2016 with the literature in order to investigate the relationship between the agricultural public policy index and other factors.

DISCUSSION OF RESULTS

Through the spatial analysis carried out, it was possible to identify a cluster in the north/northwest region of Rio Grande do Sul, that is, this region presented a high index of agricultural public policies. Although this region is not the most populated in the state, through the Agribusiness Panel in Rio Grande do Sul it is possible to observe that it is the region that employs the most in the state, with 88,084 CLT employees in 2015, as shown in figure 5 :

It is known that only a small portion of the people employed in agriculture are formal workers with a formal contract (FEIX; LEUSIN JÚNIOR; AGRANONIK, 2016). The high index of agricultural public policies identified in this region may have contributed positively for this region to employ more formal workers, since among the variables of the index is the support for associativism, where the existence of associations and representation of the category was verified. It is well known that these claim rights and supervise employment relationships, which can increase the incidence of CLT workers.

On the other hand, it is observed that the metropolitan region of Porto Alegre is the second that most generates employment, despite the fact that the index of agricultural public policies has presented a low result. This could be due to the fact that the region is densely populated, or it could indicate that the correlation performed in the previous paragraph is spurious, therefore, caution is recommended in this assessment.

A low-low cluster was also identified in the metropolitan region of the state. According to Feix, Leusin Júnior and Agranonik (2016,) agriculture is present in all regions of Rio Grande do Sul, however there are some regional concentrations, which can be seen in figures 6 and 7:

Figure 6 shows the gross value added from livestock farming in 2012. Figure 7 shows the evolution of the soybean planted area from 1990 to 2013. Through these two figures it is possible to see that the metropolitan region of Porto Alegre has a low value added gross from livestock and also a low soy planted area, which has changed little over more than a decade.

This information is in line with the index of agricultural public policies observed in this region, which leads to two potential conclusions: The region does not present favorable characteristics for agriculture and, therefore, public policies in this sector are not necessary; or, the low rate of public policies negatively affected agricultural development in this region.

CONCLUSION

The present study sought to verify the possibility of building an index of agricultural public policies in the municipalities of the state of Rio Grande do Sul. It was observed that it was possible to develop the index and compare the municipalities in Rio Grande do Sul. Added to this, it was possible to identify a high-index spatial cluster close to neighbors also with a high index in the northern region of the state and a low-index cluster close to neighbors with an also low index in the region of the capital of Rio Grande do Sul.

It was possible to associate the clusters found with the literature, giving evidence that the high rate of agricultural public policies observed in the northern region may be helping to generate formal jobs in this region. The low-low cluster of the IPPA index found in the Porto Alegre region was also associated with a historically low production in this region.

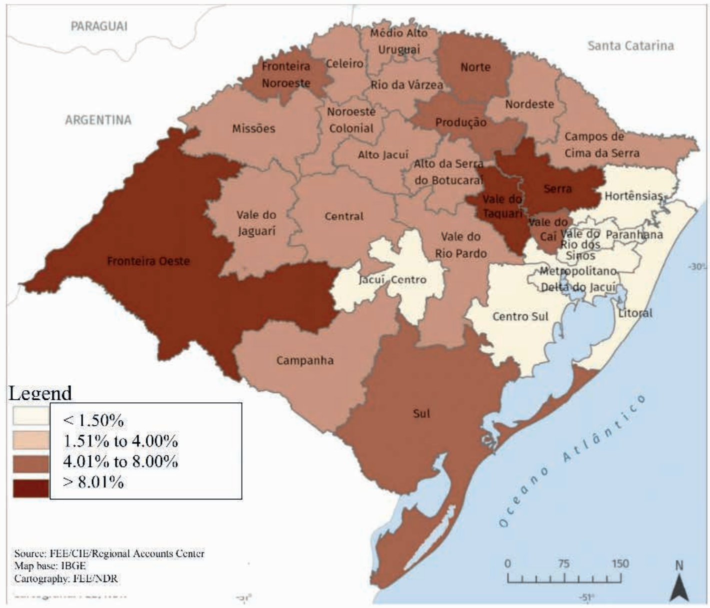

Figure 6 - Distribution of the Gross Added Value of livestock in the Regional Development Councils (Coredes) of Rio Grande do Sul — 2012

Source: FEIX; LEUSIN JUNIOR; AGRANONIK, 2016

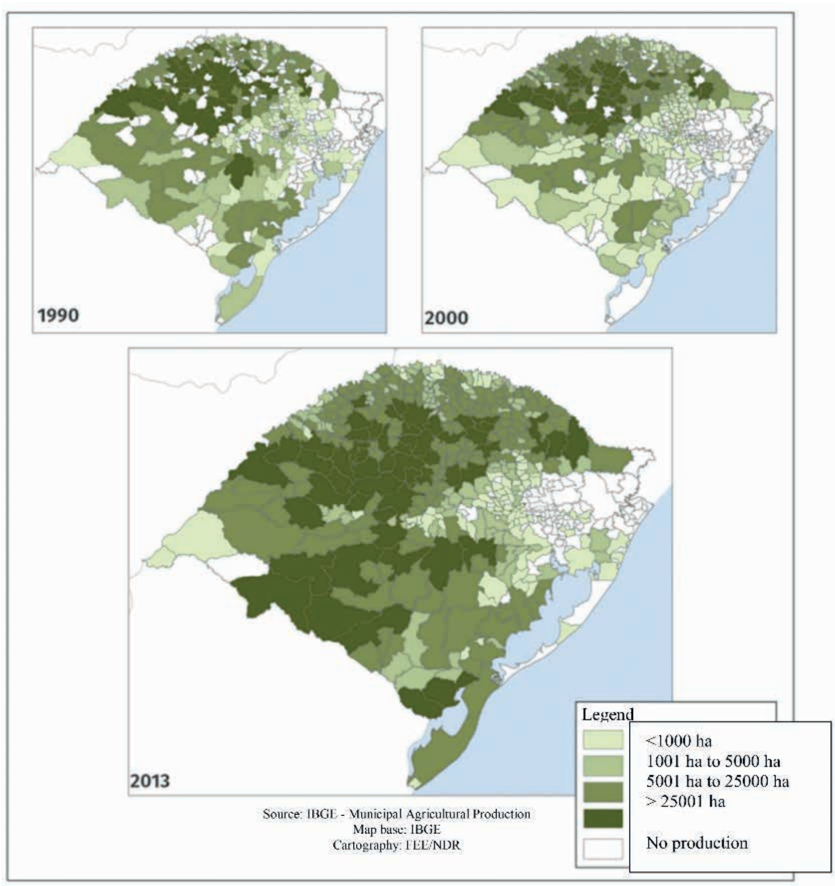

Figure 7 - Soybean planted area in the municipalities of Rio Grande do Sul — 1990, 2000 and 2013

Source: FEIX; LEUSIN JUNIOR; AGRANONIK, 2016

Limitations were found regarding obtaining recent data from the same years, which made it necessary to compare the index constructed from variables for the year 2020 with municipal agricultural data on formal jobs and soy planted area in 2016.

For future studies, it is recommended to cross, through bivariate analysis, the Agricultural Public Policy Index (IPPA) developed in this article with other indices, such as the Municipal Agricultural Development Index (IDAM), in order to accurately verify a possible correlation between public policies and agricultural productivity.

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