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# Fruit production in the Matapi Agricultural Colony and Ethnomathematics: contributions and frontiers

***Abstract:*** The research aimed to analyze fruit production as a sustainability strategy in knowledge/practice and survival in the Matapi Agricultural Colony. Using a qualitative approach and ethnographic research, techniques such as participant observation and group discussions were used. Reference is made to the studies of D'Ambrosio (2011, 2020), Mattos (2015), Mattos (2020), Mesquita (2023), among others. The narratives of Mrs. Raimundinha and her son are presented in the discussions and results, addressing the concept of Ethnomathematics in approaches with the dimensions formulated by D'Ambrosio (2011) and the affective dimension created by Mattos (2020). It is concluded that pineapple production enables dialogue and exchange between local beings, knowledge, and practices, as well as some school mathematical concepts.

***Keywords:*** Pineapple Production. Ethnomathematics. Dimensions. Frontier. Family Farming.

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**DOSSIER — HISTORY OF MATHEMATICS AND CULTURE**

## La producción frutícola en la Colonia Agrícola Matapi y la Etnomatemática: aportes y fronteras

***Resumen:*** La investigación tuvo como objetivo analizar la producción frutícola como estrategia de sostenibilidad en el conocimiento/práctica y supervivencia en la Colonia Agrícola Matapi. Con un enfoque cualitativo y de investigación etnográfica, se utilizaron técnicas como la observación participante y discusiones grupales. Se hace referencia a los estudios de D'Ambrosio (2011, 2020), Mattos (2015), Mattos (2020), Mesquita (2023), entre otros. Las narrativas de Señora Raimundinha y su hijo son traídas a colación en las discusiones y resultados, abordando el concepto de Etnomatemática en aproximaciones a las dimensiones creadas por D'Ambrosio (2011) y la dimensión afectiva creada por Mattos (2020). Se concluye que la producción de piña posibilita el diálogo y el intercambio entre los seres, saberes y prácticas locales y algunos conceptos matemáticos escolares.

***Palabras clave:*** Producción de Piña. Etnomatemáticas. Dimensiones. Fronteras. Agricultura Familiar.

## A produção de frutas na Colônia Agrícola do Matapi e Etnomatemática: contribuições e fronteiras

***Resumo:*** A pesquisa objetivou analisar a produção de frutas como estratégia de sustentabilidade no saber/fazer e de sobrevivência na Colônia Agrícola do Matapi. Com abordagem qualitativa e pesquisa do tipo etnográfico, utilizou-se técnicas como a observação participante e a roda de conversa. Recorre-se aos estudos de D'Ambrosio (2011, 2020), Mattos (2015), Mattos (2020), Mesquita (2023), entre outros. Apresentam-se as narrativas de Sra. Raimundinha e de seu filho nas discussões e resultados, abordando o conceito de etnomatemática em aproximações com as dimensões formuladas por D'Ambrosio (2011) e a dimensão afetiva criada por Mattos (2020). Conclui-se que a produção de abacaxi possibilita diálogo e troca entre os seres, saberes e fazeres locais, assim como alguns conceitos

matemáticos escolares.

***Palavras-chave:*** Produção de Abacaxi. Etnomatemática. Dimensões. Fronteiras. Agricultura Familiar.

## 1 Introduction[1]

In terms of numbers, family farming represents the majority sector of Brazilian agriculture (Schneider and Cassol, 2013). This model is supported in the rural context, reaffirming small and medium-sized territories as spaces for subsistence and income generation. Furthermore, the *family farming* category has been strengthening in recent decades, with the construction of a political identity (Picolotto, 2015), being composed of individuals who maintain agricultural practices that seek not to damage the surrounding environment.

Small associations and cooperatives have proven to be a way to combat gender exclusion, enabling joint struggles that aim at equal social opportunities and access to the productive market for members of the communities to which they belong.

Given this scenario, the research focused on survival work practices that constitute livelihoods, social improvement, cultural preservation, and combating the exclusion of any knowledge, reinforcing intellectual diversity.

The research is based on the actions of a project that began in 2022, resulting from the 2021 universal call of the National Council for Scientific and Technological Development (CNPq). It focuses on six communities, three of which are Brazilian and three Portuguese, namely: a community of small farmers in Matapi/Amapá and another in Costa da Caparica/Portugal; pottery makers from the quilombola community of Maruanum/Amapá and lace makers from a community in the municipality of Setúbal/Portugal; artisanal fishermen from a fishing community in Bragança/Pará and artisanal fishing communities in the Almada Council/Portugal.

It should be noted that the rationale for this project lies in the exchange of experiences between distinct but complementary communities located in Brazil and Portugal. It is also justified by the fact that it enables the exchange of knowledge. The project is structured in three stages: the first involves individual research in each community; the second involves pairs of communities engaging in dialogue based on affinities and similarities in their activities; and the third focuses on the integrated analysis of the six communities, encompassing knowledge, practices, and beings, which, with their intellectual productions, assist in the co-construction of new knowledge and dialogues.

This research project involved researchers from the North and Southeast regions of Brazil and a Portuguese researcher, as well as graduate students from both countries and two Brazilian scientific initiation scholarship recipients, and lasted 36 months.

The excerpt presented in this paper refers to results from the experiences of a farmer and her son with ancestral and artisanal practices in fruit production in the Matapi Agricultural Colony.

To achieve this purpose, the research aims to analyze labor activity in fruit production as a strategy for sustainability in knowledge/practice and survival for socioeconomic equity in the Matapi Agricultural Colony.

The methodological approach is qualitative and ethnographic, using techniques such as participant observation, interviews, and field diaries for recording observations made *in situ*,

[1] This article is an expansion of the paper presented as an oral communication at the IX International Seminar on Research in Mathematics Education (IX SIPEM).

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conversation circles, clarification meetings, as well as audiovisual materials — audio, videos, drawings, and photographs — and previous records produced by other researchers, when necessary.

Fruit production involves strategies for mathematizing the environment, with a view to achieving greater production at the lowest cost. This knowledge and these practices have been preserved by humans over time and also represent a way of revaluing the countryside as a supplier of plant species for the daily food of the local population. There is, therefore, great potential for it to be used as a pedagogical resource to aid in the teaching and learning of mathematical concepts in schools.

Pluriactivity (Schneider, 2003, 2009) is related to family farming through exchanges between the countryside and the city, in social and economic terms. In this sense, agricultural activities support the development of non-agricultural activities. In this study, these activities include the Pineapple Festival and the election of the Pineapple Queen, which revitalize the urban space through practices and knowledge originating in rural areas.

## 2 The Matapi Agricultural Colony and fruit production

The Matapi Agricultural Colony is located in the municipality of Porto Grande, state of Amapá (Figure 1), with access via the BR-210 (Perimetral Norte) highway.

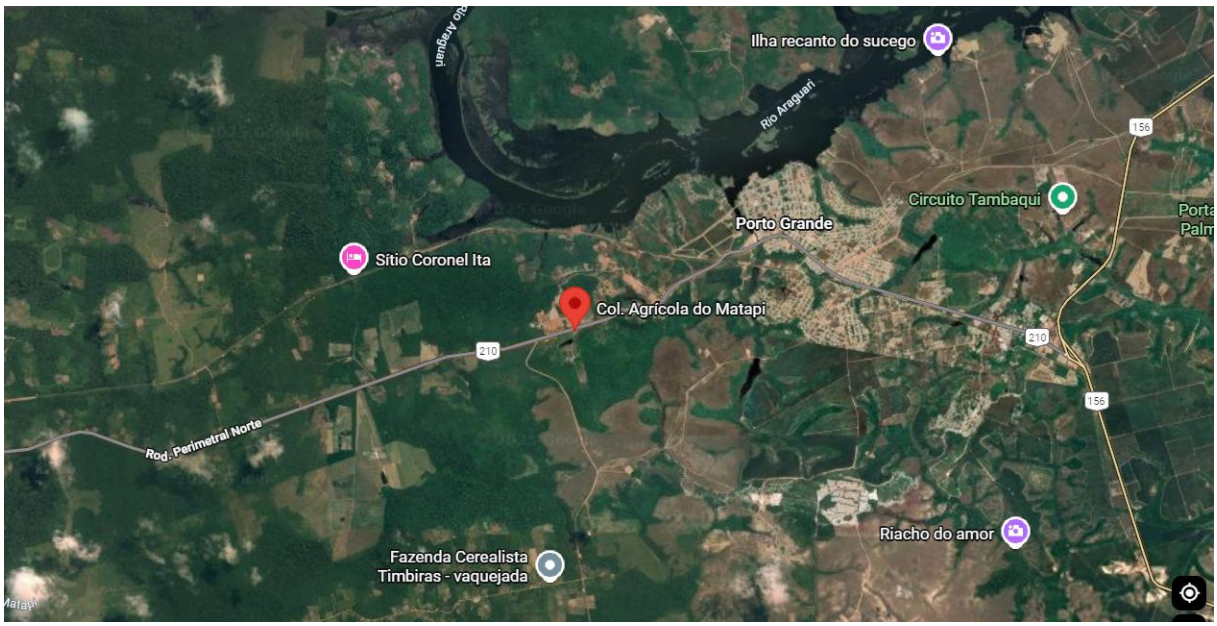


Figure 1: Map showing the location of the Matapi Agricultural Colony (Google Maps, 2025)

The Matapi Agricultural Colony is one of the largest producers of food, especially fruits and vegetables, most of which are grown by family farms, and is considered the state's main production hub. It was created during the administration of Governor Coronel Janary Gentil Nunes, with popular support for its foundation. In the 1950s, basic foods such as rice, beans, corn, sugarcane, and pumpkin were produced. In addition, pigs and chickens were raised.

There is a mixed association with the participation of women and men farmers, called *the Association of Farmers of the Matapi Agricultural Colony*, created due to the need to distribute black pepper production, and founded on May 20, 1986. Mrs. Raimundinha, a collaborator in this research, ran the entity for ten years. Currently, cocoa production, chicken farming, and pineapple irrigation are some of the projects developed by the association. The organization remains active today, and its leaders are chosen by a rotation system.

On Mrs. Raimundinha's property, as well as throughout the Agricultural Colony,

regional products such as pineapple, orange, tangerine, papaya, passion fruit, and cupuaçu are grown. Vegetables and legumes are also cultivated, including chili peppers, green onions, cucumbers, cassava, and corn. Animals such as chickens and cattle are also raised. *"You have to take it seriously because grass is very expensive",* says Mrs. Raimundinha. According to her, the flagship product of the property and the region is pineapple, but there was a sharp decline during the pandemic, which raised the price of fertilizer and exposed the lack of government subsidies. Many vegetables and legumes, because they are perishable, such as cucumbers and peppers, were lost.

As pineapple is the main fruit crop in the Porto Grande region, the *Pineapple Festival* has been held every September for the past 25 years. This event attracts large crowds, features performances by local bands, the election of the Pineapple Queen, and the preparation of foods made from the fruit. It is an incentive for local farmers and a way of promoting multiple activities in the region.

According to Schneider (2009, p. 9),

> pluri-activity tends to develop as a characteristic or a reproduction strategy of farming families living in rural areas in contexts where their connection to the market occurs through non-agricultural or para-agricultural activities. Objectively, pluri-activity refers to a phenomenon that presupposes the combination of two or more activities, one of which is agriculture.

Through these activities, the relationships between farmers and the social and economic environment have been intensified.

Regarding ways of mathematizing the environment, Mrs. Raimundinha states that she learns about fertilizer and insecticide dosages, calculations for selling and obtaining results, ways of measuring land, among other aspects. *"Farmers are very good at math. Once they learn, they can do it in their heads"*, says Mrs. Raimundinha.

At this point, it is worth clarifying that "what distinguishes everyday situations from school situations is the meaning they have for the individual, who, by solving problems, constructs logical-mathematical models appropriate to the situation" (Carraher, Schliemann and Carraher, 1995, p. 181). Therefore, learning is more effective when there is meaning in what is done on a daily basis.

Another clarification is needed, this time regarding the calculation process. Everyone has their own method of performing the mental algorithm when performing a calculation. As discussed in Mattos (2015, p. 9), these processes are important because they refer to "the ways in which we express our thoughts when faced with the need to operate with numbers in the activities we develop, perform, or participate in on a daily basis".

Given this, what we want to highlight is that a calculation strategy was developed, learned in a meaningful way, already anchored in the farmer's cognitive structure, allowing her to perform her tasks with greater agility.

## 3 Family farming and the development of multiple activities

Family farming in Brazil gained prominence in the late 1980s. It is recognized as "a social form that is recognized and legitimized in most developed countries, where the agrarian structure is mainly composed of farms in which family labor plays a decisive role" (Schneider, 2009, p. 29). Consequently, the people who work in this productive model are called family farmers, a category found in rural and countryside areas.

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In this context, family farming began to reinforce the need for specific and differentiated public policies because it involves "social groups with small tracts of land that rely primarily on family labor to carry out production processes" (Schneider, 2009, p. 32). What distinguished them at the time was their ownership of small farms. However, the technological modernization of agricultural activities led to the exclusion of some of these farmers, who were left out of the modernization process.

With the establishment of guidelines related to sustainable development, family farming

> would be characterized by the close relationship between labor and management, the management of the production process by the owners, an emphasis on productive diversification and the sustainability of resources and quality of life, the use of wage labor on a complementary basis, and immediate decision-making linked to the high degree of predictability of the production process (Schneider, 2009, p. 35).

With this understanding, it was found that the Matapi Agricultural Colony adopts the guidelines of sustainable development by planting different fruit and vegetable species, diversifying its production with a view to soil preservation and agricultural production. Considering the basic attributes — family management, ownership, and labor — family farming is understood as "that in which management, ownership, and most of the labor come from individuals who are related by blood or marriage" (Abramovay, 1997 *apud* Schneider, 2009, p. 41).

It is clear that family farming fulfills the role of supplying food to urban areas, but what remains invisible is the social divide that these family farmers face in order to continue producing, with little or no technological resources, depending on the State to meet the demands of the production process. It is reaffirmed that the social and economic role of these farmers lies in the supply of cheap, good-quality food.

Faced with this scenario and the need to diversify their sources of income, these farmers resort to multiple activities, which guarantee economic returns for both them and the state. This is a type of non-agricultural activity carried out both on and off the property. In this sense, multiple activities

> refers to social situations in which individuals who make up a family with a rural domicile begin to engage in a variety of economic and productive activities, not necessarily linked to agriculture or land cultivation, and increasingly less carried out within the production unit (Schneider, 2003, p. 100-101).

As previously mentioned, there is at least one major event in the Porto Grande region, where the Matapi Agricultural Colony is located, that exemplifies this multi-activity: the Pineapple Festival, which has been held for 25 years. During the event, there is an attraction of great importance: the selection of the Pineapple Queen, a moment eagerly awaited by all. The candidates parade in themed costumes that highlight the importance of pineapple in the region. Currently, the festival attracts tourists from all municipalities in the state of Amapá.

From this perspective, the multi-activity represented by the festival held in Porto Grande "represents a break with mono-activity and the agricultural family model, as agricultural activity no longer characterizes the reference unit" (Schneider, 2009, p. 101). Despite this understanding and the weakening of family farming, which, as already discussed, reinforces the need for state support, the Matapi Agricultural Colony continues to preserve traditional

knowledge of pineapple production.

It should be noted that Mrs. Raimundinha is interested in developing livestock farming on her property. There is still space to plant grass for animal feed, although pineapple remains the property's flagship product.

## 4 Sustainability in knowledge/practice at the Matapi Agricultural Colony

In introducing this topic, we aim to reflect on what is meant by sustainability. According to the World Commission on Environment and Development (Brasil, 1991, p. 46), "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". With this understanding, it is clear that in order to achieve sustainable development, it is important to ensure that human needs are met, both now and in the future. The concept of need refers to ensuring the basic and essential conditions for the survival of beings on the planet.

To achieve sustainable development, or eco-development, it is important to consider the five dimensions of sustainability: the social dimension, focused on building a society with equitable distribution of income and goods; the economic dimension, related to resource management and public and private investment; the ecological dimension, which aims to reduce the intensive use of natural resources from various ecosystems; the spatial dimension, which seeks a balance between urban and rural spaces; and the cultural dimension, which contemplates the inclusion of integrated agricultural systems, articulating modern and traditional knowledge (Sachs, 1993).

The wave surrounding sustainable development is based on the governability of society, established in a sustainable environmental contract. In this process, there is a preference for an ecologization of thought, according to which the autonomy of human beings, conceived as self-eco-organizing beings, is inseparable from their ecological dependence (Morin and Hulot, 2008). Thus, sustainability is understood as the preservation of both the environment and human beings, by guaranteeing their basic needs, which are essential to life on the planet.

When looking at the knowledge and practices at the Matapi Agricultural Colony, it is necessary to understand the local ecological dynamics, which involve the management, conservation, and sustainable development of cultivated species, mainly pineapple, the focus of this article. In a way, it is a revival of ancestral knowledge and practices aimed at local preservation and sustainability.

This indigenous knowledge, recognized as *ethnoknowledge*, is rich in artisanal principles, applied and disseminated over time as a way of preserving and perpetuating the culture of these farmers, passed down from generation to generation. The farmers' concern with sustainability involves not only economic survival but also subsistence, since they develop practices based on family farming.

It can be said that family farming accounts for a large part of the food that reaches Brazilian tables. According to Savoldi and Cunha (2010, p. 25), family farming has in the family the "fundamental structure for the organization of social reproduction, through the formulation of family and individual strategies (conceptual or otherwise) that directly refer to the transmission of material and cultural heritage", contributing to the maintenance of family heritage and ensuring the development of agricultural activities.

Considering that agriculture is an activity that impacts the environment by replacing natural vegetation with other vegetation that requires adaptation, it is necessary to minimize these impacts. In view of this, at the Matapi Agricultural Colony, care is taken with the amount of pesticides used for pest control, as well as special attention to soil conservation. There is also

the production of various species to minimize losses and waste, in addition to preventing soil depletion.

In Brazil, sustainable family farming represents a promising way to mitigate environmental impacts. It is understood that sustainable development in agriculture must be conceived in a dynamic way. According to Paterniani (2001, p. 303), "a dynamic concept is more appropriate and responds to the evolution and development of society", since it must consider the temporal changes of human beings, as well as the environmental relationship with agriculture. Plants are sensitive to climatic and soil variations, especially when it comes to fruit production. Because of these aspects, it is necessary to develop cultivation processes that are appropriate to the reality of Brazilian agriculture.

## 5 Ethnomathematical frontiers in the Matapi Agricultural Colony

Over time, the concept of frontier has undergone numerous transformations, traditionally related to the notion of boundaries between territories. These meanings have expanded, and today, borders are understood as elements that organize terrestrial space from a geographical point of view. However, this is not the meaning of border adopted in this study. We seek the borders of the sensible, those that permeate thought.

When thinking about the frontier of geographical thought, it is understood that this is a concept in constant transformation. In this sense, "a frontier is first and foremost a space that unfolds over time" (Resende, 2018, p. 173). This conception breaks with the idea of a frontier as a simple demarcation, bringing it closer to the notion of the sensible as something fluid and in constant change.

The frontier is understood through experience. A border that is in transformation is a becoming, a coming into being. Consequently, "a becoming is always in the middle, it can only be caught in the middle. A becoming is neither one nor two, nor a relation between two, but between two, a border or line of flight, of fall, perpendicular to the two" (Deleuze and Guattari, 1997, p. 80).

Ethnomathematical frontiers are constituted in this continuous movement of becoming, like a flow that is never the same. When looking at the community, one finds a boundary space, an in-between place (Bhabha, 1998), which strengthens identity and geographical belonging, in addition to revealing knowledge and practices, as occurs in the Matapi Agricultural Colony.

In the Ethnomathematics Program, several frontiers are identified with the activities developed in the Matapi Agricultural Colony. By frontier, we mean the point from which something becomes culturally present, a place where the knowledge of minorities dialogues with school knowledge, so that the two intertwine, as Bhabha (1998) states. It is, so to speak, a bridge: a dialogical and insurgent crossing that creates an interval space between two fields of knowledge, allowing the reaffirmation of the belonging and intellectual property of minorities, in this case, farmers.

Consequently, one of these frontiers is precisely the ethical aspect of Ethnomathematics, as it allows for the recovery or restoration of the "cultural dignity of human beings", breaking down "discriminatory barriers established by the dominant society" (D'Ambrosio, 2011, p. 9). The intent is not to folklorize or standardize cultures, but to enable dialogue between different cultures so that, in the exchange, there is a rapprochement for the cultural production of meaning.

Knijnik (1996) corroborates this understanding that culture is neither closed nor static, but rather in motion. According to the author, culture should be understood as a tense terrain of conflict, in constant dispute over the imposition of meanings and, it should be added, meaning.

Intertwined with culture are mathematical knowledge and practice, related to mathematical aspects such as comparing, quantifying, measuring, classifying, and explaining the surrounding environment and the space belonging to people. D'Ambrosio (2011, p. 22) states that "everyday life is imbued with the knowledge and practices of culture". Consequently, it is at the frontier of this knowledge and practice that we find beings who act with or on the former, transforming their everyday spaces.

Thus, we present the concept of *Humanscapes* (Mesquita, 2023), which focuses on human landscapes as interlocutors and belonging to the environment. These *humanscapes* are representatives of historical and sociocultural moments, revisited by ancestry and co-constructed by individual and collective history itself.

In this context, whether alluding to human beings or not, we walk the line constructed by beings, knowledge, and actions, which redefine spaces. Consequently, there is equal freedom for the presentation of knowledge from different places, representative of different communities.

It is evident that these beings, who use ancestral and artisanal knowledge, blend with the practices developed on a daily basis. It is not possible to separate them, because it is in dialogue, exchange, and argumentation that we find the bridge, the interval space, as alluded to by Bhabha (1998), of strangeness and crossings for the collective co-construction of knowledge. This is the path proposed by Ethnomathematics.

Within the dimensions of Ethnomathematics, there are several frontiers conducive to this research. The first has already been presented in the text: the historical dimension. Reflecting on beings, knowledge, and practices requires an approach to the historical path of each community over time. It is through history that we understand the development of various instruments, the intellectual effervescence fueled by the accelerated entry of technologies and the internet. Thus, it is necessary to understand "how mathematics is situated today in the individual and collective experience of each individual" (D'Ambrosio, 2011, p. 30). However, it is also important to understand how Mathematics will position itself in the future.

The second dimension in focus is epistemological. Under the understanding that there is co-construction of knowledge — that is, that knowledge is created intertwined with ancestral knowledge — it becomes possible to subvert the established, Eurocentric, and hegemonic order, which imposes a single path for the production of knowledge. For D'Ambrosio (2011, p. 38), there is the development of an "integrated cycle of knowledge" that cannot be fragmented. This cycle starts from reality and returns to it transmuted, due to the generation of new knowledge. Thus, different types of knowledge, academic and everyday, converge to create or generate new knowledge.

The last dimension considered is the affective dimension, proposed by Mattos (2020) and corroborated by D'Ambrosio (2020). The need to create this dimension seeks to highlight that human beings are composed of both cognitive and affective dimensions, both of which are decisive in their learning, without the possibility of dissociation. Through the affective dimension, it is possible to understand the other, or others, address the concept of *humanscapes,* address the co-construction of knowledge developed by various sociocultural peoples, understand the frontiers between the Matapi Agricultural Colony and Ethnomathematics, and reflect on the frontiers of the sensible.

The intent of this textual excerpt was not to present all the proposed dimensions — although this could be done throughout the writing — but to highlight those considered relevant to the development of the research. It should be noted that these dimensions are paths that lead to reflection and insurgency in the face of what is established as *the status quo* in society. Thus, a warning is issued about the coloniality of knowledge and being, which sustain differences,

epistemological fragmentations, and the reproduction of hegemonic paths of knowledge production.

As Mignolo (2008, p. 244) argues, “the epistemic privilege of modernity is what generates and maintains the coloniality of knowledge and being” that maintains control over, or through, knowledge. Maldonado-Torres (2022) warns that invisibility and dehumanization are expressions of the coloniality of being. Therefore, it is the role of researchers and educators to ensure visibility for both the beings and the knowledge and practices of family farmers.

Each human being is determined by the territory to which they belong. From this perspective, territory is understood as “a space of identity, or one could say a space of identification” (Medeiros, 2008, p. 217). Thus, the territory addressed in this text is configured as a space of affectivity, which generates sociocultural, economic, and political meanings and significances. Medeiros (2008, p. 217) also states that “space and territory cannot be dissociated, because while the former is necessary to demarcate the existence of the latter, the latter, in turn, is the condition for space to be humanized”. Consequently, this territory is established as a sociocultural and geopolitical space of belonging, of individual and collective experiences.

## 6 Fruit production and contributions to the use of Ethnomathematics

Fruit production involves several strategies with which farmers are already familiar. The first consists of identifying the most favorable season for each of these fruits, observing the climate and its variations, to avoid sudden losses. The second refers to choosing the most appropriate type of reproduction, considering techniques such as grafting — joining two plants so that they grow together to form a new one; cuttings — propagation by cuttings, using a small segment of the plant; or reproduction through stems, seeds, rhizomes, leaves, or roots (Yara Brasil, 2022). Pineapple, specifically, reproduces through seeds or seedlings. According to Brazilian Agricultural Research Corporation (Embrapa), seedlings can be taken from the crown, the offshoot, or the shoot (Brasil, 2006). Also, according to Embrapa,

> the most appropriate seedling for each region should be defined based on several factors, among which the following stand out: the cultivar used, the availability of planting material at the appropriate time, as well as the desired length and uniformity of the crop cycle (Brasil, 2006, p. 18).

That said, it is understood that pineapple production involves different areas of knowledge, which can be explored in the classroom, favoring interdisciplinary teaching practices. By working in an interdisciplinary manner, it is possible to enable students to grasp mathematical concepts in different ways, whether in Biology, History, Geography, Portuguese Language, among others. With this approach, it is clear that the Matapi Agricultural Colony, through pineapple production, has great potential for innovation in the context of teaching and learning.

The economy of the Porto Grande region, specifically in the Matapi Agricultural Colony, is based on family farming, which stimulates local commerce through the development of markets. According to farmers' reports, there is a diversity of fruit species grown in the colony, from citrus fruits such as oranges, tangerines, and lemons to seasonal fruits such as watermelon, pineapple, cupuaçu, papaya, and passion fruit. Based on local ancestral knowledge and experience, the importance of soil type, irrigation, and rainy and dry seasons for cultivation is understood.

As fruit production is a factor in the region's development, the municipality of Porto

Grande's main tourist attraction is the Pineapple Festival, held annually in September. As already mentioned, the event attracts thousands of visitors from different locations. Its first edition took place in the 1980s, when Porto Grande was still a district of the city of Macapá. Due to this socioeconomic and tourist factor, this text focuses exclusively on pineapple production.

In addition to the festival, which promotes pineapple cultivation, State Law No. 3004/2024 (Amapá, 2024) was enacted on January 3, 2024, recognizing irrigated pineapple cultivation in the municipality of Porto Grande as Intangible Cultural Heritage of Amapá. The municipality, located 102 kilometers from Macapá, is the main center of fruit production in the state, with an estimated 12 million plants. Given this, it is imperative to highlight pineapple as a characteristic fruit of the regional production center.

In addition to this law, the National Institute of Industrial Property (INPI) published in the Industrial Property Journal (RPI), no. 2812[2], of November 26, 2024, the recognition of the Geographical Indication (GI), in the species Indication of Origin (IO), for the municipality of Porto Grande (AP), as a pineapple producer. Through this recognition, pineapple has become one of the region's symbolic fruits, represented in historical monuments and integrated into one of the municipality's largest festivals.

According to information from RPI, the pineapple grown in Porto Grande is of the pearl variety, whose main characteristics include a sweeter taste, a very distinctive aroma, and a light yellow color. It is a fruit typical of tropical and subtropical regions, with the scientific name *Ananas comosus* (Brasil, 2024). The first stage of planting consists of calculating the area to be planted. The unit of measurement most commonly used by them is the *tarefa,* equivalent to an area of 625 square fathoms; the hectare is also used, which corresponds to an area of 10,000 $m^2$. Many farmers consider a fathom to be equal to two meters, and consider a task to be an area of 50 m x 50 m, and a hectare to be 100 m x 100 m, which corresponds to four tasks. In one hectare, 20,000 pineapple plants are planted manually. In addition to these measurements, there are other spacings such as the *lera* (pineapple planting line) and the spacings between seedlings in single rows, as illustrated in Figure 2.

Figure 2**:** Pineapple plantation in single rows (Own collection)

Farmers use meters as a unit of measurement to determine the distance between rows, adopting a spacing of 1.60 m between two rows. Between seedlings, the spacing is measured in centimeters — 40 cm from one seedling to another. These measurements are used in single row plantings. There is also double row planting, where the spacing varies slightly. In this case, the spacing between rows is 1.50 m; between rows, it is 50 cm; and between seedlings, it is reduced to 30 cm, as shown in Figure 3. This is an agricultural mathematical strategy that allows for greater production in the planting space.

[2] Available in https://revistas.inpi.gov.br/pdf/Contratos_de_Tecnologia2812.pdf

Figure 3: Planting pineapples in double rows (Own collection)

We return to Ethnomathematics as a possibility and a means of strengthening ancestral roots, as well as recognizing the knowledge and practices of family farmers. D'Ambrosio (2011, p. 43) warns that it is not a question of prioritizing one type of knowledge over another, but of incorporating them into mainstream Mathematics, using "human values, synthesized in an ethic of respect, solidarity, and cooperation". It is in this interrelation of knowledge, practices, and beings that Mathematics is understood as a living, dynamic, and dialogical knowledge.

The proposal to integrate similar measurement systems reinforces the importance of cultures, the cultural dynamics that surround them, and transmutes knowledge. A common origin between cultures or between different sociocultural peoples is recognized. In Mattos (2020, p. 85), it is stated that "the similarities prove this common origin and the divergences demonstrate the influence of the environment and the psychological dimension on the minds of members of sociocultural groups or peoples". In this same vein, D'Ambrosio (2011, p. 56) highlights that,

> action generates knowledge, which is the ability to explain, deal with, manage, and understand reality, the matema. This ability is transmitted and accumulated horizontally, in interaction with others, contemporaries, through communication, and vertically, from each individual to themselves (memory) and from each generation to the next generations (historical memory).

Both Mattos (2020) and D'Ambrosio (2011) consider the co-construction of knowledge as a result of cultural and ancestral accumulation, transmitted across generations. The ease of logical reasoning and mental calculations comes from this oral transmission and practice of everyday activities. In this context, Ethnomathematics is considered to recover these aspects in the classroom, reinforcing what is already anchored in the cognitive structure of students. From this perspective, meaningful learning (Ausubel, 2000) stands out as a theoretical contribution that corroborates the ethno-mathematical dimensions of Ethnomathematics and promotes understanding of the strategies chosen to facilitate the learning of school mathematical concepts.

It is evident that pineapple is a prominent fruit in the region of Porto Grande, Amapá, serving as a link to make teaching and learning more enjoyable. The introduction of pineapple production in Mathematics classes aims to strengthen the sense of local belonging and identity among the inhabitants of the territory. In addition, it aims to enable Mathematics classes to break down disciplinary frontiers, promoting interdisciplinary actions to achieve transdisciplinary actions in the near future.

## 7 Final considerations

The conclusion of this paper does not mark the end of the work on pineapple production;

on the contrary, it seeks to highlight that several gaps remain, generating new expectations for future discoveries. It was not possible to develop an activity in local schools to actually prove whether this knowledge provides more meaningful teaching and learning. It should be noted that, when focusing on teaching and learning processes, the research concentrates on the possibilities of pineapple production serving as a pedagogical resource with educational, cultural, and local impact.

Throughout the research, it was observed that the experiences of farmers constitute relevant mechanisms for the exchange of knowledge between Brazil and Portugal. The communities were linked by common interests, highlighting similarities in knowledge and practices, establishing, through dialogue, an exchange of experiences and life lessons. Borders are considered spaces that enable the apprehension of the sensitive, transformed over time and space.

The realization that the sensible produced at a border can only be grasped through the opportunity for experimentation allows us to understand the border as a space in constant transformation, assuming the idea of *becoming*, of coming into being. Consequently, it is proven that there are ethnomathematical borders in constant change. It is at these borders that identity and geographical, sociocultural, and affective belonging are strengthened in the Matapi Agricultural Colony.

The emphasis on different communities focuses on observing the diversity attributed to geographical location and changes in knowledge in relation to climate. The aim is to learn about, exchange, and promote debate on the similarities and differences between the knowledge produced by humanity over time. We seek ethnomathematical frontiers that transcend what is taught in classrooms.

The decision to highlight a single community was based, first, on the limited space available to present all communities in a single paper; second, on the level of detail obtained from Mrs. Raimundinha and her son Rodrigo. Added to this is the temporal proximity necessary for the dissemination of research results, as well as the researchers' experiences and the ancestral and artisanal experiences associated with pineapple production in the Matapi Colony.

It was also found that pineapple production is not restricted to the individual properties of farmers in the region. This production goes beyond the limits of family units, acquiring an economic and tourist dimension, driven by the Pineapple Festival, the election of the Pineapple Queen, the gastronomic hub with products based on the fruit, among other attractions that boost local tourism. These activities, even if classified as non-agricultural, have their origins in agricultural practices.

It is clear that the Matapi Agricultural Colony focuses on sustainable development, which meets current demands and needs. However, farmers have expressed concern for future generations, so that they too can meet their own needs. It is hoped that the sustainable development promoted by their knowledge and practices will guarantee humanity a dignified present and a hopeful future.

The desired sustainable development envisions a more equitable society in terms of income and wealth distribution, in addition to promoting responsible management of natural resources by the public and private sectors. Given this, it is urgent to minimize the use of natural resources, with a focus on preserving biodiversity in different ecosystems. Ensuring a balance between rural and urban areas reinforces sustainable development at the local and global levels. The relevance of cultural appropriation as a path to the inclusion of family and artisanal agricultural systems is emphasized.

Given the above, it was possible to establish ethnomathematical approaches capable of

converging towards the contextualization of school mathematical concepts, such as measurement systems. The approaches based on strategies for mathematizing pineapple production focused on the dimensions of Ethnomathematics, with emphasis on the historical, epistemological, and affective dimensions — without, however, excluding the relevance of the others. In D'Ambrosio (2011) and Mattos (2020), the multiplicity of possibilities that each of these dimensions offers to the debate on beings, knowledge and practices of the most diverse sociocultural groups is highlighted.

These approaches focused on the culture present in pineapple production, not only in terms of the development of family farming, but also because of the impact it has on the city of Porto Grande, especially through the Pineapple Festival. Thus, a cultural dynamic (D'Ambrosio, 2011) is identified that reverberates through exchange and constant intergroup transformation, as well as within intragroups, promoting dialogue between beings, knowledge, and practices.

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**Conflicts of Interest**

The authors declare that there are no conflicts of interest that could influence the results of the research presented in this paper.

**Data Availability Statement**

The data produced, collected, and analyzed in the paper will be made available upon request to the authors.

**Note**

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