LIVESTOCK SPECIALIZATION IN THE MUNICIPALITIES OF MATO GROSSO DO SUL

ESPECIALIZAÇÃO DA PECUÁRIA NOS MUNICÍPIOS DE MATO GROSSO DO SUL

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Abstract

This article aims to analyze the level of employment concentration of the main livestock activities (beef cattle, poultry and swine) in Mato Grosso do Sul, taking into account relevant aspects of the regional development of these activities. For that, the quantitative method was used to measure the specialization indicators, which make up the Normalized Concentration Index (ICN). To support these estimates, discussions on regional economics and development indicators supported the theoretical and historical analysis of the indices used. Among the main results found, the municipalities with the highest ICN for formal jobs were highlighted: Santa Rita do Pardo, Bataguassu, Sidrolândia, Itaquiraí, São Gabriel do Oeste, Jateí and Dourados. It is also worth mentioning that, in view of these concentrations, we sought to understand the interaction between activities, from the supply of inputs to the flow of production, as well as geographic distributions and their contributions to the local development of municipalities.

Keywords: Agribusiness. Regional Economy. Cattle. Poultry. Pig Industry.

Resumo

Este artigo tem como objetivo analisar o nível de concentração de emprego das principais atividades pecuárias (bovinocultura de corte, avicultura e suinocultura) do Mato Grosso do Sul, levando em consideração aspectos relevantes do desenvolvimento regional dessas atividades. Para tanto, foi utilizado o método quantitativo na mensuração dos indicadores de especialização, que compõem o Índice de Concentração Normalizado (ICN). Para fundamentar essas estimativas, as discussões voltadas à economia regional e aos indicadores de desenvolvimento subsidiaram a análise teórica e histórica dos índices utilizados. Dentre os principais resultados encontrados, houve destaque aos

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municípios que apresentaram o maior ICN para empregos formais: Santa Rita do Pardo, Bataguassu, Sidrolândia, Itaquiraí, São Gabriel do Oeste, Jateí e Douraddos. Vale ressaltar ainda que, diante dessas concentrações, buscou-se compreender a interação entre as atividades, desde o fornecimento de insumos até o escoamento da produção, bem como as distribuições geográficas e suas contribuições para o desenvolvimento local dos municípios.

Palavras-chave: Agronegócio. Economia Regional. Bovinocultura. Avicultura. Suinocultura.

Introduction

Agribusiness has stood out over the years, for its contribution to the Brazilian economy, as well as for productivity and GDP advances. According to data from CEPEA (2018), this sector not only boosted GDP, but also contributed to the control of inflation in the country. Only in 2017, the GDP (at constant prices) of agribusiness grew by 7.6%.

Among the activities that make up agribusiness, there is an emphasis on livestock, with emphasis on beef cattle, swine and poultry. This, even, on the world stage. But, like other economic activities, livestock has more vigorous moments and others more contracted. Thus, according to CEPEA's "Boletim PIB do agronegócio" (2017), beef cattle faced adverse situations between the years 2015 and 2016. This period was marked by the 2.8% decrease in the sales of slaughterhouses, due to mainly, the reduction of consumption in the domestic market and the inputs (-2.93%) used in production. In 2017, the livestock resumed its growth and in 2018, it was possible to verify the recovery in the prices of the Boi Gordo sign, motivated by the better performance of exports (ABIEC, 2017; VIEIRA FILHO and SOUZA JÚNIOR, 2018).

About the swine market, there are some uncertainties, in the midst of final demand, prices and the acquisition of new batches of animals, but also opportunities. As well as poultry, which in 2017 had a weakening of its market and in 2018 it resumed its productivity and detained higher prices for its products, given the increase in corn and soybean meal, the main inputs used by this sector.

In April 2018, the European Union declared an embargo on chicken meat from 20 Brazilian establishments, from these establishments there were two slaughterhouses in Mato Grosso do Sul, BRF SA (Dourados and Bello Alimentos Ltda. - Itaquiraí). It is worth noting that exports of chicken meat to the EU, accounted for 35% of Brazilian exports and the embargo harmed the incentives for investments that were already being applied in the sector (VALOR ECONÔMICO, 2018; PORTAL DO GOVERNO DO MS, 2018).

Despite this scenario, of highs and lows for livestock, in the national economy, the agribusiness labor market remained practically stable, when considering the data for 2018, compared to 2016, in which there was a slight reduction of 1,6% of the number of employed persons, rising from 18.53 million to 18.24 million people (CEPEA, 2018).

As in Brazil, in Mato Grosso do Sul, livestock stands out as an important economic activity, both for its pre-existing natural vocation focused on land extensions and the development history of the activity, as well as for the industrial development carried out by the state government and for the conditions favorable exogenous factors, directed to geographic distribution, or even to the promotion of activities that provide inputs (FAMASUL, 2017).

According to SEMAGRO (2015), the MS has stood out as a fundamental state for the production of raw material for livestock, due to the agro-industrialization introduced in the 1980s. The modernization of the primary sector provided the state, over the greater capitalization of the producer and indirectly the expansion of employment and income opportunities.

In livestock, issues related to employment have gained repercussions, mainly in view of the need for technification to increase productivity and SEMAGRO gains (2015). Therefore, understanding how the level of employability and job concentration is, can be an important tool for both rural producers and the public sphere, in definition of incentives and investments that may be necessary to advance regional development.

This is because there are several approaches to regional development, but more contemporary currents of thought, it has considered social issues, such as those related to labor, qualification, human capital appreciation, locational factors, inputs and agglomeration. as important for the regional economy (MYRDAL, 1957; HIRSCHMAN, 1958).

Considering the relevance of livestock activities for the state, as well as for the indirect stimulus of other sectors and the national economy, at the same time, in which there is a concern with the generation of jobs and income, in view of the modernization of the field, this study sought answer the following research problem: Which municipalities in Mato Grosso do Sul have the highest concentration of formal employment in livestock activities?

In view of this problem, the overall objective was to analyze the level of concentration of employment in livestock activities (beef cattle, poultry and swine) in Mato Grosso do Sul, considering the relevant aspects for the regional development of activities in the municipalities where they stand out.

 For this, the quantitative method was used, based on the estimate of the Normalized Concentration Index (ICN), multivariate analysis and calculations of the specialization indicators: Locational Quotient (QL), Hirschman and Modified Herfindahl (HMI); and Relative Participation Index (PR).

This study proves to be relevant in the academic field, in the identification of promising regions to encourage public policies and regional development projects, aiming at a greater progress in livestock, considering the importance of employment for the state.

Literature review

Regional Economy: Agglomeration and Territorial Development Bias

The regional economy does not have a unique theoretical approach, but rather diverse views that aim to absorb the complexity of economic events in space or territory. (MONASTERIO E CAVALCANTE, 2011). Due to this multiplicity of approaches, Monastério and Cavalcante (2011) developed a study on this subject, which identified and systematized the theoretical production directed to the debate about the territorial spaces inserted in the national limits, where there was the possibility of intervention and survey of individualized information.

Through this study, it was found that until the 20th century, the theoretical production inserted in the regional economy, was characterized by two large theoretical blocks. The first, consisting of classical theories of location, where authors such as Von Thünen (1826) and Isard (1956) were viewed. The second block was directed at the set of theories on regional development, with an emphasis on agglomeration factors, which were treated in the analyzes of Perroux (1955), Myrdal (1957) Hirschman (1958) and North (1959).[4]

In classical theory, discussions on regional economics were based on transport costs, to determine the optimal location of economic activities, but the external effects resulting from agglomerations of activities and the trade-off (choices) between gains in scale were disregarded. and transportation costs.

Von Thünen (1826), sought to analyze what the pattern of occupation of geographic spaces would be, based on the premises that the land is homogeneous, product prices are determined in the region, there is no monopoly and agents are price takers. Later years, studies and theories evolved.

Isard (1956) wrote about Location and Space Economy, in this study, the author added notions about optimizing points for fixing industries, location of economic activities, organization and structuring of space, spatial interactions and regional development, in the analysis of regional economy.

According to Monastery and Cavalcante (2011), the theory of regional development with emphasis on the agglomeration factors treated in the regional economy of the second block of definitions, was inspired by the Marshallian and Keynesian theories, from the 1950s. Marshal (1930) established the concept of industrial district, by highlighting the relationships of agglomeration of companies in one space. With that, the possibility of external economies of location was evidenced, in the aid to the reduction of the production costs. The Keynesian approach also brought a concern with this type of economy and approached development, from the outside, with a more macro analysis for the short term (MENDES AND MATTEO, 2011).

In 1950, the dynamic self-reinforcement mechanism came into focus, due to factors linked to industrial agglomeration. Unlike the classics, Perroux (1955) reported that growth does not happen homogeneously in space and that it manifests itself in growth poles, with their diversified intensities and with variable effects, depending on the economy of the region or location.

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[4] Von Thünen (1826); Isard (1956); Hirschman (1958); North (1959) *apud* Monasterio e Cavalcante (2011).

These hubs can act in different ways and the driving industries would induce regional development, functioning as a kind of technical polarization, related to the chaining effects of the driving industry, in relation to other industries or activities; economic polarization, in terms of job and income generation; psychological polarization about the investments generated, based on the optimism of the benefits that could originate from the driving industry and; geographic polarization associated with minimizing costs, such as transportation and the creation of external economies and agglomeration (MONASTERIO E CAVALCANTE, 2011).

The conceptual model of circular and cumulative causation was presented by Myrdal (1957), who related the racial issue of the United States with folklore and biblical elements, asking that there would be a mutual relationship of circular and cumulative chance among the factors that impact on development. This author argued that the essence of a social problem involves a complex of interdependent circular and cumulative changes, as well as the need to consider different forms of development and regional inequalities.

Myrdal (1957) tried to expose that there is no self-stabilization in the social system, as it does not move spontaneously into a state of equilibrium, but constantly moves away from that state. However, changes do not cause compensatory changes, but lead the system, with more intensity towards the initial objective, being the balance and making the process cumulative and cyclical. Therefore, the factors of production, qualification of the workforce, the valorization of human capital, can be decisive in regional development (MYRDAL, 1957).

Hirschman (1958), unlike Myrdal (1957), identified inequality as an opportunity or a necessary condition to carry out the development process, that is, development would be obtained through a succession of imbalances, which would enhance scarce resources. At the regional level, the author added forward effects (forward linkages), linked to the supply of inputs, in which sectors would be positioned downstream. And the backward linkages, which express the externalities resulting from the implementation of industries, with the viability of the minimum production scales in a region, by increasing the demand for inputs from the sector upstream (MONASTERIO E CAVALCANTE, 2011).

For North (1955), regional development emerged when exports were associated with specific locational factors, in order to favor the emergence of distribution hubs in cities, which in turn, indirectly generate demand for export services. These activities linked to the foreign market are called an export base. North (1955) further maintained that industrialization does not guarantee that regional development will continue, but the result of the success of the export base (MONASTERIO E CAVALCANTE, 2011).

The main points of each study within the block related to the regional issue, with an emphasis on agglomeration, provide physical support for economic activities and an understanding of social particularities. According to Matteo (2011), the territory must be analyzed in an integrated way with social and economic relations, instead of being just external elements.

It is worth highlighting in this understanding, the concept of Local Productive Arrangement (APL), which is also included in the aspects of agglomeration and regional or territorial development. However, it is worth mentioning that according to Carleial (2011), this term is a tropicalization of the concept of the Regional Innovation System (SRI), which seeks to explain in the localization distribution, the regional impacts of the policies of the industries, the innovative process in the regions of interest, based on the existence of a productive base and the interaction of companies, institutions and socioeconomic organizations.

Still according to Carleial (2011), this system depends on the economies of agglomeration, the capacity to enhance the productive externalities and cooperation between financial and institutional agents. The term APL ends up being generalized and disseminated in several studies, in which the identifications of productive agglomerations are called APL, making this term to be shown as a simple solution to stimulate the performance of municipalities and government entities in public policies. This term has some negative points, such as the lack of a regional vision, which highlights the different productive chains present in the region and mechanisms for monitoring and gauging the results of public policies aimed at APLs.

At the end of the 1980s, New Economic Geography (NGE) appeared in the literature, a branch that began to analyze the distribution in the space of economic activities, adding new elements of international trade theory. In this sense, new concepts of location have been incorporated into the general equilibrium structure, economic phenomena and regional inequalities on a broader geographical scale (CRUZ, 2011).

In this study, the term APL for the designations of selected economic activities will not be addressed as an object of analysis, however, it was necessary to briefly address the term and identify its fragility, as it is a term widely used in several scientific texts. similar to this study.

Methodological Aspects: Regional Economy Specialization Indicators

Several authors use the analysis of the regional economy, using indices that can explain and demonstrate the importance of a sector, for a region or for the local development of a municipality. The construction of these indicators makes it possible to verify the geographical distribution of these activities, in order to understand the regional interaction of the sectors evaluated, as well as to discern the regional specialties, which are the result of the processes of decentralization or economic concentration of the analyzed region.

The economic performance indicator shows the income generation capacity of this economy and, with the help of some other information, it can also show the level of utilization of its productive capacity (PAULANI, BRAGA, 2013, p. 336). According to Paulani and Braga (2013), the importance of the well-being of society, refers to the confrontation between the lines of the concepts of "economic growth and economic development". The measurement of social indicators is based on the socioeconomic status of a country or region, inserted in the context of economic growth and development.

In contemporary literature, the approaches in relation to the industrial economy and regional economy, according to Crocco (2006), are present in the evaluation of the characteristics and contributions of a given sector to local, regional and national development. Crocco also states that there are other studies that use other methodologies, in an attempt to evaluate these characteristics, such as Brito and Albuquerque (2002), Sebrae (2002), IEDI (2002) and Suzigan et al. (2003).

The studies by Brito and Albuquerque (2002) are based on some criteria, such as the use of the Locational Quotient (QL), which seeks to define whether the municipality in the region studied has specialization or not in any specific activity. Crocco (2006) states that these authors use QL to try to compare sectorial and spatial structures, if this index is greater than or equal to 1.

According to Paiva (2011), the Locational Quotient aims to express the comparative importance of a sector or productive activity in relation to the region studied, by identifying how many times, a given location is dedicated to a specific sector. The QL is used to measure the degree of relevance of the employment level of a specific sector or activity.

The work by Sebrae (2002) follows the same line as Brito and Albuquerque (2002), the difference is in the use of the variable number of establishments and not number of jobs, for calculating the QL. Regarding the work of the Institute for the Study of Industrial Development-IEDI (2002) and Suzigan et al. (2003), the method considers the calculation of a Locational Gini prior to the use of QL, as a criterion for the identification of clusters or local production systems (CROCCO, et al, 2006).

Britto and Albuquerque (2002) when analyzing the locational quotient at different levels of aggregation, reached three different considerations:

a) When QL = 1, the specialization of municipality J in activities in sector i is identical to the specialization of the whole of Brazil in activities in this sector

b) When QL <1, the specialization of municipality j in activities in sector i is inferior to the specialization of the whole of Brazil in activities in this sector;

c) When the QL> 1, the municipality's specialization in sector activities is superior to that of Brazil as a whole in activities in this sector.

Therefore, it is admitted that the QL is an important indicator for the identification of the productive specialty of a region. From it, the degree of relative concentration of an activity or sector in a region or municipality can be found, as well as the participation of that activity in the established region. However, in the midst of the inequality that exists in Brazil, the index identifies at least that a sector with a QL above 1 may have a productive differentiation and not a specialization of the sector.

According to the study carried out by Rezende and Diniz (2013), the application of the index must be cautious, because when the indicator is used in a poorly developed region in the industrial issue, there may be a high result of the level of specialization of a production unit, even that there is no dimension with a high level of relevance.

The Hirschman - Herfindahl Index considers Cournot's economic model, which, like Aleixo (2006), states that it conceptualizes the behavior of companies, which decide simultaneously on the quantity to be produced and distributed in the market in which they operate. To this end, information from all companies or sectors participating in the market is used. Although the HH index is associated with Herfindahl (1950), its paternity can be attributed to Hirschman who, some years before (1945), used the Euclidean norm of the vector of market shares ($= \sqrt{HH}$) to measure North American industrial concentration (KUPFER, 2013).

In order to correct possible inconsistencies in the HH index, because the calculation of conventional indicators does not reliably reflect the competitive situation of the markets or sectors, Bresnahan and Salop (1986), elaborated an adjustment in the index, including the effects of existing structural links. The index was renamed HMI - Hirschman and Modified Herfindahl index. The IHHM assesses the relative participation to capture the relevance of the sector or activity evaluated in the study, through the level of employment or salary remuneration.

If there is a need to correct QL deficiency, the Normalized Concentration Index was developed, which uses three indicators: Locational Quotient (QL); the Modified Hirschman and Herfindahl Index (HMI); and the Relative Participation Index (PR). Such indicators work as fundamental elements for the construction of a single concentration value of an industrial activity, within a region. This unique index was developed by the Research Group on Regional and Urban Economics of CEDEPLAR (UFMG), in 2003, organized by researcher Marco Aurélio Crocco.

Methodology

In order to meet the proposed objective, the quantitative research method was used, through the estimates of the Standardized Concentration Index (ICN) for beef cattle, poultry and pig farming in Mato Grosso do Sul. To find the ICN, specialization indexes were calculated: Locational Quotient (QL); the Modified Hirschman and Herfindahl Index (HMI); and the Relative Participation Index (PR).

According to Crocco et.al. (2003, 2006), the level of specialization of a region is identified by four characteristics: a) the specificity of an activity within a region; b) its weight in relation to the industrial structure of the region; c) the importance of the sector at the national level and d) the absolute scale of the local industrial structure.

In addition, the National Classification of Economic Activities (CNAE) was considered, as described in table 1, for the extraction of secondary data from the Ministry of Labor and Employment on the Annual List of Social Information - RAIS, referring to the year of 2016 (the most current one available on the platform).

Table 1: Description of livestock activities, according to the corresponding CNAEs.

ACTIVITIES	RELATED ACTIVITY	CNAE CORRESPONDING	ACTIVITIES
Live cattle	Creation	0152-2	Catlle farming
Slaughter of cattle	Industry	1011-2	Slaughter of cattle, except pigs
Live birds	Creation	0155-5	Poultry farming
Slaughter of Birds	Industry	1012-1/01	Poultry Slaughter
Live Pigs	Creation	0154 – 7/00	Pig farming
Slaughter of pigs	Industry	1012 - 1/03	Refrigerator – Slaughter of pigs
		1012 – 1/04	Matadouro – slaughter of pigs under contract

Source: prepared by the authors.

To calculate the QL, which aimed to analyze the specificity of the selected activities, according to the CNAE nomenclature, in the state of Mato Grosso do Sul. It was considered:

$$QL = \frac{E_j^i / E_j}{E_{MS}^i / E_{MS}} \tag{1}$$

E_j^i = The use of pig farming in the municipality j;
E_j = Employment in all sectors of the municipality j;
E_{MS}^i = The use of pig farming in the state of Mato Grosso do Sul;

The authors Brito and Albuquerque (2002), Sebrae (2002), IEDI (2002) and Suzigan et al. (2003), attribute to QL an important role to determine if a municipality has specialization in a stipulated activity, in this case, data related to employment. They had a level of specialization, the results greater than 1 (one).

As for the Modified Hirschman and Herfindahl (IHHm) Indicator, which captured the real weight of the activity analyzed in the production structure, we have:

$$IHHm = \left(\frac{E_j^i}{E_{MS}^i}\right) - \left(\frac{E_j}{E_{MS}}\right) \tag{2}$$

Finally, the Relative Participation (PR) indicator, focused on the importance of the municipality, in relation to the state of Mato Grosso do Sul, was described in equation 3. The PR value varies between zero and one and, the closer to one, the greater the sector's importance to the municipality.

$$PR = \left(\frac{E_j^i}{E_{MS}^i}\right) \tag{3}$$

After QL, HMI and PR were calculated, it was possible to estimate the ICN. The measurement of which occurred, through the linear combination of standardized components, as shown in equation 4. The ICN allowed us to understand the representation capacity of the agglomerations.

$$ICn_{ij} = \theta_1 QLn_{ij} + \theta_2 PRn_{ij} + \theta_3 HHn_{ij} \tag{4}$$

θ = Weight of each indicator for each productive sector.

According to Mingoti (2005, p. 59), "its main objective is to explain the structure of variance and covariance of a random vector, composed of random p-variables, through the construction of linear combinations of the original variables". These linear combinations are called main components and are not correlated with each other. If we have original p-variables, it is possible to obtain p main components. In the analysis of the main components, "n" variables are taken to produce components $Z_1, Z_2, ... Z_n$:

$$Z_i = a_{i1}X_1 + a_{i2}X_2 + ...+ a_{ip}X_p \tag{5}$$

Subject to condition:

$$a_{i1}^2 + a_{i2}^2 + ... + a_{ip}^2 = 1 \tag{6}$$

Through the variance matrix (equation 7), the variances related to their respective components and coefficients of linear combinations were identified. The variances found were called principal components, the eigenvalues of the matrix and ai1, ai2, ... after their associated eigenvectors.

$$C = \begin{bmatrix} c_{11} & c_{12} & \cdots & c_{1p} \\ c_{21} & c_{22} & \cdots & c_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ c_{p1} & c_{p2} & \cdots & c_{pp} \end{bmatrix} \tag{7}$$

It should be noted that the sum of the eigenvalues is equal to the sum of the elements of the main diagonal of the covariance matrix, that is, the trace of the matrix:

$$\lambda_1 + \lambda_2 + \lambda_3 + ... + \lambda_p = c_{11} + c_{22} + ... + c_{pp} \tag{8}$$

To ensure that the set of all components considers the total variation of data, Crocco (2003), states that once cii is the variance of Xi, and λi the of Zi, the sum of the variances of all the original variables, equal to the components, is obtained.

To obtain the weights of the variables, using principal components (PCA), the statistical software STATA was used, which provided the eigenvalues of the main components, through the correlation matrix and the variances of the components, for the calculation of each variable.

Table 2: Eigenvalues of the correlation or variance matrix explained by the main components

COMPONENT	VARIANCE EXPLAINED BY COMPONENT	VARIANCE TOTAL EXPLAINED
1	β1	β1
2	β2	β1 + β2
3	β3	β1 + β2 + β3 (= 100%)

Source: Crocco, 2003.

Table 3 presents the matrix of coefficients that demonstrated the calculation of the relative participation of each of the indicators with their respective components.

Table 3: Matrix of coefficients or eigenvectors of the correlation matrix

INPUT INDICATOR	COMPONENT 1	COMPONENT 2	COMPONENT 3
QL	∝11	∝12	∝13
PR	∝21	∝22	∝23
HHm	∝31	∝31	∝33

Source: Crocco, 2003.

Table 4 shows the relative participation of each index, derived from the matrix of auto vectors of the correlation matrix. Thus, from the sum of the module function of the eigenvectors associated with each component, the Ci were obtained, and then the module of each eigenvector was divided by the sum (Ci) associated with the components.

Table 4: Matrix of recalculated eigenvectors or relative share of indicators in each component

INDICATOR	COMPONENT 1	COMPONENT 2	COMPONENT 3
QL	$\acute{\alpha}_{11} = \dfrac{\alpha_{11}}{C_1}$	$\acute{\alpha}_{12} = \dfrac{\alpha_{12}}{C_2}$	$\acute{\alpha}_{13} = \dfrac{\alpha_{13}}{C_3}$
PR	$\acute{\alpha}_{21} = \dfrac{\alpha_{21}}{C_1}$	$\acute{\alpha}_{22} = \dfrac{\alpha_{22}}{C_2}$	$\acute{\alpha}_{23} = \dfrac{\alpha_{23}}{C_3}$
HHm	$\acute{\alpha}_{31} = \dfrac{\alpha_{31}}{C_1}$	$\acute{\alpha}_{32} = \dfrac{\alpha_{32}}{C_2}$	$\acute{\alpha}_{33} = \dfrac{\alpha_{33}}{C_3}$

Fonte: Crocco, 2003.

Bearing in mind that $\acute{\alpha}ij$ Table 4 represents the weight that each variable, which was assumed within each component and that the eigenvalues (βs of Table 2) provide the variance of data associated with the component, the final weight of each indicator was the result of the sum of the $\acute{\alpha}ij$ products by their corresponding eigenvalue (β) - for each component.

$$\theta_1 = \acute{\alpha}_{11}\beta_1 + \acute{\alpha}_{12}\beta_2 + \acute{\alpha}_{13}\beta_3 \qquad (9)$$
$$\theta_2 = \acute{\alpha}_{21}\beta_1 + \acute{\alpha}_{22}\beta_2 + \acute{\alpha}_{23}\beta_3 \qquad (10)$$
$$\theta_3 = \acute{\alpha}_{31}\beta_1 + \acute{\alpha}_{32}\beta_2 + \acute{\alpha}_{33}\beta_3 \qquad (11)$$

$\theta_1 = $ QL weight;
$\theta_2 = $ HHm weight;
$\theta_3 = $ PR weight.

After obtaining the weights for each variable, the results were added, so that to arrive at an index number, we used the linear combination of standardized indicators, in the application of the ICN equation. The index selection criterion was guided by the premise that its result has a degree greater than 1. In these circumstances, it would justify that the municipality could be relevant in the economic structure of the representation of the analyzed productive chain, by having a level of specialty of the activity or sector in the region studied. It is important to add that the analyzes included a historical series, started in 2006, considering that from that period on, the CNAE 2.0 class nomenclature started to be used.

Results and discussions
Performance of the livestock sectors in Brazil and Mato Grosso do Sul

Livestock has a significant share in the world market, mainly beef cattle. In terms of swine and poultry production advances are also undeniable. According to the report Livestock Profile in Brazil (ABIEC, 2017), around 10 million tons of beef were produced in 2016, of which 20% turned to the foreign market and 80% to the domestic market. Chicken and pork meat, in the same period, supplied 66% and 80.4% of the domestic market, 34% and 19.6% of production were directed to the foreign market, respectively (ABPA, 2017).
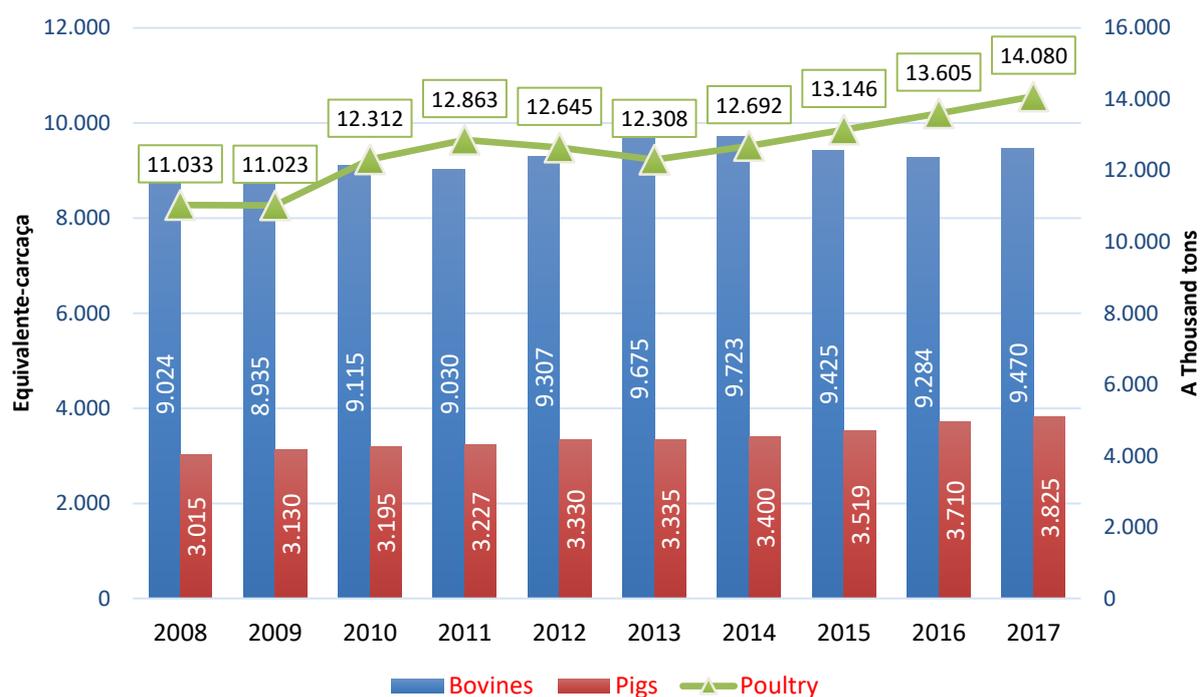
Graph 1: Meat consumption per capita in Brazil (Kg / inhabitant / year)
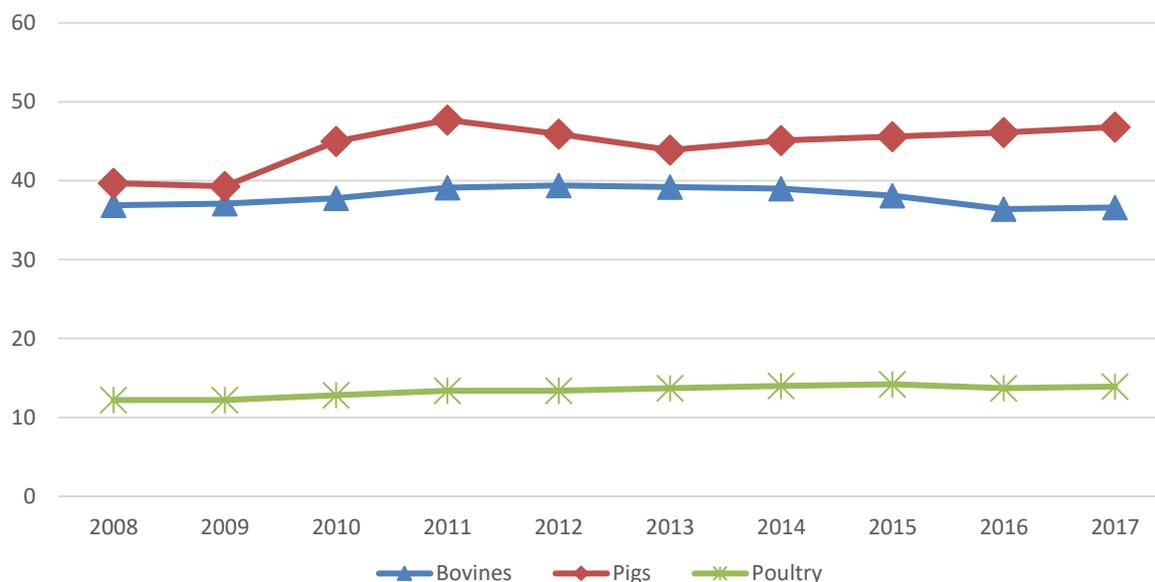
Source: Prepared by the authors based on USDA, 2017.

USDA data (2017) show that the Brazilian consumption of chicken meat has surpassed that of beef. In recent years, however, beef cattle have stood out not only in national production and consumption, but also in export leaders, which has positively benefited the Brazilian trade balance. Graph 2 shows the evolution of Brazilian production in the meat market in Brazil, from 2008 to 2017.

As in Brazil, the state of Mato Grosso do Sul has also moved positively towards expanding its market and its participation at the national level. According to FAMASUL (2017), the growth expectations for the coming years of this market are optimistic. In 2018 alone, beef production approached 791 million tons, chicken meat, an increase of almost 3.9% (+417.6 tons) and pork 7% (+144 tons). In the case of chicken meat, the exported volume decreased, due to the embargo imposed on chicken meat imports by the EU, during 2018, from 20 slaughterhouses in Brazil (PORTAL DO GOVERNO DO MS, 2018).

**Graph 2:** Brazilian Meat Production (Bovines, Pigs and Poultry)

According to the Balanço Anual do Agronegócio Sul-Mato-Grossense [Annual Balance of Agribusiness Sul-Mato-Grossense] (2017), pig farming was the activity that most stood out in the last 17 years, growing more than 180%, due to incentives for the development of the production chain and technological advances. Poultry has also made significant progress and achieved a production growth of 141.11% for the same period. For beef cattle, this percentage was 20.87%. When comparing livestock production, despite these growth percentages, the highlight in terms of volume was beef cattle.

For the state, in 2017, 417.6 thousand tons of chicken were produced, an increase of 3.9% in relation to 2016. For the pig farming, 144 thousand tons of pigs were slaughtered, an increase of 7%, in the same period.

The results of the generation of formal jobs (or number of employed persons) also followed, to a lesser extent, these growth trends for livestock, which were presented in graphs 3 and 4, in accordance with data from the Ministry of Labor and Employment.

Graph 3: Evolution of formal employment in the creative sector
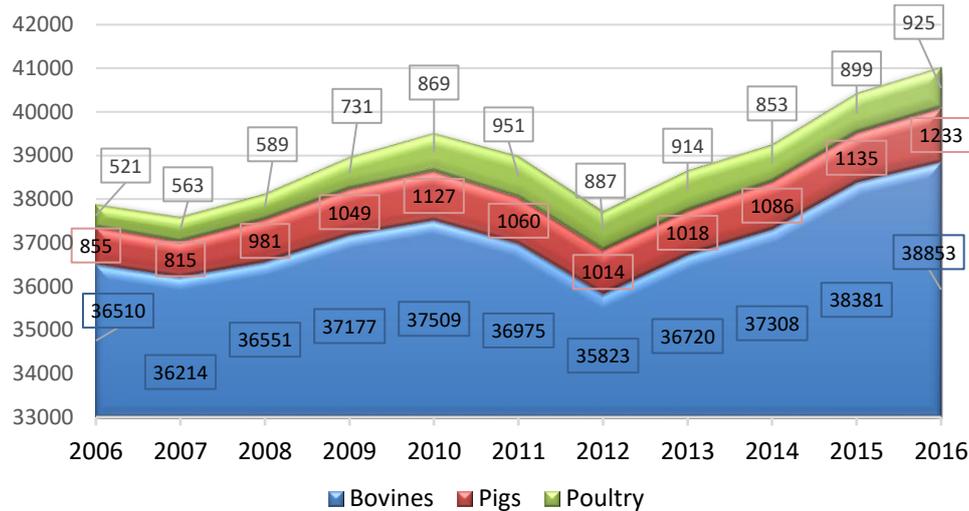
From 2006 to 2016, cattle breeding increased by 6%, poultry (chicken) 44% and pigs 78% in the number of formal jobs. For slaughterhouses, these percentages were -13%, 44% and 107%, respectively. For these results, it is observed that despite the representativeness of beef cattle in volume produced and the advances in productivity, this activity has become less intensive, over the years, in labor, in comparison to poultry and poultry. pig farming.

Graph 4: Evolution of formal employment in the sector in the slaughterhouse industry
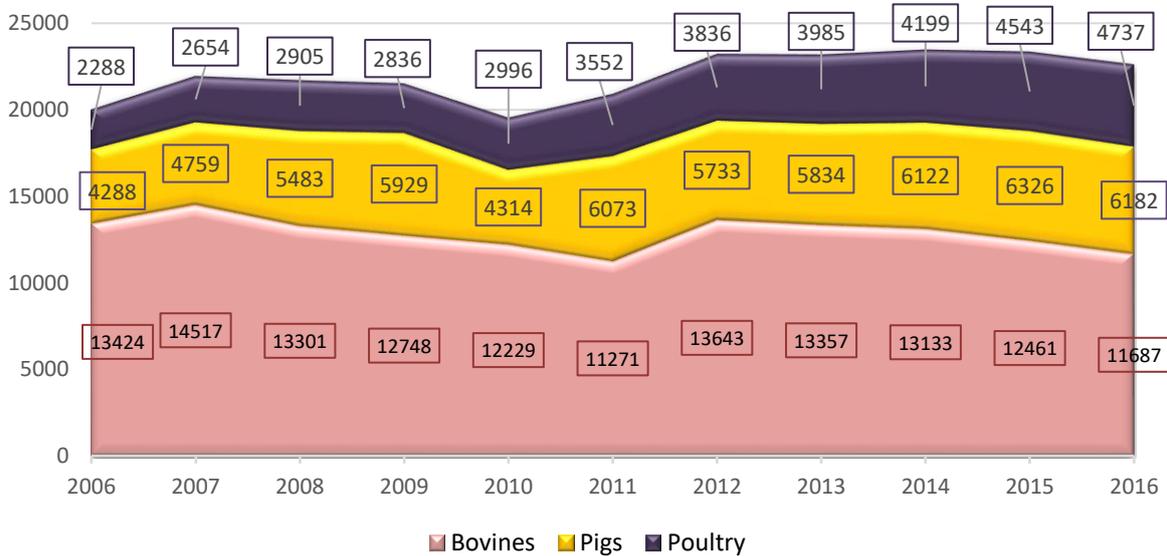
The information presented in this topic highlights the importance of the livestock sector over the years, as one of the main segments for the economy at the national and state levels. When relating this importance and behavior of the results of production and employment with the agglomerations of livestock activities, it can be said that there would be opportunities to enhance or obtain a higher level of regional development.

This when considering the strategies for the optimization of the location of activities and some determinants, such as those treated by Perroux (1955), Myrdal (1957) and Hirschman (1958), in view of the existence of growth poles for the qualification of constructions. In which the valuation

of human capital can be measured, by calculating the ICN of formal employment, described in the next topic.

Normalized Concentration Index in Formal Employment

With the application of the methodology proposed in this study, from secondary data available from the Ministry of Labor and Employment, it was possible to identify the municipalities that had a degree of specialization both in production and in the livestock industry of Mato Grosso do Sul, for the year 2016 (most updated data so far).

In cattle production, the municipalities of Corumbá (1.2500), Porto Murtinho (1.5931), Ribas do Rio Pardo (1.7643) and Santa Rita do Pardo (1.4682), had the highest concentration levels in the generation of formal employment. As shown in Figure 1, several cities did not obtain a determinant degree greater than 1, but had considerable levels for the breeding of cattle, indexes that could have an indirect impact on livestock or could even be considered as future potential.

Regarding the industries, the highlights for the concentration level were: Bataguassu (3.5354), Rochedo (2.5076), Nova Andradina (2.0536), Naviraí (1.8030), Guia Lopes da Laguna (1.0238) and Anastácio (1.5931).

It is worth mentioning that in municipalities, whose population level is considered small, in comparison to industrial regions, the installation or presence of industries can foster economic and regional development. In addition, most of these industrial regions are closer to the border with other states, which favors the flow of production and access to inputs. With this, strategically, this location favors the sector's productivity and impacts the generation of jobs.

The industries in the regions highlighted in Figure 1, which operate with the Federal Inspection Seal, which can be considered as industrial centers and which in some cases are close to the borders are: Marfrig Alimentos SA, Minerva SA, JBS SA, Vale Grande Indústria e Comércio de Alimentos SA, Mfb Marfrig Frigoríficos Brasil, Frigoríficos Mataboi SA (ABIEC, 2016).

Factors highlighted in the literature by Mydral (1957) and Hirschman (1958), take into account that the elements related to production are decisive for regional development and the valorization of human capital, as well as for the reduction of production costs. Since, social issues generate opportunities that enhance a region, given its peculiarities.

Figure 1: Standardized Concentration Index for Cattle Farming
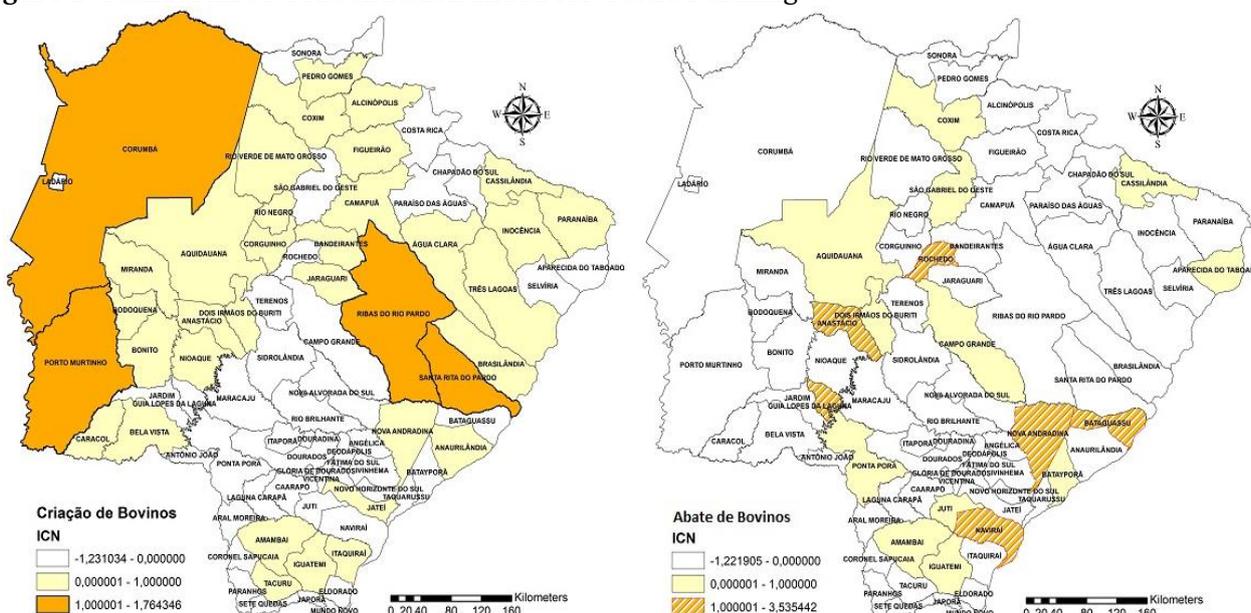
Source: Prepared by the authors.

In view of the representativeness in beef cattle in the state of Mato Grosso do Sul, the State Government published Decree 14.772, in the Official Gazette of the state of Mato Grosso do Sul, on June 28, 2017, which allowed the reduction of the ICMS (Tax on Circulation of Goods and Services) rate from 12% to 7% for the sale of standing ox, a fact that in a way also had an impact on poultry and pork negotiations.

Also according to the Official Gazette, this measure demonstrates the state's interest not only in industry, but also in reducing the tax burden on interstate operations, in order to establish favorable conditions for rural producers to overcome possible difficulties of local trade, due to the concentration refrigeration industry.

In addition to this type of stimulus, it is worth noting that Mato Grosso do Sul positions itself as one of the largest producers of corn and soybeans in Brazil, which are the main inputs used in the production of feed that feed birds (chicken). This representativeness works as an important strategy or factor that made it possible to stimulate poultry farming in the state.

In poultry production, the municipalities that stood out in the concentration level were: Sidrolândia (4.3358), Água Clara (3.4966), Terenos (3.6881), Cassilândia (2.0822), Dourados (1.5283). The State of Mato Grosso do Sul has 602 cutting farms, 38 laying farms, 22 breeding farms and 5 hatcheries, according to information from IAGRO (2014). In the industry related to poultry slaughter, there was an emphasis on: Sidrolândia (4.8870), Itaquirai (4.8477), Dourados (2.6181), Caarapó (1.0277) and Aparecida do Taboado (1.0692), as shown in Figure 2.

In the industry sector are present: Seara Alimentos (Sidrolândia) with the largest refrigeration plant, Frango Bello (Itaquiraí and Aparecida do Taboado), BRF Brasil (Dourados), Doux Frangosul - JBS in the municipality of Caarapó and Frango Ouro from Aparecida do Taboado. It is observed from the advancement of poultry, that there were contributions from this sector, for the improvement of working techniques, included in the adoption of new technologies and that impacted on the quality and offer of the products.

Figure 2: Normalized Concentration Index for Poultry
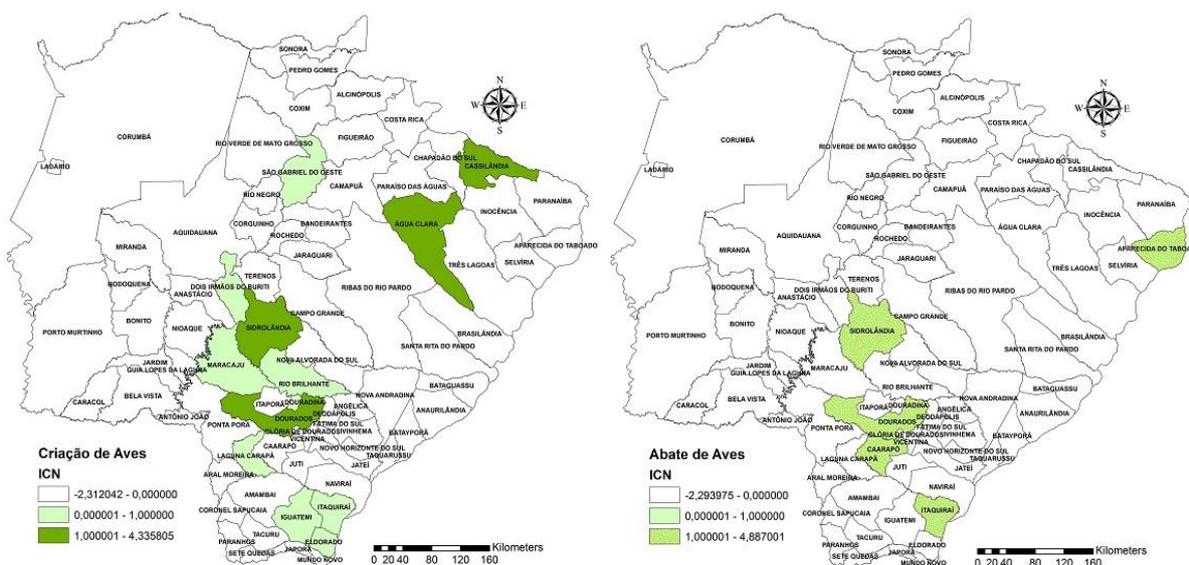
Source: Prepared by the authors.

The poultry industry in the state is mainly concentrated in the central-south region, functioning as a 100% integrated activity, in which the links in its chain are interconnected and close to the regions, where industries and suppliers of inputs are located, at the Dourados and São Gabriel do Oeste.

This activity tends to diversify the region's economy, providing more jobs, considered techniques, to improve production performance. According to the animal production report of AviSite (2011), poultry stands out in its social aspect, due to the use of intensive labor and with this it has a greater offer of direct and indirect jobs and consequently with the collection of taxes arising from the activity.

Pig farming followed the growth of other activities, but with less expressiveness. The municipalities that stood out in the creation of pigs were: São Gabriel do Oeste (4.3253), Jateí (4.1990), Ivinhema (3.0076) and Vicentina (1.3881), as shown in Figure 3.

Some of these cities are part of the same region that has a higher concentration of poultry production and, with this, the same strategies of proximity are used from where the inputs are produced, which justifies the agglomeration in that location. According to the Laboratory for

Economic Research in Swine (LAPESUL, 2015), 60% of the pig production that supplies the agro-industry Aurora, originates from São Gabriel do Oeste and Cooasgo cooperative members, which includes independent and dependent producers.

Therefore, when talking about industry, São Gabriel do Oeste (5.7072) and Dourados (5.1930) stand out, as shown in Figure 3, based on cooperative and integrated production systems. Cooasgo (from São Gabriel do Oeste) works mainly with the production and commercialization of pigs, however, it also has confinement of Bovines, Leitão Production Unit, UPL crechário.

This cooperative operates in the swine market with agricultural activities, providing support for the marketing and production of pigs, by meeting the demand for breeding stock, inputs, technical assistance and grain storage. It is this cooperative that supplies products to the Aurora slaughterhouse industry. At the Dourados there is greater market dominance by JBS - FOODS (SEARA), with its integration system, which provides the main mechanisms for production.

Figure 3: Normalized Concentration Index for Swine
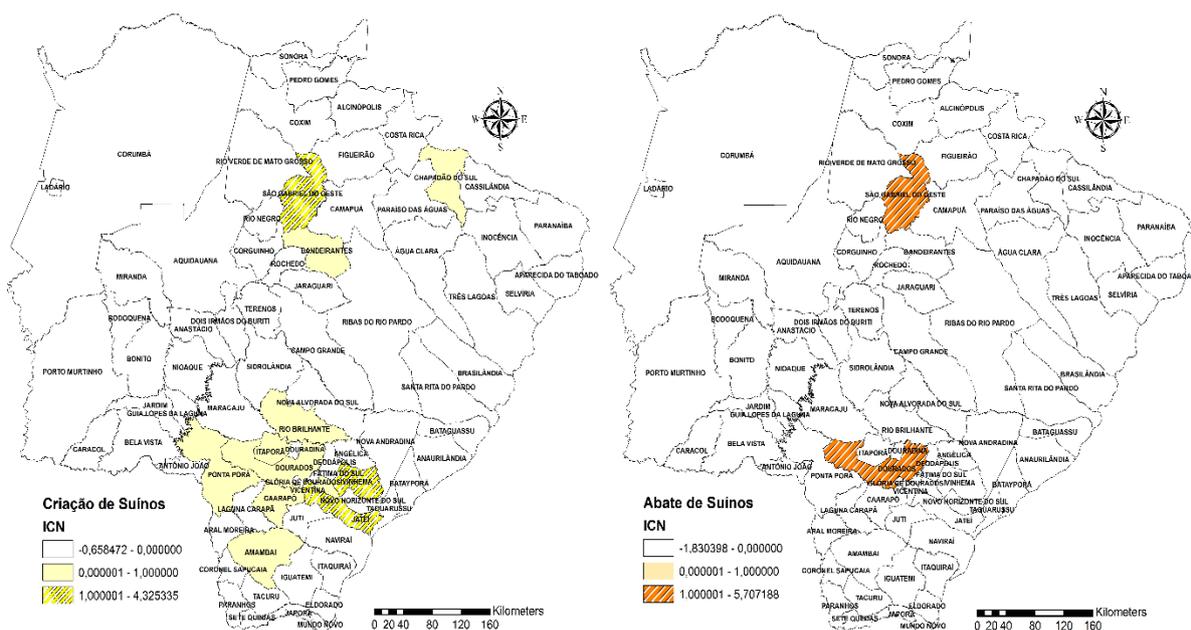
Source: Prepared by the authors.

The industrial sector of pork has been characterized as one of the main responsible for sustaining the economic and social development of many Brazilian municipalities, from the generation of jobs in the field, industry, commerce and services (ABPA, 2013). The pig farming chain is complex and involves a range of companies linked to the various stages of production until reaching the final consumer (ROSSI, PFÜLLER, 2008).

Final Considerations

The objective of this work was to analyze the level of job concentration of the main livestock activities at Mato Grosso do Sul, considering the relevant aspects for the development of these activities. In this context, the main activities studied were beef cattle, poultry and pig farming.

From the literature review of this study on regional development, the calculation of the Standardized Concentration Index was used, in which it was possible to estimate the concentration of formal employment for production, industrialization and processing activities.

It was identified with this, that beef cattle has a significant participation in meat production, in domestic and foreign trade. Despite the fact that poultry and pig farming do not have the same representativeness as beef farming, these activities have gained emphasis due to the advances and the more intensive use of labor.

With that, it was noticed that the concentration of employment of livestock occurred between the nearest cities to the border regions with other states, in view of the facilitation of the flow of production and purchase of inputs. It is worth noting that the Center-South region had a greater degree of concentration of production and employment for poultry and swine.

These activities have the potential and competitiveness to boost the economy of the State and Brazil. They even have strong interconnections with other sectors of the economy, which stimulate the search for greater productivity and lower costs, such as the logistical proximity for the purchase of raw materials.

It can be said that the processes of creation and processing of livestock activity contributed to the development of the state, from the generation of employment, income qualification of the labor force, valorization of the worker, investments, incentives to public policies, geographical approximation cities or centers of interest for the purchase of inputs and production flow.

The geographical distributions of these activities demonstrate the importance of the sectors for the local development of the municipality, with exercises aimed at direct and indirect execution of these activities. Information like this can help government institutions to identify regions, where incentives and investments are needed, as well as public policies.

However, it is noteworthy that the research has limitations in relation to the data provided by the Ministry of Labor and Employment, both with regard to the data gap, as well as the fact that it considers only formal jobs. For a more robust and complete analysis of the geographical distributions related to the employment of certain activities or sectors of the economy, an analysis of informal work is a suggestion for future work.

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