Bovine dairy production and diversity of regional dairy products sold in Presidente Médici markets - RO, Western Amazon

Produção leiteira bovina e diversidade de produtos lácteos regionais comercializados em mercados de Presidente Médici - RO, Amazônia Ocidental

Producción láctea bovina y diversidad de lácteos regionales vendidos en los mercados Presidente Médici - RO, Amazonia Occidental

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ABSTRACT
This study investigates bovine dairy production in Rondônia, as well as the availability of bovine dairy products produced in the state available in markets in the urban area of Presidente Médici - RO. To this end, the SIDRA/IBGE Municipal Livestock Survey database was used, from 2015 to 2022; To assess the availability of dairy products, visits to markets were carried out. For the period analyzed, Rondônia emerges as the largest producer in the North Region, presenting its peak in 2018, with 1,160,198 liters, the state's contribution at national level is approximately 1.9%, the municipalities with the highest milk production were: Jaru, Machadinho do Oeste and Ouro Preto, respectively; the municipality of Presidente Médici ranked 11th with production of 212,913 liters. Regarding the commercialization of dairy products produced in the state, these were found in 100% of the markets, with cheese having the greatest diversity of types and manufacturers, followed by butter, yogurt, type C milk, UHT milk and dulce de leche, respectively. Dairy production in Rondônia and the municipality of Presidente Médici may be related to the need for genetic improvement of the herd, low technology and greater technical assistance to producers. With regard to dairy products available in the markets, it is clear that entrepreneurship through agroindustrialization is one of the economic strategies that integrate several stages of the production chain, adding value to the product, increasing the use of local labor, which contributes to reducing the rural exodus and increases the well-being and comfort of the families and communities involved.

Keywords: dairy cattle farming, commercialization, milk and derivatives, family farming, agroindustrialization, regional development

RESUMO
Este estudo investiga a produção leiteira bovina rondoniense, assim como, a disponibilidade de produtos láteos bovinos produzidos no estado disponíveis nos mercados da zona urbana de Presidente Médici - RO. Para tanto, foi utilizado o banco de dados da Pesquisa Pecuária Municipal do SIDRA/IBGE, anos 2015 a 2022; para aferir a disponibilidade dos produtos láteos foram realizadas visitas aos mercados. Para o período analisado, Rondônia desponta como maior produtor na Região Norte, apresentando seu pico em 2018, com 1.160.198 litros, a contribuição do estado a nível nacional é aproximadamente 1,9%, os municípios com maior produção leiteira foram: Jaru, Machadinho do Oeste e Ouro Preto, respectivamente; o município de Presidente Médici ocupou a 11ª posição com produção de 212.913 litros. Quanto à comercialização dos produtos láteos produzidos no estado, estes foram encontrados em 100% dos mercados, sendo o queijo com maior diversidade de tipos e fabricantes, seguido pela manteiga, iogurte, leite tipo C, leite UHT e doce de leite, respectivamente. A produção leiteira rondoniense e do município de Presidente Médici podem estar relacionadas a necessidade de melhoria genética do rebanho, baixa tecnificação e maior assistência técnica aos produtores. Com relação aos produtos láteos disponíveis nos mercados percebe-se que o empreendedorismo por meio da agroindustrialização é uma das estratégias.
Económicas que integran varias etapas de la cadena productiva, agregando valor al producto, aumentando el uso de mano de obra local, que contribuye para disminución del éxodo rural e aumenta el bienestar y conforto de las familias y comunidades involucradas.

**Palavras-chave:** bovinocultura leitífera, comercialización, leite e derivados, agricultura familiar, agroindustrialização, desenvolvimento regional

**RESUMEN**
Este estudio investiga la producción de lácteos bovinos en Rondônia, así como la disponibilidad de productos lácteos bovinos producidos en el estado disponibles en los mercados de la zona urbana de Presidente Médici - RO. Para ello se utilizó la base de datos de la Encuesta Ganadería Municipal SIDRA/IBGE, de 2015 a 2022; Para evaluar la disponibilidad de productos lácteos se realizaron visitas a mercados. Para el periodo analizado, Rondônia emerge como el mayor productor de la Región Norte, presentando su pico en 2018, con 1.160.198 litros, el aporte estatal a nivel nacional es de aproximadamente el 1,9%, los municipios con mayor producción de leche fueron: Jaru, Machadinho do Oeste y Ouro Preto, respectivamente; el municipio de Presidente Médici ocupó el puesto 11 con una producción de 212.913 litros. En cuanto a la comercialización de productos lácteos producidos en el estado, estos se encontraron en el 100% de los mercados, siendo el queso el de mayor diversidad de tipos y fabricantes, seguido de mantequilla, yogur, leche tipo C, leche UHT y dulce de leche, respectivamente. La producción lechera en Rondônia y el municipio de Presidente Médici puede estar relacionada con la necesidad de mejoramiento genético del rebaño, baja tecnología y mayor asistencia técnica a los productores. Respecto a los productos lácteos disponibles en los mercados, es claro que el emprendimiento a través de la agroindustrialización es una de las estrategias económicas que integran varias etapas de la cadena productiva, agregando valor al producto, incrementando el uso de mano de obra local, lo que contribuye a reducir el éxodo rural y aumenta el bienestar y la comodidad de las familias y comunidades involucradas.

**Palabras clave:** ganadería lechera, comercialización, leche y derivados, agricultura familiar, agroindustrialización, desarrollo regional

**1 INTRODUCTION**

Brazil ranks third in global bovine dairy production (Vilela et al., 2022). However, dairy farming in Brazil exhibits heterogeneous production due to varying levels of technology on rural properties. While some farms adopt modern routines and equipment, others remain with traditional methods, leading to low specialization of cattle and deficiencies in activity management. These practices, often based on cultural knowledge and lacking effective control of field operations, contribute to economic losses and discourage investment in dairy farming, resulting in significant economic losses (Ragazzi, 2021; De Oliveira, 2023).

In this context, Andrade et al. (2023) understand that the consolidation of the Brazilian dairy chain since the 1990s has faced structural, socioeconomic, and political issues that may have limited the sector’s technification and professionalization, leading to a geographically dispersed market.

Milk is considered one of the world's most important agricultural commodities, ranking among the top five traded products in both volume and value (FAO, 2016). Approximately 10% of
the global population is directly involved in dairy production, with about 133 million dairy farms directly and indirectly involving around 1 billion people (GDP, 2019).

According to De Leite (2019), milk stands out not only for its economic value but also as a rich and complex food, filled with essential macro and micronutrients. These characteristics make it a fundamental element for human nutrition and growth. Milk is also considered one of the most versatile products in the food agro-industry, as it can be transformed into various products such as different types of butter, cheeses, yogurts, dairy drinks, etc. (Siqueira, 2021).

According to De Leite (2023) and IBGE data (2022c) from a quarterly milk survey, Rondônia ranks first as a milk-producing state in the Northern Region and tenth in the Brazilian ranking. Dairy farming is among the segments of great importance, primarily because it is conducted within the scope of family farming.

Furthermore, according to IBGE (2019), in the last ten years, raw milk production in the state of Rondônia has grown by 51%, surpassing the Northern region's rate (33.8%) over the same period (Silva, 2021). IBGE data (2022c) revealed that production was approximately 656 thousand liters of milk, with the micro-regions of Machadinho d'Oeste and Porto Velho being the largest milk producers in the state (IDARON, 2023).

Dairy industries under federal inspection (SIF) in the state are responsible for processing 94.8% of industrialized milk. According to the Federal Inspection Service (SIF) data (SIGSIF, 2019), 41 dairy industries with SIF are installed in the state, contributing to the sector's modernization. Of these, 18 are active and have a State Inspection System (SIE/RO), according to IDARON records (2023).

Given the productive capacity of milk in the state of Rondônia, the need was identified to survey the data on its dairy production and the regional dairy products marketed in the urban markets of Presidente Médici, located in the central region of the state.

2 DEVELOPMENT

The research was conducted in the city of Presidente Médici - RO (Figure 1), in the eastern mesoregion of Rondônia and the micro-region of Ji-Paraná. According to IBGE data (2022b), it has a population of approximately 19,327 inhabitants, divided between urban (9,721 inhabitants) and rural (9,606 inhabitants) areas.
In this work, data from the Brazilian Institute of Geography and Statistics (IBGE) concerning the Municipal Livestock Survey (PPM) were used. These data were utilized to analyze the evolution of the major Brazilian regions, the Northern Region, and the state of Rondônia regarding milk production from 2015 to 2022 (IBGE, 2024). After downloading the data, they were organized into an Excel® spreadsheet for graph creation.

Field research followed an observational and descriptive methodology (Zigmund; Babin, 2011), examining the availability of bovine milk-derived products in six markets in the municipality between February and April 2024.

Details of the marketed dairy products, such as product lines, brands, suppliers, origin (state), and manufacturing municipality, were obtained from labels. Each establishment was numbered for identification purposes, and all information was recorded as presented on the respective labels, ensuring the accuracy of this research's results.

The establishments were selected based on available infrastructure and consumer flow, considering that the municipality lacks retail stores with the profile of hypermarkets and instead has markets.

After obtaining permissions from the establishment owners, information collection began. It started with the verification of the refrigerated products sector, where dairy items like cheeses, butter, yogurts, dairy drinks, cream cheese, and pasteurized milk are located. Then, the shelf section was examined, where products that do not require refrigeration, such as UHT milk and dulce de leche, are found.
3 RESULTS AND DISCUSSION

3.1 MILK PRODUCTION IN RONDÔNIA

In 2022, milk production in Brazil reached 34.6 billion liters, reflecting a 1.6% decrease in national production. This decline was linked to the withdrawal of smaller producers from the activity due to high input costs, which led them to conclude that the activity was not profitable. As an alternative, leasing land for grain cultivation became a better option for financial sustainability (IBGE, 2022c).

The Municipal Livestock Production (PPM) survey provides production data for 2022, indicating a shift in the dairy sector's behavior, with a noted decline. In 2021, 29.5 million cows were milked, whereas in 2022, only 15.7 million cows were milked. Dairy production is predominantly in the South and Southeast regions, with the Northeast being the only region that continued to show growth. The North region saw a decrease in production from 2021 to 2022, measured at approximately 80 thousand liters of milk (Figure 2) (IBGE, 2022c).

According to Almeida (2019), more technologically advanced producers utilize balanced feeding, technical assistance, and investments in equipment and facilities, resulting in higher productivity. Intermediate producers care for management and health, making investments in the activity, but show lower productivity than advanced producers. Traditional producers have low technological use and rural credit, as well as low productivity.

![Figure 2: Milk production in Brazilian regions, 2015 - 2022.](Source: IBGE/PPM (2024), prepared by the authors (2024)](attachment:image)

The level of dairy productivity is defined by the difference between subsistence production and professionalized milk production (Ostapechen; Gotardo, 2019). When analyzing all the regions that make up Brazil, there are significant discrepancies, production fluctuations, and varying quantities produced. These differences are associated with the technological and productive level,
where the producer seeks to adopt appropriate techniques, management, and health practices to keep their herd healthy and maximize its productive potential. In the North region, the state of Rondônia has been prominent (Figure 3), reaching its peak in 2018 with the highest recorded production and subsequent declines in the following years. The heterogeneity of production observed in the state demonstrates the need to direct public policy efforts and business actions to reconcile these differences, forming part of the improvement process in the dairy sector and consequently regional growth (Valerio et al., 2022).

As previously noted, Rondônia is a state that has been standing out in dairy farming, as its production is becoming significant, being the largest producer in the Northern region and maintaining the position of the 10th largest milk producer in Brazil (Moitinho, 2024). The state holds 1.9% of the national production (Figure 4), generating jobs, strengthening the milk chain, and boosting the state's economy. Furthermore, Andrade et al. (2023) reported that Rondônia's milk production has become more dispersed among municipalities.

This productive advancement in the dairy chain is the result of investments in genetic improvement, balanced nutrition, and animal welfare practices, ensuring that these animals have comfort, nutrition, and health, thereby expressing their productive potential and resulting in greater production and quality of the final product. Due to these new techniques, the state has new agro-industries and dairy plants that also encourage producers to add value to the processed product and
deliver it to the market, further aiding the state’s milk chain with new opportunities for technical assistance, both on dairy farms and in industries.

Figure 4: Contribution of Rondônia’s milk production in 2022.

Within the state of Rondônia, milk production fluctuations are also present (Figure 5), with the highest productivity observed in Jaru and Machadinho do Oeste, producing 36,777 and 37,735 liters of milk, respectively. The lowest production was in the municipalities of Rolim de Moura and Nova União, with 11,361 and 10,135 liters of milk, respectively. This difference in milk production quantity indicates the existence of subsistence-level production properties, while higher productivity suggests producers aiming for greater efficiency, likely adopting more suitable management, nutrition, and health practices (Ostapechen; Gotardo, 2019).

Figure 5: Municipalities with the highest milk production in Rondônia, 2015 to 2022.

Source: IBGE/PPM (2024), prepared by the authors (2024)
3.2 REGIONAL DAIRY PRODUCTS

Following surveys conducted in six markets, the dairy products sold, their respective brands, and their municipalities of origin were identified. In the milk category (Table 1), the products available included UHT milk and C-pasteurized milk. However, C-pasteurized milk was only present in two of the surveyed establishments. In contrast, UHT milk was available in all six markets; all the dairy products found in this study are produced in the state of Rondônia, in the municipalities of Jaru, Santa Luzia d’Oeste, Presidente Médici, and Urupá, with Jaru having the highest number of milk suppliers (brands).

<table>
<thead>
<tr>
<th>Line</th>
<th>Product</th>
<th>Supplier (Brand)</th>
<th>Origin (State)</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>C-pasteurized</td>
<td>Miraela</td>
<td>RO</td>
<td>Santa Luzia d’Oeste</td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>Massaroto</td>
<td>RO</td>
<td>Presidente Médici</td>
</tr>
<tr>
<td></td>
<td>UHT Milk</td>
<td>Toya</td>
<td>RO</td>
<td>Urupá</td>
</tr>
<tr>
<td></td>
<td>UHT Milk</td>
<td>Nilza</td>
<td>RO</td>
<td>Jaru</td>
</tr>
<tr>
<td></td>
<td>UHT Milk</td>
<td>Italac</td>
<td>RO</td>
<td>Jaru</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2024)

Regarding cheese (Table 2), a wide variety was available in the markets, encompassing various brands and flavors to cater to consumer preferences. Notably, mozzarella cheese was available for sale in all six evaluated establishments. Mozzarella cheese (seasoned knot), a gourmet version of mozzarella enhanced with herbs and regional spices, was found in only two of the visited establishments and is produced by a single supplier, an agro-industry established in the municipality where the research was conducted.

López et al. (2023) highlight that when tasting gourmet cheese, it is important to pay attention to its texture on the tongue. Some cheeses are creamy and fatty, while others have a firmer, crumbly texture, bitter taste, or strong odor; this perception greatly depends on the sensory analysis training of the person tasting the food. Temperature also plays a significant role in the tasting experience, as some cheeses reveal their full flavor potential when served at room temperature, while others benefit from slight warming to release their aromas. Producing gourmet products is an alternative for manufacturers to stand out among competitors.

Mozzarella cheese (gourd-shaped) was found in only one of the stores; this cheese is named for its round shape, similar to the fruit produced by Crescentia cujete L., a Bignoniaceae known as calabash or gourd tree. It is a forest species native to tropical America and can be found in the Northeast of Brazil, mainly in the Caatinga, where the fruit is used to make household utensils (Azevedo, 2010).
Coalho cheese, Minas padrão cheese, and Provolone cheese were offered in two markets; Prato cheese, Cheddar cheese, and Meia cura cheese were the least available products, found in only one of the six visited stores (Table 2). Requeijão was available in at least one of the three versions (creamy, culinary, and lactose-free) provided by suppliers in all markets evaluated during the three-day survey (Table 2). Of the cheeses sold in the six evaluated markets, six are manufactured in the municipality of Presidente Médici, while the others are distributed among the municipalities of Rolim de Moura, Santa Luzia d’Oeste, Teixeirópolis, Jaru, and Urupá.

Among the dairy derivatives found in the markets (Table 3), yogurts showed the least variety of available options, leaving considerable space for similar products from other regions of the country. Two suppliers (Massaroto and Marcon) produce their products in the municipality where the research was conducted, while the Ishiybom brand is produced in a district of Presidente Médici.

In the present study, dairy beverages were not found in the visited markets, indicating a decline in the availability of this product between 2022 and 2024. This observation aligns with the study by Valerio et al. (2022) on the availability of regional dairy products sold in six markets, which found dairy beverages available in three packaging options—in trays, bags, and bottles—in
three markets in the municipality in 2022. Yogurt was available in four of the six analyzed markets
(Table 3).

Table 3. Yogurt found in markets.

<table>
<thead>
<tr>
<th>Line</th>
<th>Product</th>
<th>Supplier (Brand)</th>
<th>Origin (State)</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt</td>
<td>Yogurt</td>
<td>Marcon</td>
<td>RO</td>
<td>Presidente Médici</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Massaroto</td>
<td>RO</td>
<td>Presidente Médici</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ishiybom</td>
<td>RO</td>
<td>Estrela de Rondônia</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2024)

Regarding butter (Table 4), salted common butter was sold in all six surveyed markets. Homemade pot butter, an artisanal product, is produced in the municipality where the research was conducted, and all six surveyed markets had this product available for their customers. The other brands are produced in the municipalities of Nova Brasilândia, Urupá, and Jaru.

Table 4. Butter found in markets.

<table>
<thead>
<tr>
<th>Line</th>
<th>Product</th>
<th>Supplier (Brand)</th>
<th>Origin (State)</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>Butter</td>
<td>Ouro</td>
<td>RO</td>
<td>Nova Brasilândia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toya</td>
<td>RO</td>
<td>Urupá</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Italac</td>
<td>RO</td>
<td>Jaru</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caseira de pote</td>
<td>RO</td>
<td>Presidente Médici</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Massaroto</td>
<td>RO</td>
<td>Presidente Médici</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2024)

Dulce de leche, the product with the fewest suppliers, is available from only one manufacturer for sale in the municipality. This product was found in five of the evaluated establishments. It has proven competitive with brands from other regions of the country, presenting the advantage of lower transportation costs compared to other brands. This product has been available for sale in the municipality of Presidente Médici for less than two years, as confirmed by analyzing the work of Valerio et al. (2022), where the authors did not mention this product being sold in stores during their research year.

Table 5. Dulce de leche found in markets.

<table>
<thead>
<tr>
<th>Line</th>
<th>Product</th>
<th>Supplier (Brand)</th>
<th>Origin (State)</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dulce de Leche</td>
<td>Italac</td>
<td>RO</td>
<td></td>
<td>Jaru</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2024)
4 CONCLUSION

The data from this study reaffirm the significant role of Rondônia as a pillar in dairy production in the Northern region, standing out amidst an emerging national contribution. The diversity of dairy products available in local markets, especially cheese and butter, highlights the potential for enriching the food supply and valuing regional dairy products. These results provide concrete data that can guide public policies and business actions aimed at technological enhancement, with the goal of expanding product variety, sustainability, and food security.

Future research can expand the understanding of the dairy production chain, focusing on strengthening productive practices and local economic development. This not only encourages the resilience and efficiency of production but also promotes food and nutritional autonomy, reinforcing the vital role of regional agro-industries and local agri-food networks.
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