Production of Tambaqui (*Colossoma macropomum*) in Brazil between 2017 to 2021

Produção de Tambaqui (*Colossoma macropomum*) no Brasil entre os anos de 2017 a 2021

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Shirlene Lopes de Araújo  
Bacharela em Ciências Ambientais pela Universidade Federal do Amapá  
Universidade Federal do Amapá  
Macapá, AP. Brasil  
E-mail: shirlenelps7@gmail.com

Juliana Barros da Mota  
Doutoranda em Zootecnia pela Universidade Federal de Minas Gerais  
Universidade Federal de Minas Gerais  
Belo Horizonte, MG. Brasil  
E-mail: juliana.bmota04@gmail.com

Dara Cristina Pires  
Doutoranda em Zootecnia pela Universidade Federal de Minas Gerais  
Universidade Federal de Minas Gerais  
Belo Horizonte, MG. Brasil  
E-mail: darapires1996@gmail.com

Kleber Campos Miranda-Filho  
Doutor em Oceanografia Biológica pela Universidade Federal do Rio Grande  
Universidade Federal de Minas Gerais  
Belo Horizonte, MG. Brasil  
E-mail: kleber08@gmail.com

**ABSTRACT**

This article sought to evaluate the production of tambaqui in Brazil from 2017 to 2021. For the constitution of the work, secondary aquaculture data collected by the Brazilian Institute of Geography and Statistics, from 2017 to 2021, were used, considering the production by region, states, and municipalities. Data analysis was based on descriptive statistics. In this context, the North region was the largest producer of tambaqui, followed by the Northeast and Midwest, emphasizing the states of Rondônia, Maranhão, and Roraima. Despite standing out in the production of tambaqui, the North had a drop in the production of the species. Regarding municipalities, the highlight was Ariquemes, followed by Almas and Amajari. Although the species presents excellent zootechnical characteristics, which favor its production and commercialization, it is necessary to invest in public policies that help producers intensify production.

**Keywords:** aquaculture, fish, Southeast, North, Amazon.
RESUMO
Este artigo buscou avaliar a produção de tambaqui no Brasil durante os anos de 2017 a 2021. Para a constituição do trabalho utilizou-se os dados secundários da aquicultura levantados pelo Instituto Brasileiro de Geografia e Estatística, no período de 2017 a 2021, considerando a produção por região, estados e municípios. A análise dos dados foi com base na estatística descritiva. Neste contexto, a região Norte foi a maior produtora de tambaqui, seguido pelo Nordeste e Centro Oeste, com destaque para os estados de Rondônia, Maranhão e Roraima. Apesar de se destacar na produção de tambaqui, o Norte teve queda na produção da espécie. Em relação aos municípios, o destaque foi para Ariquemes, seguido por Almas e Amajari. Ainda que a espécie apresente excelentes características zootécnicas, que favorecem sua produção e comercialização, torna-se necessário investimento em políticas públicas que auxilie os produtores na intensificação da produção.

Palavras-chave: aquicultura, peixes, Sudeste, Norte, Amazônia.

RESUMEN
Este artículo buscó evaluar la producción de tambaqui en Brasil entre 2017 y 2021. El trabajo utilizó datos secundarios de acuicultura del Instituto Brasileño de Geografía y Estadística para el período 2017 a 2021, considerando la producción por región, estado y municipio. Los datos se analizaron utilizando estadísticas descriptivas. En este contexto, la región Norte fue la mayor productora de tambaqui, seguida del Nordeste y Centro Oeste, destacándose los estados de Rondônia, Maranhão y Roraima. A pesar de destacarse en la producción de tambaqui, el Norte registró una caída en la producción de la especie. En cuanto a los municipios, destacó Ariquemes, seguido de Almas y Amajari. Aunque la especie tenga excelentes características zootécnicas, que favorecen su producción y comercialización, es necesario invertir en políticas públicas para ayudar a los productores a intensificar la producción.

Palabras clave: acuicultura, peces, Sudeste, Norte, Amazonia.

1 INTRODUCTION
In recent years, tambaqui has emerged as a leading species among native fish in Brazil, representing 31.2% of national production, totaling 262,370 tons (Peixe BR, 2022). This species has physiological characteristics that allow it to increase production, including rapid growth, a propensity to accept exogenous food and tolerance to low levels of dissolved oxygen (Moraes et al., 2017). Furthermore, tambaqui demonstrates resistance to pathogens (Mourad et al., 2018), meat with nutritional and sensory properties that attract consumers (Costa et al., 2020), as well as significant cultural and economic importance (Guimarães & Martins, 2015).

Tambaqui production ranks second only to tilapia production (exotic species), primarily due to the difficulty in environmental regularization in the states where the species is produced, the necessity for investment in input and processing infrastructure, and the lack of official support, particularly in the northern region of the country. On the other hand, the production of native fish plays an important role in the national heritage, adding economic value to the sector (Peixe BR, 2022).
In this way, the survey of *Colossoma macropomum* production in recent years allows us to identify the increase in its cultivation at the national level, as a mechanism for understanding the development of the activity and identifying potential improvements to intensify its expansion.

Fish farming, within aquaculture, has been indicated as the next global frontier in the scope of producing healthy food (Schulter & Vieira Filho, 2017). Thus, studies aiming to investigate the topic and understand its production for the sector’s development are essential for justifying public policies. Therefore, this research aimed to evaluate tambaqui production from 2017 to 2021 in Brazil’s primary municipalities, states, and regions.

**2 MATERIAL AND METHODS**

The study area was characterized by seven main municipalities (Ariquemes-RO, Cujubim-RO, Amajari-RR, Almas-TO, Paragominas-PA, Rio Crespo-RO, and Alto Alegre-RR) known for tambaqui production, including the two largest states in each region (Rondônia, Roraima, Maranhão, Piauí, Minas Gerais, São Paulo, Paraná, Santa Catarina, Mato Grosso and Goiás) and all five regions of the country (North, Northeast, South, Southeast and Central-West). Within the municipalities, the top five producers were selected for each year, considering variations in production levels throughout the period.

This study relied on secondary data sourced from the Brazilian Institute of Geography and Statistics (IBGE), seeking to present existing information and portray the extent of tambaqui farming during the years 2017 to 2021 (latest databases available at IBGE), regarding tambaqui production across different regions, states, and municipalities of Brazil. Data collection focused on tracking the evolution of production (including fluctuations) and the corresponding values generated over time.

Descriptive statistics were employed to collect, describe, and organize tambaqui production data, involving the representation of production through graphs illustrating central tendency measurements (Silva et al., 2015).

**3 RESULTS AND DISCUSSION**

The data collected from 2017 to 2021 revealed that the North region was the largest producer of tambaqui in Brazil, yielding 80.7 thousand tons in 2017, with a subsequent decline in production in the ensuing years. The Northeast region followed suit, achieving its peak in 2020, with a production of 21.7 thousand tons. Additionally, the Central-West region demonstrated in 2019, a production of 6.3 thousand tons (see Table 1).
Table 1. Tambaqui production in tons, by region from 2017 to 2021.

<table>
<thead>
<tr>
<th>Regions</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>80.700.0</td>
<td>74.994.9</td>
<td>73.181.8</td>
<td>73.429.4</td>
<td>67.730.7</td>
</tr>
<tr>
<td>Northeast</td>
<td>22.038.9</td>
<td>21.251.9</td>
<td>21.047.2</td>
<td>21.728.7</td>
<td>21.339.3</td>
</tr>
<tr>
<td>Southeast</td>
<td>458.3</td>
<td>488.2</td>
<td>466.8</td>
<td>440.2</td>
<td>398.5</td>
</tr>
<tr>
<td>South</td>
<td>4.6</td>
<td>4.8</td>
<td>4.5</td>
<td>9.6</td>
<td>13.3</td>
</tr>
<tr>
<td>Central-West</td>
<td>5.084.2</td>
<td>5.814.6</td>
<td>6.379.2</td>
<td>4.936.3</td>
<td>5.111.6</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2023).

This result corroborates what was found by Pedroza Filho et al. (2016), who identified the North, Northeast, and Central-West regions as the largest producers of “round” fish, with tambaqui being the most cultivated species. Several factors inherent to tambaqui make it the main native species cultivated in the Northern region of Brazil, namely, being characteristic of the Amazon basin, ease of obtaining young specimens, rapid growth, rusticity, adaptability to cultivation systems, and its strong appeal to consumers due to its firm meat and excellent flavor (Pedroza Filho et al., 2016; Neves et al., 2018). These characteristics have also contributed to its expansion into other regions of the country, including the South, where tilapia is the main species produced.

In this context, although the South region exhibited the lowest tambaqui production in Brazil, it experienced an increase from 4.6 tons in 2017 to 13.3 tons in 2021 (Table 1), obtaining an increase in its production in the years 2020 and 2021 when compared to previous years. Unlike the North and Southeast regions, which showed fluctuations in production from 2017 to 2020 and still reduced production in 2021 (Table 2).

Table 2. Percentage of tambaqui production by region, from 2017 to 2021 in Brazil.

<table>
<thead>
<tr>
<th>Regions</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>74.5%</td>
<td>73.1%</td>
<td>72.4%</td>
<td>73.0%</td>
<td>71.6%</td>
</tr>
<tr>
<td>Northeast</td>
<td>20.4%</td>
<td>20.7%</td>
<td>20.8%</td>
<td>21.6%</td>
<td>22.6%</td>
</tr>
<tr>
<td>Southeast</td>
<td>0.4%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>South</td>
<td>0.004%</td>
<td>0.005%</td>
<td>0.004%</td>
<td>0.009%</td>
<td>0.014%</td>
</tr>
<tr>
<td>Central-West</td>
<td>4.7%</td>
<td>5.7%</td>
<td>6.3%</td>
<td>4.9%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2023).

Despite the increase in tambaqui production in southern Brazil, it remains relatively small compared to other regions of the country. Consumer preference for other species, such as tilapia, along with climatic factors, may contribute to the limited significance of tambaqui production in this area.

Among the top 10 Brazilian states in tambaqui production over the five years, the states in the North and Northeast regions stand out in the first three positions. Specifically, Rondônia leads
with 205,324.1 t, followed by Maranhão with 54,314.2 t and Roraima with 54,298.6 t. Other significant producers include Piauí (26,180.3 t), São Paulo (11,327.7 t), Mato Grosso (7,668.1 t), Santa Catarina (5,608.6 t) and Minas Gerais (3,559.3 t). The states of Goiás (678.1 t) and Paraná (127.1 t) occupy the lower positions.

Although Rondônia has been the leading tambaqui producer in Brazil from 2017 to 2021, its production experienced a decline, mainly from 2018 to 2021. Unlike the states of Roraima (RR), Maranhão (MA), and Paraná (PR), generally saw an increase in tambaqui production, during the same period (RR and MA) and the production of PR in 2021 (Table 3).

### Table 3. Tambaqui production in tons by the Brazilian state in the five years (2017 to 2021).

<table>
<thead>
<tr>
<th>States</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rondônia (RO)</td>
<td>62.0%</td>
<td>55.5%</td>
<td>54.1%</td>
<td>54.5%</td>
<td>51.3%</td>
</tr>
<tr>
<td>Roraima (RR)</td>
<td>13.2%</td>
<td>14.0%</td>
<td>14.4%</td>
<td>15.4%</td>
<td>16.9%</td>
</tr>
<tr>
<td>Maranhão (MA)</td>
<td>12.0%</td>
<td>14.3%</td>
<td>14.9%</td>
<td>15.9%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Piauí (PI)</td>
<td>6.1%</td>
<td>7.9%</td>
<td>7.5%</td>
<td>7.0%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Minas Gerais (MG)</td>
<td>0.003%</td>
<td>5.2%</td>
<td>6.0%</td>
<td>4.1%</td>
<td>0.014%</td>
</tr>
<tr>
<td>Paraná (PR)</td>
<td>4.2%</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.4%</td>
<td>4.9%</td>
</tr>
<tr>
<td>São Paulo (SP)</td>
<td>0.003%</td>
<td>2.5%</td>
<td>2.5%</td>
<td>2.6%</td>
<td>0.003%</td>
</tr>
<tr>
<td>Santa Catarina (SC)</td>
<td>2.0%</td>
<td>0.13%</td>
<td>0.12%</td>
<td>0.14%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Mato Grosso (MT)</td>
<td>0.5%</td>
<td>0.005%</td>
<td>0.005%</td>
<td>0.01%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Goiás (GO)</td>
<td>0.07%</td>
<td>0.001%</td>
<td>0.001%</td>
<td>0.00%</td>
<td>0.103%</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2023).

The decline in fish production in Rondônia in 2019 may be attributed to various factors, including health and marketing issues. However, other factors may also have contributed to this reduction, such as the increase in production costs due to the pandemic period. This increase influenced the prices of basic inputs for fish feed, making the product more expensive and harming the performance of the fish. Another point is the lack of definitive environmental regulation, and reduced bureaucracy in accessing licenses, in addition to the difficulties in processing and transporting production (Meante & Dória, 2017; Neves et al., 2018; Peixe BR, 2019; 2020; 2021).

Investments in the fish production sector, particularly in Paraná, launched the South region as the leader in fish production in the country (Peixe BR, 2018), although not with tambaqui, factors such as the presence of a well-established production chain structure, advanced environmental legislation, strategic location, good transport infrastructure and fishing industries that help add value to the product can justify Paraná's growing participation in tambaqui production, although still small (Barroso et al., 2018; Governo do Estado do Paraná, 2022).
An additional noteworthy factor is the increased research investment by the Brazilian Agricultural Research Corporation (EMBRAPA), for example, genetic improvement, which helps to reduce mortality in young forms, enables greater resistance to diseases, increased rates of growth and inevitably increased production (Peixe BR, 2018; 2019).

Regarding the municipalities leading tambaqui production in Brazil, those in the Northern region, such as Ariquemes-RO (leader in the production in recent years), Cujubim-RO, Almas-TO, Amajari-RR and Paragominas-PA. Rio Crespo-RO, despite appearing in third position in 2017, was unable to maintain its ranking among the five largest producers from 2018 to 2021. Similarly, Alto Alegre-RR only appeared among the five largest producers in 2021 (Figure 1).

Figure 1. Production of the five municipalities that produced the most tambaqui in each year in Brazil from 2017 to 2021 in tons. Source: Prepared by the authors (2023).

![Figure 1](image)

During the period from 2017 to 2021, Cujubim experienced the most significant decline in production among the municipalities studied, dropping from 21% in 2017 to 13% in 2021. Ariquemes also showed a drop in production, mainly from 2018 to 2020, but showed growth to these years in 2021. Amajari on the other hand, managed to increase its production and keep it constant until 2021 (Table 4).

### Table 4. Percentage of tambaqui production by Brazilian municipality in the five years (2017 to 2021).

<table>
<thead>
<tr>
<th>Municipality</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ariquemes (RO)</td>
<td>48%</td>
<td>38%</td>
<td>37%</td>
<td>36%</td>
<td>48%</td>
</tr>
<tr>
<td>Cujubim (RO)</td>
<td>21%</td>
<td>16%</td>
<td>17%</td>
<td>17%</td>
<td>13%</td>
</tr>
<tr>
<td>Almas (TO)</td>
<td>17%</td>
<td>17%</td>
<td>16%</td>
<td>16%</td>
<td>20%</td>
</tr>
<tr>
<td>Amajari (RR)</td>
<td>14%</td>
<td>16%</td>
<td>17%</td>
<td>17%</td>
<td>20%</td>
</tr>
<tr>
<td>Paragominas (PA)</td>
<td>0%</td>
<td>13%</td>
<td>13%</td>
<td>13%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors (2023).
The city of Ariquemes has been a notable figure in fish production, especially tambaqui for at least nine years, maintaining its position as the leading producer of this species since 2014 (Sobral et al., 2020; IBGE Sidra, 2023). This achievement is acknowledged in the Peixe BR yearbooks. The Rondônia Government (2019) attributes the sustained dominance of the state, and thus Ariquemes city, in the top position of Brazilian tambaqui producers, to the emergence of large enterprises. These enterprises have successfully enhanced their production efficiency and possess superior administrative and financial capabilities, facilitating the development of the sector.

Meante (2020) identifies various contributing factors to the advancement of fish farming in Rondônia and Ariquemes, including favorable climatic conditions, ample water resources, specialized legislation, access to rural credit, and the proximity to Amazonas, a significant consumer market for fish in Brazil.

In the case of Amajari, several factors may have influenced the increase in production and its maintenance. These included a rise in fish consumption, mitigation of climate and health-related challenges, increased attention and support from governmental bodies to foster the industry, and adjustments in fish pricing. These pricing adjustments have empowered fish farmers with greater investment opportunities in new technologies and product diversification, which guarantees these producers greater added value to the product (Peixe BR, 2019; 2020; 2021).

4 CONCLUSIONS

From 2017 to 2021, the North region emerged as the primary tambaqui producer in Brazil, with notable cities within the region, notably Ariquemes, leading the production. Tambaqui exhibits significant potential for growth within the Brazilian production chain, mainly due to the increase in production in other regions in recent years, as occurred in the South region. Concerning the states, Rondônia was the largest producer of tambaqui in recent years. Therefore, the cultivation of this native species presents several positive zootechnical characteristics for its commercialization. However, public policies that intensify its production are fundamental for the success of the activity.

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