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Social Bioeconomy: Applying resources from the buriti palm tree

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Abstract
The sustainable socio-economic development of the buriti palm tree comprises, therefore, an environmental education project aimed at mitigating various indicators of poverty in Maranhão, using the natural resources of *Mauritia flexuosa* while enhancing benefits for the population at all stages of the process, from its conception. In this context, the research aims to utilize the natural resources from the buriti palm, applying collectivity in the construction of social, economic, knowledge, skills, attitudes, and competencies values. To achieve this goal, the methodology was divided into five stages: Diagnosis (analysis of the social and economic aspects of communities living around buriti palm groves and a survey on knowledge and use of buriti); Action (workshops to teach sustainable harvesting techniques for palm leaves and fruit, collection of buriti palm materials to transform into production inputs, production of different materials using buriti palm inputs, encouragement of entrepreneurship and product commercialization, and the importance of cooperativism); Results (based on socio-economic and environmental aspects); Evaluation (response of communities to the activities developed); Reflection. Twenty families with an average per capita income of R$ 600.00 directly participated in the project, and after the project, they achieved an average income of R$ 1,400.00. To incorporate these results, various handicrafts were produced using buriti palm straw, stem, and fruit, which were traded in the local market and crafts fair. Satisfaction with participating in the activities had an excellent response of 73%, a great 15%, and a good 12%. For the creation of a cooperative, there was an approval rate of 95% among community members. Thus, the research project emphasized innovation, creativity, entrepreneurship, cooperativism, natural resources, and sustainability. These collective challenges made a difference in generating value, inclusion, and human advancement.

Keywords: Social and economic inclusion; Entrepreneurship; Cooperativism.

1. Introduction
The tree of life, also known as the buriti palm, has a solitary trunk that can reach up to 20 meters in height. This species is characterized by being thornless (inerme), or when thorns are present, they are solitary and scarce on the lower surface of the pinnae. Its leaves are costopalmate, rounded, with a length of about 3.5 meters. Additionally, it has numerous peduncular bracts that enclose the entire peduncle, with a length of 8-12 cm. The inflorescence is branched in the first order, with 27-35 branches, and has a length of 2.5-3.7 meters (DONADIO et al., 2002; ARAÚJO et al., 2004; SILVA et al., 2018).
In Brazil, it inhabits the phytogeographic domains of the Amazon, Caatinga, and Cerrado, in monospecific formations called Buritizal; in Peru, it's known as Aguajal; Cananguchal in Colombia; Morichal in Venezuela, and some parts of Colombia (KANH, 1991). It usually occurs in swampy areas, gallery forests, or around springs, in low and humid areas, or palm groves, as in the Cerrado areas.
The pulp of its fruits, rich in vitamins and high in protein, is used for the production of juices, wines, sweets, cakes, creams, jams, ice creams, and popsicles. It can also be consumed fresh or as flour after drying (Almeida et al., 1998; Martins et al., 2006). The oil extracted from the pulp has applications in the food industry, cosmetics, fuels, and traditional medicine. It is recognized for its pleasant taste and aroma and is an important source of unsaturated fatty acids and vitamins A and E (NASCIMENTO SILVA et al., 2023).

The western region of the state of Maranhão constitutes a mixed eco-community transitioning between the Cerrado and the Amazon rainforest. In this region, extensive areas of buriti palm groves are found due to their occurrence associated with periodically or permanently flooded areas with poor drainage. This species is commonly found along rivers, igapós, streams, springs, palm groves, wet clearings, riparian forests, and gallery forests.

However, Martins et al. (2016) report that populations of *M. flexuosa* have been under strong anthropogenic pressure, particularly due to the expansion of agricultural activities, leading to the destruction of springs and palm groves. In the region, it is common to observe crops and burns near palm groves, resulting in water loss, death of buriti palms, and the compromise of new generations of the species. Another specific problem is related to the economic vulnerability of the population around palm groves, which cut down the palms for small-scale agriculture.

The presented problems are classic and structural, directly related to the Human Development Index (HDI) of the region, which is low. Most inhabitants have family incomes tied to state and federal government programs. There is also a lack of a government program for humanistic environmental education focused on the sustainable use of natural resources in the region. With this perspective, the guiding question of the research on "Social Bioeconomy: Applying resources from the buriti palm" is: How can social bioeconomy be effectively applied in the use of resources from the buriti palm to promote sustainable development, improve the socioeconomic conditions of local communities, and contribute to environmental conservation?

Therefore, this research aimed to use natural resources from the buriti palm, applying collectivity in the construction of social, economic, knowledge, skills, attitudes, and competence values. For the common good of the people, it is essential for a healthy quality of life and social sustainability.

In this perspective, the mentioned article is organized into five sections: 1) the introduction, presenting and contextualizing the social bioeconomy of the inclusion of the palm; 2) the theoretical-conceptual framework, highlighting the potentialities of the buriti palm; 3) the methodological approach, explaining the procedures for data construction and analysis; 4) the results and discussion, demonstrating how the practices of handling the buriti palm can strengthen bioeconomy; 5) the final considerations, highlighting the contributions noted with the undertaken practice.

2. Theoretical - Conceptual Framework

The buriti palm tree (*Mauritia flexuosa*) is renowned for feeding and providing support for other species. Its fruits nourished different families of birds and animals. Some bryophytes use the palm tree to survive.

Life Palm Tree

The buriti palm is known as one of the most beautiful palm trees, and it is a species referred to by indigenous peoples as the "tree of life." It is fully utilized by communities in extraction areas. Some palms, reaching over 10 meters, can be between 100 and 400 years old. Their leaves form a rounded canopy and are commonly collected for rustic house coverings and use in craftsmanship (Figure 1) (JARDINE et al., 2018).

Fig. 1: Buriti Palm. **Source**: Zilmar Soares.

For rivers, the buriti is crucial. It can help conserve swampy areas with pure and permanent water (Figure 02). In places where springs are drying up, planting the palm, among others, is recommended. For humans, the buriti is also highly beneficial. The delicious heart of the palm is extracted from it, and the pulp of its fruit can be used to make sweets, juices, liqueurs, wines, and even ice creams. The oil extracted from the fruit has medicinal value for the traditional people of the Cerrado, who use it as a vermifuge and natural energizer. It can also be used for frying fish, manufacturing soap, and cosmetics (AMDA, 2018).

Fig. 2: Wetlands preserved by buriti palm trees. **Source**: Rose Mary Araujo - IV CONBRAU/2018

Diversity and riches of palm trees

Palms stand out from a natural, economic, and ecological perspective. In addition to being regularly incorporated into human diets in the form of fruits and heart of palm, and even processed products such as sweets, beverages, and oils, crafts made from species of the genera Orbygnia, Syagrus, Acrocomia, and *Mauritia flexuosa* (buriti) are frequently traded in fairs and markets in many cities in Central Brazil (PEREIRA, 1996).

Indigenous peoples use palm leaves in crafts and the construction of their homes, the pulp and seeds as food and ingredients for paintings, and the stems in their traditional log races. Various species of wildlife feed on their leaves, fruit pulp, and seeds (FILGUEIRAS et al., 1998).

Studies on the diversity and structure of vegetation in Cerrado communities have been conducted by Pires et al. (1999), Felfili et al. (2001), and Felfili & Felfili (2001), providing a good understanding of structural patterns in populations. However, knowledge of these patterns for the buriti palm is scarce or nonexistent when it comes to its diversity and economic richness.

Socioeconomic development of the people of cerrado

In the Cerrado, rural populations living around buriti palm forests are described by Porto-Gonçalves (2008) as communities of the Cerrado. These Cerrado communities are agroextractivists who integrate their knowledge and culture through the use of natural resources, maintaining a constant dialogue with the various niches that form the diverse landscapes of the Cerrado. The agroextractivists of the Cerrado are peasants and family farmers who use Cerrado resources for self-sustainability and the commercialization of their products. They exhibit special characteristics such as small-scale production and the integration of biodiversity resource collection from the Cerrado with agricultural production and animal husbandry activities (BISPO et al., 2020).

This agro extractivism activity in the Cerrado can thus constitute an important tool for the sustainable use of the biome by harnessing products from its vast biodiversity, including the buriti palm (Carvalho, 2007). The utilization of these resources is done both for the self-sustainability of communities and for the production and commercialization of products that primarily serve as supplementary income for these families and, in some cases, even as the main source of income (SILVA, 2009).

However, despite Cerrado products being rich in the knowledge and culture of its people and representing a possibility for an alternative market model, there are still various obstacles in agroextractivist production. Challenges include difficulties related to collective organizational forms, such as cooperatives and micro agroextractivist enterprises; land tenure issues that sometimes limit access to natural resources; challenges in marketing agroextractivist products, both due to the lack of a structured chain and fully established norms for this sector; as well as difficulties in obtaining credit and financing for this production (SIMONI, 2012).

Thus, there is also a need to question consumption practices, as consumption must also be engaged in dynamics that focus on valuing localities, food quality, and the relationship between the countryside and the city or between the producer and the consumer. This is crucial to understanding the socio-economic development of this population (TRICHES; SCHNEIDER, 2014).

Sustainability and Education

For a shift towards sustainable behavior, a strategy must be devised for the full development of both humanity and nature. Thus, the implementation of programs capable of promoting the importance of Environmental Education and the adoption of practices aimed at sustainability becomes crucial, to reduce any impact our activities may have on the surrounding ecosystem that sustains us (LIMA et al., 2020).

According to Leff (2001), the principles of environmental management and participatory democracy advocate the necessary transformation of national states and the international order, aiming for the convergence of conflicting interests and common goals of diverse social groups and classes toward sustainable development and nature appropriation. The strengthening of local environmental management projects and grassroots communities is driving federal, state, intendancies, and municipal governments to establish procedures for peacefully resolving the interests of various economic agents and groups of citizens in environmental conflict resolution. In this context, education can be employed as a transformative tool for socioeconomic and sustainable development in Cerrado communities in southwestern Maranhão.

Entrepreneurship

The entrepreneurship movement in Brazil began to take shape in the 1990s, with the establishment of entities such as SEBRAE (Brazilian Service of Support for Micro and Small Enterprises) and Softex (Brazilian Society for Software Export). Before that, there was practically no talk about entrepreneurship and the creation of small businesses (DORNELAS, 2005, p.26).

According to Chiavenato (2007), an entrepreneur is someone who can make things happen, endowed with a business sense, financial acumen, and the ability to identify opportunities. With this arsenal, they turn ideas into reality for their benefit and the benefit of the community. Due to their creativity and high energy levels, entrepreneurs demonstrate imagination and perseverance, aspects that, when combined appropriately, enable them to transform a simple and poorly structured idea into something concrete and successful in the market.

Entrepreneurship and innovation involve wrestling with all the details of idea. In this regard, innovation is based on the mechanism's ability to generate profits. Drucker (1987) emphasizes that "brilliant ideas" do not represent innovation in the vast majority of cases because most of the time the revenue does not surpass the costs of creating or implementing the said "invention."

Cooperativism

Cooperatives differ from other types of societies due to their distinct characteristics: voluntary membership, variable share capital, one member one vote, dependence on a minimum number of people for their existence rather than capital, and the distribution of surplus and losses proportional to each member's production, among other specificities that make them special for valuing the individual over capital (SANTOS et al., 2019).

3. Materials and methods

This is action research because it directly involves the researcher and the community. According to Engel (2000), action research is a type of engaged participant research, as opposed to traditional research, which is considered "independent," "non-reactive," and "objective." As the name suggests, action research seeks to integrate research with action or practice, meaning to develop knowledge and understanding as part of the practice. It is, therefore, a way of conducting research in situations where one is also a practitioner and aims to improve the understanding of that practice.

As the name implies, action research aims to produce changes (action) and understanding (research). Considering these two dimensions, changes and understanding can make a significant contribution to the research project. Thus, the possibilities of use are vast, ranging from a teacher in a small school in a remote region away from urban centers to a sophisticated study of organizational change (CAMPBELL, 2000). In this understanding, the research methodology was based on the work of Engel (2000) - Diagnosis, action, result, evaluation, and reflection.

Diagnostic Moment

The diagnostic stage aimed to identify and define the problem, establishing various possibilities of actions for its resolution. During this phase, the epistemological principles guiding the actions were determined, involving an understanding of the production of knowledge and the position of the research subjects, namely, the community. For this reason, it was essential to pose questions, make inquiries, conduct analyses, and document the investigated phenomenon. Social, economic, environmental aspects, and the Sustainable Development Goals (SDGs) were taken into consideration.

Analysis of Social and Economic Aspects of Communities Living Around Buritizais

The analysis of the social and economic aspects of the communities residing in areas near the buriti palm forests. Initially, the research aimed to identify the exact location of the study, as this is crucial for understanding the object and subject of the investigation. Thus, the research was conducted in the Western Region of Maranhão, an area rich in buriti palm forests and also home to a community with a low Human Development Index (HDI). To gain insights into the social and economic aspects of the community, 20 families were selected. Questionnaires containing specific parameters were employed for this purpose. The questionnaires addressed information such as the number of family members, family income, knowledge about the palm tree, and the use of its resources in their daily routine.

Actions Taken into Practice

In this phase, a comprehensive understanding of the objectives, interests, and potential obstacles to be faced during the research execution was developed. Various alternatives were identified for exploration, along with their respective consequences. Overall, the goal of action research is to achieve a substantive agreement, even if not necessarily complete, on a specific action to be taken. In the context of this research, the focus was on the community's knowledge regarding the use of natural resources from the buriti palm to build socioeconomic and environmental values.

These actions aimed to present a sustainable production chain around the buriti palm, from harvesting to the commercialization of final products, implementing sustainable agricultural practices to ensure environmental preservation and palm regeneration through workshops, lectures, and workshops. In the workshops and workshops, the possibility of developing products derived from the buriti palm, such as oil, pulp, fibers, among others, was presented. The creation of high-value-added products, such as cosmetics, functional foods, and handicrafts, using raw materials from the palm, was encouraged.

Local entrepreneurship was stimulated by empowering the community to start small businesses based on buriti palm resources, encouraging the creation of cooperatives and associations to strengthen collective participation in bioeconomy management and benefits. To implement Environmental Education around the buriti palm, environmental education programs were put into practice to raise community awareness about the importance of preserving the buriti palm and associated biodiversity, presenting sustainable and responsible natural resource management practices through workshops and lectures.

Support from SEBRAE and UEMASUL was sought to explore innovative technologies to maximize efficiency in the extraction and processing of buriti palm resources, through technological alternatives to reduce environmental impact and improve product quality.

Thus, partnerships were sought with the Craft House of Imperatriz, companies, and research institutions to strengthen the implementation and sustainability of initiatives related to social bioeconomy. Monitoring and evaluation of the project were established to track the social, economic, and environmental impact of actions, allowing for continuous adjustments and improvements. These actions contributed to the sustainable development of local communities, promoting environmental preservation, and the responsible use of buriti palm resources in social bioeconomy.

Workshops To Teach Straw and Fruit Harvesting Techniques in a Sustainable Way

The activities were initiated with the guidance of technical guidelines to adopt good practices for the sustainable organic management of buriti palm. This involved the following actions:

- Location, characterization, and mapping of buriti palm occurrence areas;
- Survey of productive potential through sampling;
- Production estimation;
- Collection planning, including tools and operational safety measures;
- Processing for pulp production, including separation and selection of fruits;
- Storage;
- Processing for vegetable oil production;
- Processing for straw production destined for handicrafts;
- Maintenance and protection of buriti palm occurrence areas, implementing conservation measures;
- Monitoring of production and conservation of the species.

In this phase of the activities, informative materials such as brochures, banners, and an educational booklet containing all necessary information were developed. The actions carried out in this stage followed the standards of the Good Management Practices Series for Sustainable Organic

Extraction of Buriti (*Mauritia flexuosa* L.f.) from the Ministry of Agriculture, Livestock, and Supply of 2012. Additionally, the activities were in line with the Sustainable Development Goals (SDGs), especially goals 12 and 15, which address Responsible Consumption and Production and Life on Land, respectively.

Collection of Buriti Palm Materials to Transform Into Production Inputs

The collection was carried out as the extraction of non-timber forest products. In this phase, each activity was meticulously planned, with an emphasis on determining collection areas, timing, and frequency of collections (cycle and periodicity), strictly adhering to the guidelines of the Ministry of Agriculture of 2012. During this stage, actions were established to prevent or mitigate accidents, including the use of Personal Protective Equipment (PPE) by the extractivist-producers, as well as planning routes and access to reduce impacts and damage, focusing on the maintenance and protection of the forest.

In the collection process, the following standards were followed:

- Special care for the fruits, due to the short viability period for pulp or scraping production.
- Collection was always carried out in the same area throughout the entire harvest.
- Collection of straw and the "eye" was carried out throughout the year;
- There was no collection of the "eye," stem, or green leaves from palm trees with fruits;
- Selection of palms with more leaves to remove the "eye";
- Avoid collecting two "eyes" in a row from the same palm tree;
- Abstention from removing leaves before the fruits mature on the palm tree to prevent premature fruit drop due to direct exposure to the sun;
- Prioritization of collecting the "eye" from younger plants;
- Awareness that the removal of the "eye" can affect future fruit production;
- Pre-selection during collection, excluding deteriorated or low-quality fruits;
- Preference for collecting fruits fallen on the ground;
- Implementation of rotation in collection areas.

Before each collection, the area under the palm tree was cleared to prevent accidents with venomous animals, using a long-handled stick with a sickle at the end. Plastic boxes (baskets) were preferably used for transporting buriti fruits, aiming to reduce pulp losses due to friction between the fruits.

Production of Different Materials Using Buriti Palm Inputs

Following all safety techniques, the following materials were produced using the buriti stem: toys, decorative pieces, boxes for storing objects, biocomposites, and decorative items. With the straw, rugs, clothes, and necklaces were produced. With the fruit and its derivatives, oil, soap, detergent, food, ice cream, popsicles, juices, sweets, chocolate truffles, bioacrylic, and decorative bioplastic were created.

Lima (2009) asserts that traditional and cultural handicrafts carry a "strong cultural mark" and constitute a product that reflects the identity, both of the craftsman and the community, expressing cultural identity. Thus, for Lima (2009), the handicraft product, as a commodity, has advantages in the market due to its added value, which includes not only cultural and traditional value but also the application of this methodology that promoted SDG number 8 (Decent Work and Economic Growth). This propelled sustainable, inclusive, and lasting economic growth, ensuring full, productive employment and decent work for all.

Encouraging Entrepreneurship and the Sale of Products

Regional handicrafts consolidate themselves as an excellent opportunity for entrepreneurs from the local population to use their talents and skills in creating sustainable businesses, promoting a creative economy, and reflecting consumers' interest in handicrafts. With this approach, some products were taken to the handicraft market in Imperatriz and sold according to the local economy. The selection of materials considered criteria of quality, creativity, and originality.

In this phase of the project, those involved learned through workshops important rules about the market and the economy. This methodology was based on the work of Pereira (2013), who states: "In summary, economic science is associated with capitalism and the process of commodification, which occurred at the end of the 18th century. It aims at the production, circulation, and distribution of goods, and as a coordination principle, the market and competition. As an ideology, it serves the bourgeoisie, which, in the early 19th century, had already assumed full autonomy as a class, already being a class for itself." Entrepreneurship rules published by SEBRAE were also applied.

Measurement of Proposed Results

The measurement of research results on "Social Bioeconomy: Applying resources from the buriti palm tree" involved the use of different methods and indicators to assess the impact on social, economic, and environmental areas. Among these methods, the following were applied:

Social Indicators

The employment rate in the local community, improvement in access to education and health, level of participation, community engagement in activities related to social bioeconomy, and changes in the standard of living and well-being of the population.

Economic Indicators

Growth in per capita income of those involved, generation of direct and indirect jobs from material collection, handicraft production, and product sales, improvement in product quality according to the market, and assessment of increased economic activity in the region.

Environmental Indicators

Reforestation and regeneration rate of the buriti palm tree, assessment of local biodiversity, and monitoring of environmental preservation in buriti palm tree areas, reduction of environmental impact in sustainable management practices, and efficiency in the use of natural resources from the buriti palm tree.

Production and Commercialization

The volume of production of products derived from the buriti palm tree, total sales value and profitability, market penetration and consumer acceptance of products, and diversification and innovation in products.

Community Participation
Level of community involvement in decisions related to bioeconomy, involvement and success in creating local cooperatives and associations, and evaluation of the community's perception of benefits and challenges faced.
Quality of Life Indicators
Improvement in housing conditions, access to basic services such as clean water and electricity, and assessment of food security in the community, especially using resources from the buriti palm tree.
Technological Innovation Indicators
Adoption of new technologies in the production and processing of materials, proposal for trademark registration, efficiency in resource use without unnecessary waste, number of ideas and innovations developed by the community, and improved operational efficiency through technological innovations.
Stakeholders' Feedback
Opinions and feedback from different stakeholders, including the local community, artisans, traders, consumers, and partners who supported the project. By developing specific indicators and data collection methods for each of these areas, it was possible to obtain a comprehensive view of the impact of social bioeconomy in applying resources from the buriti palm tree. The combination of quantitative and qualitative data could provide a more complete and in-depth understanding of the research results.

4. Results and Discussion

One of the currently prominent concepts of social technology encompasses products, techniques, or replicable methodologies developed in collaboration with the community, representing effective solutions for social transformation (VIANA et al., 2022; NOGUEIRA et al., 2024).
Socioeconomic Aspects of the Involved Communities
The first practical stage of the project began with an understanding of the socioeconomic aspects of the people involved. Twenty families with incomes below the minimum wage, receiving assistance from federal, state, and municipal governments, were selected. They lived in simple housing without the necessary minimum infrastructure (Figure 3).

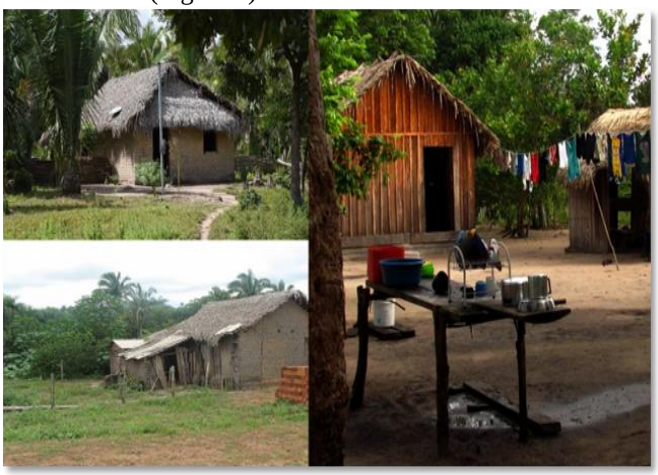

Fig. 3: Aspects of housing in the rural area of western Maranhão
Source: J. Wilson 2023.

After a thorough analysis of the appropriate technology movement, Dagnino, Brandão, and Novaes (2004:56-57) demonstrate that various currents emphasize a product, not a process, according to a normative vision. The movement failed to implement its ideas due to a lack of clarity on how the process should be organized. According to these authors, "innovation cannot be conceived as something created in one place and applied in another, but as a process developed in the place where that technology will be used, by the people who will use it." Emphasizing the process of technology development is essential to the concept of social technology.
When analyzing socioeconomic aspects, it was observed that project participants have a family income below R$ 850.00 (eight hundred reais). The community's education level is low, limited to incomplete primary education, and the average number of family members is 4 people. There is a significant difference in family income before and after the project. Initially, 40% of the community had an average family income of R$ 500.00, and by the end of the project, this income increased by an average of R$ 1600.00 (Graph 2), representing an increase of R$ 1,100.00, equivalent to a 220% increase.
The origin of this change dates back to events between 1830 and 1848. In this period, the bourgeois class lost its critical-revolutionary characteristic in the face of proletarian struggles (according to Lukács, 1992, p. 109), giving rise to a rationality that, in seeking to mystify reality, created a fetishized and fragmented image of it. Lukács refers to this as the "ideological decadence of the bourgeoisie." According to him (1992, p. 123), after the emergence of Marxist economics, it became impossible to ignore class struggle as a fundamental factor in social development whenever social relations were analyzed from an economic perspective.
According to Costa (2020), the reflection on the "social issue" arises, poverty, and its manifestations are no longer seen as a result of economic exploitation but as autonomous phenomena and the individual or collective responsibility of the people affected by them. The "social issue" begins to be perceived as separate "issues" and even as natural phenomena or produced by the behavior of individuals facing them.
During the implementation of practices, it was noted that the community where the project was carried out had limited knowledge about the buriti palm. They were not fully aware that all parts of the buriti were usable. The fruits provide food and oil, the leaves are a source of fibers for crafts, and the entire palm can have ornamental uses, playing a significant role in the traditions and cultural identity of various indigenous communities and traditional peoples.
From the discovery of Brazil until the 1970s, the buriti thrived majestically in the veredas and buritizais of the cerrado, sustainably exploited by indigenous people and sertanejos, who called it the "Tree of Life." However, from that period on, vast areas of the cerrado and the Amazon were considered potential for the expansion of the Brazilian agricultural frontier to meet the growing demand for food and plant raw materials for the steel industry. Consequently, buritizais were gradually disappearing (SILVA et al., 2010). After the implementation of practical activities, the responses showed a significant change in their configuration. All participants, that is, 100% of them, began to see the buriti palm differently.

Workshop to Explore Techniques for Collecting

Materials

The activities were carried out, including the preparation and maintenance of productive areas, performed over three months outside the production period. These activities are extremely important to ensure the efficiency of collection and reduce the risks of accidents, as well as the loss of material quality (fruits, straws, and stems). From the meetings, it was agreed that younger individuals would be responsible for participating in the collections, while older individuals would dedicate themselves to the production of artisanal materials. In this context, artisans play the role of both art producers and culture producers. According to Lima (2005), the artisanal object is a manifestation of human work done manually, where the use of tools and instruments to manipulate raw materials is guided by the creator's will, primarily using hands. Therefore, the artisanal production process is essentially manual. Another aspect highlighted by Lima (2005) is the freedom of the artisan to determine the pace of production, choose raw materials and technology used, as well as define the final form they want to give to the product, which is the result of their creation, knowledge, and culture.

Collection and preparation of material

The collection was carried out according to the established calendar, with the participation of younger people, totaling 12 participants in total. This amount represents approximately 30% of the participants involved in the project (Figure 4).

Fig. 4: Collecting buriti stalks for making crafts Source**:** Zilmar Soares.

To work in the production of handicrafts, the material was collected in its natural state and then dried (Table 1). This step is necessary to facilitate the cutting and creation of each design. Producing handicrafts is essentially a manual craft that involves the creativity of knowing how to do it in their field of expertise. According to Rocha Grangeiro and Bastos (2016): "craftsmanship is still, for the majority of the interviewed workers, the only productive activity, and for those who engage in another activity, income obtained through handicrafts is characterized as the main income."

Table 1: Data on materials collected at each stage.

Material	In natura/Kg	Dry/Kg
Straw Fiber	70	55
Stallus fiber	58	19
Fruit pulp	60	48
Shell	45	38
Mesocarp (skin)	20	18

Source: Autor (2022)

Handmade Productions in Sociocultural Relations Networks

The work and craftsmanship emerge as an important theme because handicrafts are a traditional activity that also remains present in contemporary society. This form of work has both creative and symbolic dimensions, as well as economic and commercial aspects (VIEIRA et al., 2016; DUARTE et al., 2020). According to Lima (2005), traditional and cultural handicrafts carry a "strong cultural mark," being a product that reflects the identity of the artisan and the community, expressing cultural identity. Thus, handicraft products have advantages in the market due to their added cultural and traditional value.

Social technology, applying resources obtained from the buriti palm, acts as a technological tool to solve social problems. It can reduce inequalities by combining scientific and popular knowledge, creating products that become essential for society. Social needs in vulnerable regions are met through the practical knowledge combined with existing community knowledge, and it is crucial to value this fusion of knowledge.

Based on this principle, various materials were produced, and their production costs were analyzed to gain a perspective on the socio-economic valuation of resources (Table 2). The community worked collectively, with each individual contributing their creativity in creating their own designs. According to the report of an entrepreneur, an object produced by artisans as part of the project can reach a value ranging from R$ 10.00 to 300.00. Thus, handicraft products made from buriti fiber, with the support of the community, can be marketed in distant markets, including with prospects for international reach. Through these activities and the formation of cooperatives, the community will have access to strategies for promoting and marketing their products, participating in various local and regional fairs.

Table 2: Materials produced with due costs and value perspective for the market.

Handmade pieces	Price for production R$	Price for sale R$
Handmade car	1,00±0,50	10,00±5,00
Handmade airplane	1,00±0,50	10,00±5,00
Decorative frame	50,00±30,50	130,00±80,00
Jewelry box	2,00±0,50	20,00±5,00
Craft boat	3,00±0,50	30,00±5,00
Craft spinning wheel	30,00±5,00	25,00±4,00
Decorative game	4,00±2,00	25,00±3,00
Decorative bowl set	4,00±1,00	25,00±2,50
Fasten to frame	98,00±20,00	300,00±50,0
Straw fiber sandal	10,00 ± 2,00	20,00±4,00

This table presents results according to expenses applied to production and market value assessed by the artisan house of Imperatriz Maranhão – 2022. **Source**: Autor.

According to Marx (1975), craftsmanship, in its abstract sense, constitutes an interchange between man and nature through an expenditure of physical and mental energies. Marx (1975, p. 202) understands craftsmanship as a process in which man and nature participate when the human being "sets in motion the natural forces of his body, arms and legs, head and hands, to appropriate the resources of nature, giving them a form useful to human life." In the Marxist view, human labor is essentially creative. Marx (1975, p. 202) asserts: "[...] what distinguishes the worst architect from the best bee is that he designs the structure in his mind before turning it into reality. At the end of the labor process, a result emerges that already existed beforehand in the worker's imagination. He doesn't just transform the material he works on; he impresses upon the material the project that he had consciously in mind, which constitutes the determining law of his mode of operation and to which he must subordinate his will."

In craftsmanship, according to the model idealized by Mills (2009), the artisan has mastery over the work process, meaning a single worker performs all functions or is aware of their part in the whole. For Mills (2009, p.60): "The craftsman has an image of the finished product, and even if he does not make it entirely, he sees the place of his part in the whole and therefore understands the meaning of his effort in terms of that whole."

Entrepreneurship and Sale of Products

According to Sennett (2009), the connection between craftsmanship and the employment of human capacity to promote sociocultural changes encompasses both ethical and practical issues. In terms of ethics, craftsmanship promotes the artisan's commitment to honoring human purposes by doing something well, without other justifications beyond pride and satisfaction derived from the execution of their work. As a practice, craftsmanship is not just the acquisition of in-depth knowledge and the development of a skill but also the constant dialogue between execution and thought, inseparably.

The reframing of craftsmanship as a strategy for the reproduction of unequal relations is related to the entrepreneurial posture. According to SEBRAE (2010), "the artisan's difficulty in developing an entrepreneurial posture and seeing craftsmanship as a business, and access to markets are the main challenges that need to be overcome for the legitimization of craftsmanship as a successful Brazilian business" (p.10). In this sense, entrepreneurial training was carried out through coordinated actions defined as a solution to promote entrepreneurship in regional craftsmanship. The argumentation in this section was based on questioning the economic situation of the population, which constitutes a natural path for regional development, thus improving the Human Development Index (HDI).

To reaffirm the participants' entrepreneurship, a small fair was organized for two days (June 11 and 12, 2022) in the commercial center of Imperatriz, with the support of the Municipality and the House of the Artisan. In this event, artisans exhibited and sold what they produced. This action demonstrated the artisan's ability to identify problems and opportunities, develop solutions, and invest resources in creating something positive for society. This can result in a business, a project, or even a movement that generates real changes and impact on daily life, especially regarding socioeconomic aspects. After the event concluded, the result was positive, with each participant earning an average of R$ 800.00 (eight hundred reais). For them, this was a good outcome for two days of activity.

Cooperativism: Association for Human Solidarity

Cooperativism is nothing more than an association of people united to cooperate with the goal of cooperating, aiming to solve economic problems through human solidarity. It is an economic and social system that seeks, through cooperatives, the organization and distribution of wealth (SANOS; CEBALLOS, 2019). According to Crúzio (2005, p.13), "a cooperative is the union of workers or various professionals who associate voluntarily, with free entry for individuals, provided that individual interests in producing, trading, or providing a service do not conflict with the general objectives of the cooperative." Thus, the "Palmeira da Vida" project proposed to the participants the creation of a cooperative society, with the purpose of promoting the production and marketing of handicrafts collectively. As the project is democratic, voting was conducted among the 40 participants, and Graph 05 presents the result of this vote.

The result was satisfactory, with 95% of the participants understanding the proposal for creating the cooperative, only 3% disagreeing, 1% expressing no opinion, and 1% casting a blank vote. In this way, it was possible to achieve the objective of this project, which is to use natural resources from the buriti palm, applying collective work in building social values, knowledge, skills, attitudes, and competencies. Cooperativism strengthens itself in response to socio-economic difficulties, acting as a factor of social inclusion and as an alternative for many to remain in the labor market. Based on principles of humanism, freedom,

equality, solidarity, and rationality, cooperativism seeks to build a better society, grounded in noble concepts. It is increasingly standing out as an option and a solution for economic growth in challenging times (SANOS; CEBALLOS, 2019).

5. Conclusion

The social inclusion of 20 participating families resulted in socio-cultural transformation, entrepreneurial spirit, collective and cooperative development, economic emancipation, recognition of the sustainable value of the buriti palm for the local economy, commitment to the environment, and sustainable environmental education. However, it is not enough to possess the potential for emancipatory socio-economic transformation if people are bound by ideological chains that limit their actions. It is understood that interventions in social technology can become distractions to conceal the systematic reproduction of the excluding logic of capital over the involved individuals. Through creative practical activities and research, the project transformed the resources of the buriti palm into a handicraft activity directed toward the productive sector.

The research solidified itself as an option for socio-economic development grounded in cooperation, self-management, solidarity, and economic viability, along with cultural, environmental, and social aspects. The activities promoted entrepreneurship using the natural resources of the buriti palm, establishing democratic mechanisms for management and decision-making regarding economic policies, forms of organization of handicraft production, and allocation of resources obtained.

The objectives were achieved through democratic, collective, solidarity-based, mutual work approaches, and the valorization of the individuals involved. Sustainable development and social technology were applied inclusively and transformatively, as the community recognized a natural resource as a source of sustainable income. Thus, entrepreneurial activities were established as responsible organizations, committed to both socio-environmental aspects and socio-economic progress. The research valued innovation, creativity, entrepreneurship, cooperativism, natural resources, and sustainability. These joint challenges made a difference in generating value, inclusion, and the ascent of the human being.

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