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DO CAMPO À MESA: CULTIVO TRADICIONAL DO "ARROZ DO BARRO", PRÁTICAS ALIMENTARES E SEGURANÇA ALIMENTAR EM UMA COMUNIDADE DO MARANHÃO

FROM FIELD TO TABLE: TRADITIONAL "ARROZ DO BARRO" CULTIVATION, FOOD PRACTICES, AND FOOD SECURITY IN A COMMUNITY IN MARANHÃO

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Resumo

O arroz (*Oryza sativa* L.) constitui um dos principais cereais destinados à alimentação humana, e seu cultivo, especialmente em sistemas tradicionais, pode envolver dimensões produtivas, alimentares, econômicas e culturais associadas aos modos de vida das comunidades produtoras. Nesse contexto, práticas de cultivo, formas de uso e conhecimentos relacionados ao arroz podem ser transmitidos entre gerações e integrar as estratégias de produção e alimentação das famílias. O objetivo desta pesquisa foi investigar a importância produtiva, alimentar, econômica e cultural do "Arroz do Barro", sua disponibilidade sazonal, formas de acesso e relação percebida com a segurança alimentar dos domicílios avaliados. Realizou-se estudo exploratório, descritivo e transversal, entre 2024 e 2025, na comunidade Barreira Velha, Barreirinhas, Maranhão, Brasil, com agricultores, pertencentes a domicílios distintos, selecionados de forma não probabilística. Foram coletadas informações sociodemográficas e sobre produção, manejo, disponibilidade, destinação e comercialização do arroz, além da aplicação da Escala Brasileira de Insegurança Alimentar (EBIA). O cultivo apresentou ciclo anual; a produção foi destinada ao consumo familiar, à comercialização, à reserva de sementes e às trocas por outros alimentos. Os agricultores relataram conhecimentos e práticas associados ao cultivo transmitidos entre gerações, bem como importância alimentar, econômica e cultural atribuída ao "Arroz do Barro". Também foram relatadas mudanças no sistema produtivo, como redução da disponibilidade de sementes tradicionalmente utilizadas, dificuldades relacionadas à mão de obra e uso de fertilizantes químicos. Conclui-se que, entre os agricultores investigados, o "Arroz do Barro" integra práticas produtivas e alimentares locais e apresenta importância econômica e cultural, configurando-se como um sistema produtivo tradicional em transformação.

Palavras-chave: Arroz; Agricultura; Segurança Alimentar.

Abstract

Rice (*Oryza sativa* L.) is one of the major cereals used for human consumption, and its cultivation, particularly in traditional systems, encompasses productive, dietary, economic, and cultural dimensions associated with the ways of life of farming communities. In this context, cultivation practices, forms of use, and knowledge related to rice may be transmitted across generations and incorporated into household production and food strategies. This study aimed to investigate the productive, dietary, economic, and cultural importance of the locally designated "Arroz do Barro" rice, its seasonal availability, means of access, and perceived relationship with household food security. An exploratory, descriptive, cross-sectional study was conducted between 2024 and 2025 in the community of Barreira Velha, Barreirinhas, Maranhão, Brazil, involving farmers from different households who were selected using a nonprobability sampling approach. Sociodemographic information and data on rice production, management, availability, allocation, and commercialization were collected, and the Brazilian Food Insecurity Scale (EBIA) was administered. Rice cultivation followed an annual cycle, and production was allocated to household consumption, commercialization, seed reserves, and exchange for other foods. Farmers reported intergenerational transmission of knowledge and practices associated with cultivation, as well as the dietary, economic, and cultural significance attributed to "Arroz do Barro." Changes in the production system were also reported, including reduced availability of traditionally used seeds, labor-related difficulties, and the use of chemical fertilizers. The study concludes that, among the farmers investigated, "Arroz do Barro" is essential to local production and dietary practices, possessing both economic and cultural significance. It represents a traditional production system that is currently undergoing transformation.

Keywords: Rice; Agriculture; Food Security.

Resumen

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El arroz (*Oryza sativa* L.) es uno de los principales cereales utilizados para el consumo humano, y su cultivo, especialmente en sistemas tradicionales, puede involucrar dimensiones productivas, alimentarias, económicas y culturales asociadas con los estilos de vida de las comunidades productoras. En este contexto, las prácticas de cultivo, las formas de uso y el conocimiento relacionado con el arroz pueden transmitirse entre generaciones e integrar las estrategias de producción y alimentación de las familias. El objetivo de esta investigación fue indagar la importancia productiva, alimentaria, económica y cultural del "Arroz do Barro", su disponibilidad estacional, formas de acceso y la relación percibida con la seguridad alimentaria de los hogares evaluados. Se realizó un estudio exploratorio, descriptivo y transversal entre 2024 y 2025 en la comunidad de Barreira Velha, Barreirinhas, Maranhão, Brasil, con agricultores pertenecientes a diferentes hogares, seleccionados no probabilísticamente. Se recopiló información sociodemográfica e información sobre la producción, manejo, disponibilidad, destino y comercialización del arroz, además de la aplicación de la Escala Brasileña de Inseguridad Alimentaria (EBIA). El cultivo presentaba un ciclo anual; la producción estaba destinada al consumo familiar, la comercialización, la reserva de semillas y el intercambio por otros alimentos. Los agricultores informaron sobre conocimientos y prácticas asociadas al cultivo transmitidos de generación en generación, así como sobre la importancia nutricional, económica y cultural atribuida al arroz de barro. También se reportaron cambios en el sistema de producción, como la menor disponibilidad de semillas de uso tradicional, dificultades relacionadas con la mano de obra y el uso de fertilizantes químicos. Se concluye que, entre los agricultores investigados, el arroz de barro integra prácticas productivas y alimentarias locales y presenta importancia económica y cultural, configurándose como un sistema productivo tradicional en transformación.

Palabras clave: Arroz; Agricultura; Seguridad alimentaria.

1. Introduction

Rice (*Oryza sativa* L.) is a cereal of major global importance and serves as the staple food for more than half of the world's population. Rice cultivation is widespread throughout Brazil. In Maranhão, rice is a staple component of main meals and is widely used in a variety of local recipes (CONAB, 2015; Wander, Silva, and Ferreira, 2021).

In 2021, Brazil ranked among the world's ten largest producers of paddy rice, with production of approximately 11.7 million metric tons (FAO, 2023). Between 2015 and 2018, Brazil produced an average of 11.6 million metric tons of paddy rice. Among Brazil's five major geographic regions, the South was the country's leading rice-producing region, while Maranhão was the largest producer in the Northeast. Rice is cultivated using two main systems: irrigated and upland rice, the latter formerly known as rainfed rice. Various cultivation techniques and production arrangements are used within these systems. In Maranhão, these include upland cultivation using the traditional slash-and-burn system; mechanized upland cultivation; continuous flooding; intermittent irrigation; and flood-recession cultivation without water control,

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with more than one transplanting sometimes occurring during the crop cycle (Wander, Silva, & Ferreira, 2021).

Rice is notable for its high nutritional value, as it is a source of carbohydrates, primarily starch, as well as protein and minerals such as phosphorus, iron, and calcium, in addition to B-complex vitamins. The proteins found in rice are distributed throughout the grain, contributing to its high nutritional value and facilitating digestion (Sousa, 2019).

The cultivation of “Arroz do Barro” is a traditional practice deeply rooted in communities throughout the municipality of Barreirinhas, Maranhão, Brazil, where it plays an important role in food security and the livelihoods of numerous families. The term “Arroz do Barro” is a local and culturally specific designation used by farmers in Barreirinhas to refer to rice produced using traditional cultivation practices in the region. The term does not refer to a specific variety or cultivar based on formal agronomic identification; rather, it refers to the way in which this type of rice is locally recognized and named. Its use in this study is intended to preserve the terminology used by the farmers themselves and its connection to the community’s sociocultural and productive context.

This traditionally cultivated rice, adapted to the unique conditions of Maranhão’s floodplain environment, not only provides a staple food for local communities but also plays a significant role in preserving the region’s biodiversity and aquatic ecosystems. However, despite its cultural and ecological significance, the cultivation of “Arroz do Barro” faces several challenges, including the loss of cultivated areas due to urbanization, climate change, and a declining interest in its cultivation. In addition, the limited recognition and appreciation of “Arroz do Barro” has contributed to its gradual replacement by commercial varieties, which are often less adapted to the local environment and less resilient to environmental challenges.

Furthermore, changes in the local environment may contribute to a lack of knowledge about the economic and nutritional properties of regional foods, potentially resulting in decreased consumption and reduced use of these foods in the production of culturally and nutritionally significant products. Moreover, despite cultivating a highly

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nutritious food, numerous families have abandoned both its cultivation and consumption as a result of changes associated with industrialization, as well as changes in the daily routines of the community and its residents.

Against this backdrop, this study aimed to investigate the productive, dietary, economic, and cultural importance of “Arroz do Barro,” its seasonal availability, means of access, and perceived relationship with household food security.

2. Method

This was an exploratory, descriptive, cross-sectional study conducted with farmers involved in the cultivation of “Arroz do Barro” in the community of Barreira Velha, Barreirinhas, Maranhão, Brazil, over a 12-month period (September 2024 to August 2025). Barreirinhas is a city in the northern region of Maranhão, within the Lençóis Maranhenses area, covering 3,046.308 km², with 65,589 inhabitants and a population density of 21.53 inhabitants per square kilometer (IBGE, 2022). The region’s per capita Gross Domestic Product (GDP) was BRL 9,951.26 (IBGE, 2021), and the municipality’s Municipal Human Development Index (MHDI) was 0.570 (IBGE, 2022).

The study sample consisted of four family farmers from the community under study, selected using nonprobability convenience and purposive sampling methods. The inclusion criteria were residence in the community, being aged 18 years or older, actively involved in the cultivation of “Arroz do Barro,” available to participate during the data-collection period, and willing to participate in the study. Participation was voluntary, and all participants provided informed consent by signing the Informed Consent Form (ICF). The exclusion criteria consisted of farmers who declined to participate, failed to complete the study instruments, or did not sign the ICF.

In the community under study, the traditional cultivation of “Arroz do Barro” continues to be practiced by a small number of farmers, although more farmers are actively engaged in the practice than were included in this study. No prior census was conducted to identify all such farmers; therefore, it was not possible to precisely

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determine the total population of active producers during the study period.

Thus, the four participants do not represent all farmers who maintain this production practice, and the findings should be understood as reflecting the experiences and characteristics of the farmers investigated, without any claim to statistical representativeness of the community's farming population.

Data were collected using semistructured forms in face-to-face interviews conducted after obtaining formal and voluntary consent from the participants. The interviews were conducted in 2025 at the participants' homes. All interviews were conducted by the same researcher to ensure consistency in the administration of the instruments and recording of responses.

The first form included questions addressing sociodemographic and socioeconomic characteristics (name, sex, age, date of birth, place of birth, skin color, marital status, educational attainment, telephone number, number of children, current occupation, and household composition), as well as questions concerning the cultivation practices used for "Arroz do Barro," including soil conservation, use of water resources, and local biodiversity. Questions about food consumption were also included to assess the importance and role of "Arroz do Barro" in the diet of the community. This data-collection form was developed by the researchers specifically for the purposes of this study. The instrument was administered individually to the farmers in an interview format and took approximately 40 minutes to complete. Responses were recorded manually by the interviewer during the administration of the questionnaire. Because this instrument was developed specifically for this investigation, no formal expert review, pretesting, or pilot testing was conducted.

The questions include in the form were:

a) What are the main conditions that most influence the cultivation of "Arroz do Barro"?;
b) How is the soil prepared for the cultivation of "Arroz do Barro"?;
c) How are water resources used for the cultivation of "Arroz do Barro"?;
d) What is the investment required for planting and harvesting "Arroz do Barro"?;

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e) What financial return is obtained from the sale of “Arroz do Barro”?;
f) How is “Arroz do Barro” commercialized in the municipality of Barreirinhas, Maranhão?;
g) What cultivation methods are used for “Arroz do Barro”?;
h) How are seeds selected for planting “Arroz do Barro”?;
i) What is the best time of year to begin planting?;
j) What is the average quantity, in kilograms, of “Arroz do Barro” obtained in a single harvest?;
k) How long does it take before “Arroz do Barro” can be harvested?;
l) How is “Arroz do Barro” processed after harvesting?;
m) Do you know how long “Arroz do Barro” remains suitable for consumption after harvesting?;
n) What criteria are used to select the planting site for “Arroz do Barro”?;
o) Do you know what the environmental impacts are of planting and harvesting “Arroz do Barro”?;
p) How does knowledge about the cultivation of “Arroz do Barro” pass from one generation to another?;
q) How long has the tradition of rice production existed in this location?;
r) How frequently do you and your family consume this rice?; and
s) Are there days when this is the only rice available for you and your family to consume?

For the purposes of this study, access to “Arroz do Barro” was operationally defined and restricted to the ways in which the product is obtained and circulates among farmers and their households, including household consumption, exchanges, and sale. Broader dimensions of physical and economic access, such as distance to points of sale, availability in markets, price variation, and geographic or economic barriers, were not included in this assessment.

The second instrument administered was the Brazilian Food Insecurity Scale (EBIA), which classifies households as food secure or experiencing mild, moderate, or severe food insecurity, with specific scoring criteria according to the presence or

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absence of children under 18 years of age (Pérez-Escamilla *et al.,* 2004; Pérez-Escamilla & Segall-Correa, 2008; Segall-Correa & Marin-Leon, 2009). The households were assessed, and only one participant from each household completed the EBIA; this participant was responsible for food acquisition or preparation.

Based on the study by Segall-Correa and Marin-Leon (2009), the scale assigns one point for each affirmative response. Households with a score of zero are classified as having food and nutrition security (FNS). Food and nutrition insecurity (FNI) scores vary according to the presence of household members under 18 years of age. In this study, because all households assessed included members under 18 years of age, the following score ranges were used for classification: 1–5 points, mild food insecurity; 6–10 points, moderate food insecurity; and 11–15 points, severe food insecurity. The interviewers received training in the administration of the scale. The EBIA was administered in a private setting within the participant's home, without interference from other individuals, and there were no missing responses.

Following data collection, the data were entered into Microsoft Office Excel® 2016 and stored in a database for comparison and correction, when necessary. Categorical variables were described using absolute and relative frequencies.

Responses to the open-ended questions were analyzed descriptively, based on the responses provided by the four participating farmers, each from a different household. Following data collection, the responses recorded in the research instrument were individually reviewed and organized according to the topics previously addressed in the interview guide.

Initially, all responses from each participant were read in full, followed by systematization of the information according to the topics investigated. Subsequently, convergent and distinctive aspects of the participants' responses were identified and descriptively synthesized for presentation of the findings.

Considering the exploratory nature of the study, the small number of participants, and the type of information collected, no formal qualitative analysis technique involving coding or the construction of analytical categories was employed. The open-ended responses were used as complementary information to the

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quantitative data to contextualize and enhance understanding of the characteristics of “Arroz do Barro” cultivation among the participating farmers.

Furthermore, because the open-ended responses were descriptively systematized rather than subjected to discourse-based qualitative analysis, the findings were presented in aggregate and narrative form, without the use of excerpts from individual participants’ statements.

This study was part of a larger research project entitled “Arroz do Barro Project: Nutritional, Technological, and Microbiological Profile, Product Development, and Sensory Acceptability,” which was submitted to and approved by the Research Ethics Committee of Hospital Carlos Macieira in accordance with Resolution No. 466 of December 12, 2012, of the Brazilian National Health Council, and its complementary provisions governing research involving human participants, under approval No. 5,816,098, dated December 14, 2022. The parent study is also registered with the National System for the Management of Genetic Heritage and Associated Traditional Knowledge (SisGen), under registration No. AC38471, in connection with activities involving access to genetic heritage and associated traditional knowledge covered by the project. The present study component was descriptive and exploratory in nature and did not involve access to associated traditional knowledge as defined under Law No. 13,123/2015.

3. Results and Discussion

Four farmers from four distinct households were interviewed in 2025. Two were men and two were women, raging in age from 41 to 74 years. The two female farmers self-identified as Pardo, while the two male farmers self-identified as Black. Regarding marital status, two participants were married (50%), one was divorced (25%), and one was widowed (25%). Two farmers had completed high school (50%), one had incomplete elementary school (25%), and one was illiterate (25%). Monthly household income ranged from one minimum wage (BRL 1,518.00) to BRL 6,000.00, and household size ranged from three to seven people.

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The production of “Arroz do Barro” has been a traditional practice in the village of Barreira Velha for more than a century and is not limited to this location. This tradition is also maintained in several other villages in the municipality of Barreirinhas, including Santa Rita, Formiga, Santa Cruz, Baixão dos Júlios, Andiroba, and Palmeira dos Ferreira, where production practices and investments show similarities, including the exchange of labor and services. Many families do not allocate their production to sale, limiting its use to household consumption. By contrast, some families use their production for multiple purposes, including sale, household consumption, exchange for other foods, and, in some cases, as their primary source of employment and income.

The interviews conducted with farmers from the Barreira Velha community revealed that the cultivation of “Arroz do Barro” extends beyond its dietary dimension, constituting a central element of the community’s cultural and social identity. More than simply a food present in families’ daily lives, this rice represents tradition, memory, and a sense of belonging that has been transmitted from one generation to the next. Farmers reported that knowledge related to planting, crop management, and harvesting is acquired from childhood, passed down from grandparents to parents and from parents to children. In some families, cultivation practices date back more than 40 years, while in others they have continued for more than a century.

From a comparative perspective, studies conducted in other regions of Brazil have documented different forms of rice production organization. In the state of Pará, for example, the Bujaru Farmers’ Association (Associação Bujaruense dos Agricultores e Agricultoras, ABAA) initially operated solely as a rice-processing organization; over time, however, it became a reference in solidarity economy, agroforestry production systems, social inclusion, and income generation, among other areas (Silva *et al*., 2023). In Santa Catarina, traditional production of upland rice is also observed, with cultivation based on seed selection, which contributes to household food security in the region. Although production is lower than that of irrigated rice, this practice continues to support economic viability and the preservation of local cultural traditions (Pinto *et al*., 2018).

According to the farmers, the cultivation process for “Arroz do Barro” includes

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the selection of seeds for planting, based on characteristics observed by the producers themselves, such as seed size and the height of the plants from which the seeds were obtained. These criteria form part of the management practices reported by the participants and reflect knowledge developed through their experience with cultivation. However, no varietal identification or agronomic, botanical, or genetic characterization of the seeds used was conducted, nor were their local names systematically recorded. Therefore, the findings allow the seed-selection criteria used by the farmers to be described but do not support classification of the seeds as varieties, cultivars, or other genetically distinct groups.

The interviewed farmers reported that the most suitable period for beginning the cultivation of “Arroz do Barro” corresponds to the transition between the dry and rainy seasons, generally between May and July. Within this period, June was identified as the most favorable month for cultivation. One participant reported having conducted trials in which planting was initiated exclusively during the rainy season and, on another occasion, exclusively during the dry season; however, neither attempt was successful. These findings are consistent with the collective perception that the period between May and June, in areas with naturally waterlogged soils and influenced by the river’s tidal dynamics, is the most suitable period for production.

According to the interviewed farmers, tidal dynamics play an important role in supplying water to areas used for “Arroz do Barro” cultivation and are incorporated into crop management without the use of conventional irrigation systems. Participants reported organizing certain cultivation practices according to local conditions and water dynamics, indicating knowledge developed through experience with the environment and the production activity. However, the present study did not conduct a hydrological characterization of the cultivation areas, and parameters such as the frequency and duration of flooding, salinity, drainage conditions, seasonal variations in water level, or climate-related risks were not assessed. Therefore, based on the data obtained, it is not possible to establish the effects of these conditions on the productivity or environmental sustainability of the system.

Before the cultivation cycle begins, the farmers emphasized that the initial

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investment is a determining factor in ensuring a satisfactory harvest. This investment, however, may vary depending on the expected yield. Expenditure on fertilizer, for example, ranges from BRL 700.00 to BRL 1,300.00, an amount sufficient to fertilize one to two rows, each measuring approximately 50 × 40 m (2,000 m²). Considering inputs and other additional costs, the investment per row may reach BRL 1,500.00. These figures should be interpreted as estimates provided by the farmers to characterize the production context investigated; no accounting analysis or systematic assessment of the components of production costs was conducted.

In some families, factors such as health-related limitations or other demands affecting labor availability may result in the need to hire workers, whose daily rate, according to the participants, may reach BRL 50.00. Another form of work organization reported by the farmers is the so-called “exchange of labor and services,” in which farmers assist one another with agricultural activities carried out on other producers’ land and may subsequently receive assistance with their own activities, particularly during periods of increased labor demand, such as harvesting. According to the interviewees, this practice constitutes an alternative means of mobilizing labor and may reduce the need for paid labor during certain stages of cultivation.

However, the present study did not systematically investigate the rules governing this practice, the degree of reciprocity among participants, possible asymmetries in exchange relationships, or the conditions under which families with limited labor availability participate. Thus, although the “exchange of labor and services” constitutes a form of community-based work organization identified in the study context, its economic and social effects cannot be established based on the data obtained.

Furthermore, according to the farmers, preparation of the area for “Arroz do Barro” cultivation involves several management steps. Initially, the vegetation present in the area is manually cut, and the resulting plant material is either left in place or incorporated into the soil and, according to the participants, used as a form of natural fertilization. However, this study did not include soil analyses that would allow the effects of this practice on soil fertility or conservation to be assessed. In parallel with

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area preparation, the seeds are soaked in water for approximately two days and subsequently kept in a covered area for an additional two days. According to the farmers, this stage takes place concurrently with the second clearing of the land.

After approximately one month of initial growth, the seedlings are transplanted, according to the farmers, to the previously prepared permanent cultivation area. In this procedure, the seedlings are grouped into sets of approximately three plants and spaced approximately 30 cm apart. This description corresponds to the management practices reported by the participants; their effects on soil characteristics, vegetation cover, or crop productivity were not assessed. Approximately 15 days after transplanting, the farmers reported applying a chemical fertilizer locally referred to as “18×18.” According to the interviewees, a single application is sufficient to meet the crop’s requirements for approximately four months. No systematic information was obtained regarding the product’s exact composition, application rate, treated area, or agronomic recommendation. Periodic vegetation management practices, in turn, are maintained throughout the production cycle.

The reported use of chemical fertilizer in the cultivation system warrants attention, particularly considering the lack of detailed information in this study regarding its composition, application rate, and conditions of use. These factors limit any assessment of the agronomic suitability or potential environmental implications of its use and underscore the need for specific studies addressing input management in this production system.

One of the interviewed farmers also reported conducting preliminary soil tests before planting as a strategy to ensure the viability of the crop and prevent future losses.

Some practices reported by the farmers, such as use of local vegetation in area management and adapting cultivation to local environmental conditions, share similarities with agroecological principles as far as they incorporate resources available within the environment itself and knowledge related to local production conditions. However, the system also involves practices such as vegetation clearing, changes in cultivation areas, and, in some cases, the use of chemical fertilizer, whose

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environmental implications were not assessed in this study. Therefore, although certain aspects of “Arroz do Barro” cultivation may converge with agroecological principles, the system as a whole cannot be characterized as agroecological or environmentally sustainable without a specific assessment of its practices and their respective environmental impacts.

According to the farmers, the production cycle of “Arroz do Barro” extends for approximately four months after planting, when harvesting takes place (August to November). After this stage, the plants are transported to a dry, well-ventilated area, where they remain during the drying process and are turned over daily. The grains are subsequently separated manually by striking the plants with wooden sticks. The rice is then placed in bags, processed using equipment locally known as a “piladeira,” a small-scale rice-processing machine used to remove the husk and polish the grains, and subsequently stored. It should be noted that the present study did not assess parameters such as grain moisture content, physicochemical or microbiological conditions, the occurrence of insects or other contaminants, or losses during drying, processing, or storage. Therefore, this description reflects the practices reported by the farmers and does not allow inferences to be made regarding their effects on the nutritional or sanitary quality of the product.

“Arroz do Barro” is cultivated in an annual production cycle. According to the farmers, one row of cultivation corresponds locally to an area of approximately 50 × 40 m, equivalent to approximately 2,000 m² or 0.20 ha. This equivalence represents the reference used by the farmers investigated and should not be interpreted as a standardized measurement applicable to other locations. Each line can produce between 40 and 70 “paneiros” (traditional baskets used locally as a unit of measurement for harvested rice) per cycle. Each of these baskets contains approximately 20 kg and, according to the local unit of sale, three “paneiros” correspond to a bag of approximately 60 kg. The sale price reported by the participants was approximately BRL 440.00 per bag. These figures are estimates reported by the farmers and should be interpreted as a descriptive characterization of production and commercialization in the context investigated. Gross revenue or net income was not

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estimated because systematic information was not obtained on losses, household consumption, exchanges, donations, or the volume actually sold.

Rice is marketed through different channels, including direct sales in the town center and sales by pre-order. However, farmers face difficulties related to appropriate packaging due to the lack of suitable equipment, which may limit the product's shelf life and market appeal. When immediate financial returns are not available, some families resort to exchanging rice for other foods or consuming it themselves, reinforcing the role of this cereal as an important food resource for local food security.

Figure 1 presents the main stages of the production process reported by the farmers, from seed selection to the allocation of rice for sale or household consumption.

Although no direct questions were asked about this issue, the interviewed farmers did not report a rigid division of production activities by sex. Men and women reported participating in the different stages of "Arroz do Barro" cultivation, including area preparation, planting, crop management, and harvesting. This finding indicates that, within the group investigated, both sexes participate in productive activities. In family farming units, men and women may participate in productive activities while still differing in terms of the roles they perform, their autonomy in managing resources, and their domestic and caregiving responsibilities (Grimm & De Oliveira Estevam, 2022). However, given the small number of participants and the fact that the study was not specifically designed to analyze gender relations or the division of labor, this finding should be interpreted descriptively and cannot be generalized to the community as a whole.

This production system integrates knowledge and practices traditionally employed by farmers with different forms of use of "Arroz do Barro." The allocation of production to household consumption, sale, seed reserves, and exchange for other foods demonstrates the integration of cultivation into the participants' food and economic strategies. In this context, farmers attribute importance to "Arroz do Barro" that extends beyond its commercial dimension, associating it with household food supply, local production practices, and the continuity of knowledge related to its

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cultivation.

According to the interviewed farmers, many families have reduced their production of “Arroz do Barro” over the years. Among the factors identified by the participants was the departure of young people from the community in search of employment and other opportunities in the municipal seat of Barreirinhas, Maranhão, or in other municipalities. In the farmers’ perception, this migration reduces the availability of family labor for cultivation-related activities. However, the present study did not directly investigate young or former producers and therefore cannot establish a causal relationship between youth migration and the reported reduction in production. Intergenerational approach studies are necessary to understand the factors associated with young people’s decisions to remain in or leave the community and their potential implications for generational succession and the continuity of this agricultural practice.

Figure 1. Stages of “Arroz do Barro” production in Barreira Velha, Barreirinhas, Maranhão, Brazil, 2025.



Source: Prepared by the authors based on the study data; visual elements generated

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with the assistance of artificial intelligence (OpenAI, 2026).

Thus, the findings indicate that “Arroz do Barro” cultivation has economic and food-related importance for the farmers investigated, with production allocated both to household consumption and, in certain circumstances, to sale. Participants reported costs primarily associated with the purchase of inputs and, when necessary, the hiring of labor, while some activities are performed by family members themselves or through the local practice of “exchange of labor and services.” However, the data obtained do not allow the economic viability of the activity to be established, as the volume actually commercialized, losses, the share allocated to household consumption and exchanges, the value of unpaid family labor, opportunity costs, and total production costs were not systematically measured. Accordingly, the production, cost, and sale figures presented in this study should be interpreted as descriptive information provided by the farmers rather than as indicators of profitability or economic viability of the production system.

Regarding storage time, the farmers reported that “Arroz do Barro” can be stored until the year following harvest. This information reflects the experience reported by the participants, as no parameters related to storage conditions, moisture content, type of packaging or container used, or losses occurring during this period were assessed. Therefore, the reported storage period should not be interpreted as a technical determination of the product’s shelf life or expiration date.

In addition to social and production-related challenges, the interviewed farmers reported perceiving environmental changes over time in the areas where they carry out their activities. The changes mentioned include a reduction in areas of natural vegetation, decreased availability of fish and shrimp, and a decline in the occurrence of buriti palms (*Mauritia flexuosa*). This information should be interpreted as the perceptions of the participating farmers regarding changes in the environment and production system, as the present study did not conduct ecological assessments that could confirm the occurrence, magnitude, or causes of these changes. Nevertheless, the farmers’ reports highlight issues relevant to understanding perceived changes in the local environment and point to the need for specific environmental studies

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assessing aspects such as changes in land cover and land use, vegetation, biodiversity, and the availability of aquatic resources.

The farmers also reported a decline in the availability of rice seeds traditionally used in the community. Although the study did not identify the local names of these rice types or conduct agronomic or genetic characterization, the reported decline in the availability of traditionally used rice seeds is relevant to understand changes in the local production system. The diversity of cultivated species and varieties is an important component of agrobiodiversity and is continuously managed by farmers through seed selection, cultivation, conservation, and exchange practices. In traditional agricultural systems, these practices may contribute to maintaining the diversity of cultivated rice types and the knowledge associated with their management (FAO, 2019; Khoury *et al.*, 2022).

The literature shows that the replacement or abandonment of traditionally cultivated varieties may result in a reduction in the agricultural diversity available within production systems. However, the magnitude and implications of this process vary across species, regions, and agricultural systems; therefore, the occurrence of genetic erosion should not be inferred solely from the perceived decline in the availability of particular rice types (Khoury *et al.*, 2022). In Brazil, local seed systems play an important role in maintaining agrobiodiversity, as farmers actively participate in the production, selection, conservation, and exchange of seeds, integrating these practices with social relationships and locally developed knowledge (Santilli, 2012).

In this context, the report by farmers in Barreira Velha of a decline in the availability of previously used seeds warrants attention, particularly because the participants also associated some of these seeds with lower requirements for chemical fertilizers. This characteristic, however, reflects the interviewees' perceptions and was not agronomically assessed in the present study. The conservation of farmer-maintained varieties may be important for local agricultural systems, as rice types cultivated and selected over time may exhibit characteristics associated with the environmental conditions, food uses, and sociocultural preferences of the communities that manage them (FAO, 2019).

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Thus, although the findings of this study do not allow varietal diversity to be characterized or the occurrence of genetic erosion to be confirmed, the perceived decline in seed availability points to the need for specific investigations into the agrobiodiversity associated with “Arroz do Barro” cultivation. Future studies could identify the local names of cultivated rice types, their agronomic characteristics, methods of acquisition, conservation, and exchange, as well as factors associated with their continued use or abandonment. Such characterization could contribute to understanding the dynamics of local agricultural diversity and inform on-farm conservation strategies, in which diversity is dynamically maintained within production systems and is directly linked to farmers’ practices and choices (FAO, 2019; Khoury *et al.*, 2022).

Among the households of the interviewed farmers, one of the four was classified as experiencing moderate food insecurity, while the remaining three were classified as food secure (Table 1). When asked about the frequency of “Arroz do Barro” consumption, all participants reported that they consume it daily when it is available. The farmers also reported that rice is not the sole food available to their households, including during periods of greater restrictions on access to food, and that it is consumed together with other foods.

Table 1. Food security status of the households investigated. Barreirinhas, Maranhão, Brazil, 2025.

Household	Presence of household members under 18 years of age	EBIA score	Classification
A	Yes	6	Moderate food insecurity
B	Yes	0	Food security
C	Yes	0	Food security

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D	Yes	0	Food security

Source: Authors, 2025.

Studies involving family farmers have highlighted that production for household consumption can form part of strategies for accessing food and contribute to maintaining dietary practices linked to local production systems, while the diversity of available foods plays an important role in an adequate and healthy diet (De Paiva; Da Silva Santos; Trad, 2024; Vaz *et al.,* 2025). In the present study, the fact that farmers reported that “Arroz do Barro,” even when consumed daily, does not constitute the family’s sole food source suggests that it forms part of a diet that also includes other foods. However, because no quantitative assessment of dietary diversity or dietary intake was conducted, it is not possible to infer the adequacy or overall quality of these families’ diets.

Taken together, the findings suggest that “Arroz do Barro” cultivation should be understood as a traditional production system undergoing transformation, in which historically developed practices and knowledge coexist with changes associated with current production conditions. Management practices associated with local water dynamics, farmers’ own criteria for seed selection, and community-based forms of labor organization remain present in the practices reported by the participants. At the same time, participants reported the use of chemical fertilizers, reduced availability of previously used seeds, difficulties related to labor availability, and perceived local environmental changes. These elements reveal a dynamic more complex than an opposition between “traditional” and “modern” or between “sustainable” and “degraded,” indicating processes of adaptation and transformation of the production system in response to different environmental, economic, and social conditions.

Thus, the continuity of “Arroz do Barro” cultivation appears to involve both the preservation of local knowledge and practices and their adaptation in response to changes experienced by farmers. However, given the exploratory nature of the study, the relationships between these transformations and their underlying causes cannot be established based on the data obtained and require specific, broader investigations.

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This study has several limitations that should be considered when interpreting the findings. First, the main limitation concerns the nonprobability convenience sampling of participating farmers, as well as the absence of a prior census that would have made it possible to determine the total number of active producers in the community. Although the participants had direct experience and were actively involved in “Arroz do Barro” cultivation, the findings should not be generalized to all local farmers. Nevertheless, given the exploratory nature of the study, the information obtained provided an opportunity to document production practices, perceptions, and experiences related to the maintenance of this traditional cultivation system.

Second, the cross-sectional design limited the ability to establish causal relationships between rice cultivation and food security indicators; only associations observed at the time of data collection could be identified. Another limitation is the use of self-reported information on production, sale, and agricultural practices, which may be subject to recall and social desirability biases. The study was also conducted on a single traditional community in the municipality of Barreirinhas and involved a small number of local farmers, further limiting the generalizability of the findings to other sociocultural and environmental contexts, which may exhibit different patterns of production, consumption, and community organization.

Finally, it was not possible to examine, at the household level, the relationship between EBIA food security classification and specific indicators related to “Arroz do Barro” cultivation, such as production volume, consumption frequency, stockpiling, and income generated through its sale, because these data were not collected in a standardized manner for this purpose.

Notwithstanding these limitations, the study has several strengths. It is a pioneering investigation of “Arroz do Barro,” a traditional production system that remains underdocumented in the scientific literature, thereby contributing to the recognition and appreciation of local knowledge. The use of the EBIA, a nationally validated instrument, was another important strength, as it enabled food security and food insecurity to be assessed in a standardized manner and facilitated comparisons with findings from other studies. Furthermore, the study integrated productive,

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socioeconomic, cultural, and dietary dimensions, providing a multidimensional perspective on the significance of “Arroz do Barro” for the group investigated. The findings reinforce the role of this traditional cultivation system not only as a source of food and income but also as an element of cultural identity and community solidarity, providing relevant evidence to inform public policies aimed at family farming, food security, and agrobiodiversity conservation.

Taken together, the findings provide a comprehensive understanding of “Arroz do Barro” cultivation as a traditional production practice that integrates food-related, economic, and cultural dimensions among the farmers investigated. Its allocation to household consumption, sale, seed reserves, and exchange for other foods demonstrates that rice forms part of different strategies for using agricultural production. The reported daily consumption of “Arroz do Barro” when available indicates its importance in the dietary practices of the participating families. Although most households were classified as food secure according to the EBIA, given the cross-sectional design, the small number of participants, and the absence of a specific assessment of the rice’s contribution to household diets, the observed food security status cannot be attributed to the cultivation or consumption of “Arroz do Barro.”

At the same time, the farmers’ reports show that this agricultural practice does not remain unchanged. The intergenerational transmission of knowledge and the maintenance of local management practices coexist with changes related to the use of chemical fertilizers, reduced availability of traditionally used seeds, labor constraints, and the departure of young people from the activity, along with environmental changes perceived by farmers. These elements support an interpretation of “Arroz do Barro” as part of a traditional production system undergoing transformation, in which continuity and change interact in response to the social, economic, productive, and environmental conditions experienced by farmers. Rather than categorizing this system as sustainable or unsustainable, the findings emphasize the need to understand how these transformations may affect the continuity of cultivation practices, the transmission of local knowledge, and the diversity of seeds used. These issues require further, more comprehensive investigation.

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4. Conclusion

The production of “Arroz do Barro” in the community of Barreira Velha, Barreirinhas, Maranhão, constitutes a traditional agricultural practice to which the farmers investigated attribute food-related, economic, and cultural importance. Its production serves multiple purposes, including household consumption, sale, seed reserves, and exchanges, demonstrating its integration into both household food supply and the productive and economic strategies of participating families.

The findings indicate, however, that this traditional production system is undergoing transformation. The continued use of local practices and knowledge related to water management, seed selection, and community-based work organization coexists with changes such as the use of chemical fertilizers, reduced availability of traditionally used seeds, labor constraints, and environmental changes perceived by the farmers. These findings should be interpreted as participants’ reports and perceptions and do not allow causal relationships to be established or conclusions to be drawn regarding environmental sustainability, economic viability, or the relationship between the production system and household food security.

Future studies involving larger numbers of farmers and communities where “Arroz do Barro” is cultivated, together with agronomic, hydrological, nutritional, microbiological, economic, and environmental assessments, may broaden understanding of the system and its transformations. Studies focused on intergenerational transmission may also help identify factors associated with the continuity of cultivation and the involvement of younger generations.

The findings also highlight aspects that may be considered in rural development and food security initiatives, including the conservation of locally used seed diversity, technical support appropriate to the characteristics of the production system, improvements in processing and storage conditions, opportunities for sale, and recognition of the knowledge associated with cultivation practices. However, priorities and intervention strategies should be defined through participatory processes

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involving the community and taking into account its needs, knowledge, and interests.

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