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ABSTRACT

This study aims to map and analyze micro-production chains established through agro-extractive activities in the Braço community (Almeirim, Pará, Brazil), identifying challenges and proposing improvements for local sustainable development. The methodology employed a descriptive exploratory approach using a mixed-methods data collection technique with 55 families, through interviews and participatory workshops. The results indicated that agro-extractivists exhibited low educational attainment and high residential stability, with primary income derived from pensions, supplemented by extractivism and agriculture involving 16 products incorporated into the local micro-production chains. Despite agricultural practices being traditionally driven by economic necessity and subsistence, individual marketing through intermediaries predominates, with limited participation in cooperatives and modest, seasonal income. It was concluded that strengthening local agro-extractive activities requires governmental support, community organization, overcoming infrastructural challenges, and qualified technical assistance to improve management, market access, sustainability, and contribute to the productive empowerment of this community.

Keywords: Bioeconomy. Traditional Community. Vale do Jari.

RESUMO

Este estudo tem como objetivo mapear e analisar micros cadeias produtivas implantadas através do agroextrativismo na comunidade do Braço (Almeirim-PA), identificando-se os desafios e propondo melhorias ao desenvolvimento sustentável local. Para a metodologia utilizou-se uma pesquisa exploratória descritiva com uso de técnica de obtenção de dados mista, com 55 famílias, através de entrevistas e oficinas participativa. Os resultados apontaram agroextrativistas com baixa escolaridade e alta estabilidade residencial, com renda principal da aposentadoria, complementada pelo extrativismo e agricultura de 16 produtos incorporado as micro cadeias produtivas local. Apesar da tradição agrícola por necessidade econômica e subsistência, predomina a comercialização individual via atravessadores, com baixa adesão às cooperativas e renda modesta e sazonal. Concluiu-se que o fortalecimento do agroextrativismo local exige apoio governamental, organização comunitária, superação de desafios de infraestrutura e assistência técnica qualificada para aprimorar a gestão, acesso a mercados, sustentabilidade e contribuir com o empoderamento produtivo desta comunidade.

Palavras-chave: Bioeconomia. Comunidade tradicional. Vale do Jari.

INTRODUCTION

Extractivism is defined as the extraction of natural resources of plant, animal, or mineral origin and has historically played a significant role in Brazil's economic development. This activity has driven notable economic cycles, such as those of brazilwood, gold, and rubber, contributing to the shaping of the national economy (Bispo; Diniz, 2014; Rueda, 1995). Over time, this practice has been reconfigured, particularly when associated with family farming, giving rise to the concept of agroextractivism.

Extractivism and agroextractivism are fundamental components of the Brazilian forest bioeconomy. According to the Brazilian Forest Service (2022), Brazil holds the second largest forest area in the world, with 58% of its territory covered by natural and planted forests, harboring more than 20% of the planet's total species. In this context, the bioeconomy related to non-timber forest products has grown significantly in recent years, generating more than BRL 15 billion over a decade. As emphasized by the Brazilian Forest Service (2022, p. 9), "promoting the forest bioeconomy is essential both for socioeconomic development in the country and for the conservation of Brazilian forests."

According to Afonso (2012), agroextractivism represents the combination of agricultural and extractive activities, both developed in rural contexts. This integration has proven strategic, especially in regions such as the Amazon, where it simultaneously contributes to income generation and environmental conservation. In these territories, extractivism and agroextractivism value

traditional knowledge, promoting the sustainable use of natural resources. Gusmão (2019) highlights challenges within family farming, particularly barriers to commercialization, including logistical obstacles, disorganization of initiatives, lack of immediate payment, certification issues, and difficulties in large-scale production.

In this scenario, local markets emerge as promising alternatives, strengthening cultural identity, family ties, and regional food habits, while adding value to products and enhancing competitiveness in relation to large agrifood corporations. The Braço community, located in the municipality of Almeirim, Pará State, represents a concrete example of this reality. Situated in the Jari Valley—an area of high biodiversity marked by the presence of extractivist, agroextractivist, and quilombola communities (Nascimento; Caramello; Silva, 2025)—this locality faces socioeconomic and environmental challenges common to rural Amazonia.

For agroextractivism to consolidate itself as a primary local income source, it is essential to overcome obstacles related to infrastructure, commercialization, and lack of institutional support. Agroextractivist activities play a crucial role not only in the local economy but also in environmental conservation. According to the Brazilian Forest Service (2022), non-timber forest production requires conserved forests which, when properly managed, maintain essential functions such as carbon sequestration, hydrological cycle regulation, and erosion control, thereby directly contributing to climate change mitigation.

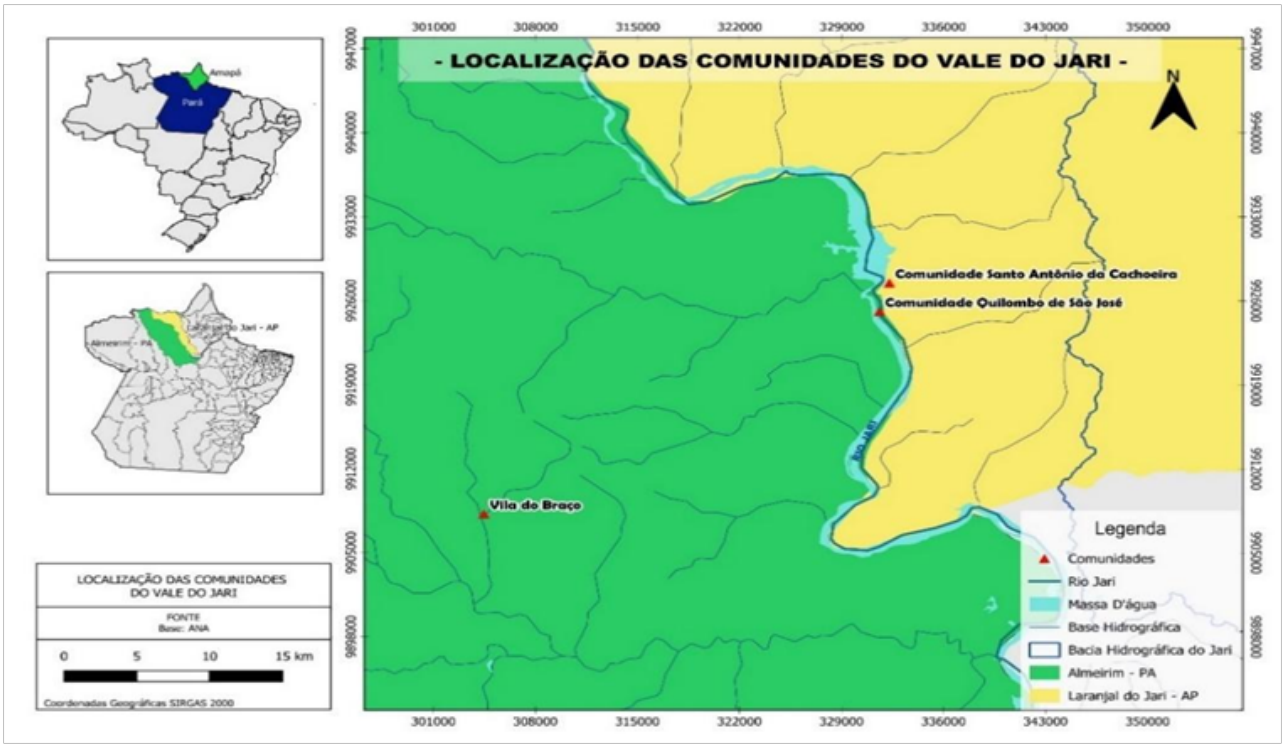
Given this context, this study aims to analyze the integration and dynamics of agroextractivist micro value chains in the Braço community, identifying the products produced, the main challenges faced, and proposing strategies to improve their organization, management, and market integration at different spatial scales. The study seeks to strengthen these value chains and promote sustainable regional development, contributing to the literature on sustainable local development in the Jari Valley and opening avenues for further research.

METHODOLOGY

STUDY AREA

This research is part of the Amazônia +10 Initiative, conducted in accordance with Ethics Committee approval No. 6,189,379 and aligned with the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger and Sustainable Agriculture) and SDG 20 (Rights of Indigenous Peoples and Traditional Communities). The study was carried out in the Braço community, located in the Monte Dourado district, municipality of Almeirim, Pará State (Figure 1). The community lies approximately 30.1 km away via an unpaved road, indicating geographic isolation and logistical difficulties for the movement of people and goods, which are intensified during the rainy season (January–June).

Figure 1 | Location map of the Braço community



Source: prepared by the authors (integrated into the macro-project database – 2025).

The community holds strategic relevance as a representative ecosystem of agroextractivist dynamics in the Jari Valley within the context of the Amazonian forest bioeconomy. This relevance led to its inclusion in the project "Challenges and expectations for local development and permanence [...]" under the Amazônia +10 Initiative (Nascimento, Caramello; Silva, 2025). This territorial configuration reinforces the region's environmental and socioeconomic importance, given the interdependence among municipalities influenced by the Jari River.

Because the Braço community self-identifies as agroextractivist—while others in the Jari Valley identify primarily as extractivist—it has strong potential as a model for analyzing micro value chains under conditions of geographic isolation and logistical vulnerability. This makes it particularly relevant for undergraduate and graduate research exploring how traditional knowledge and economic diversity respond to conservation and subsistence challenges.

The scarcity of research in isolated Amazonian communities, often neglected due to logistical challenges and the scientific invisibility of riverine populations (Fernandes; Muser, 2021), further underscores the importance of this study. The absence of previous studies in the Braço community fills a critical gap and may stimulate future investigations into the socioeconomic and environmental dynamics of bioeconomy in underexplored contexts (Costa, 2012).

The area is characterized by an equatorial climate, with high temperatures and humidity year-round. The average annual temperature is 26.4 °C. Rainfall is intense, ranging from 1,998.2 mm to 2,347.7 mm during the rainy season (January–June) (Gomes Sobrinho et al., 2012). The hydrography is marked by the Jari River, which forms a natural boundary between Pará and Amapá States and may facilitate production outflow to other regions.

DATA COLLECTION

Data were collected on March 15, 16, and 23, 2025, through semi-structured interviews with 55 households selected via convenience sampling from a total of 100 households, representing 55% of the community. This method is commonly used when specific population segments must be accessed (Marconi; Lakatos, 2003). Respondents were residents aged 18 years or older, in accordance with ethical research standards.

Additionally, on March 23, a participatory workshop was conducted to map the seasonal calendar of agroextractivist activities (Drumond, 2002), helping to correlate interview data. Community representatives and long-term residents participated, enabling the reconstruction of historical context (Matos; Caramello; Carniatto, 2025). This mixed-methods approach allowed the capture of both measurable data and subjective, cultural dimensions of the studied activities (Johnson; Onwuegbuzie; Turner, 2007).

The research instrument included both qualitative and quantitative dimensions, covering socioeconomic profiles, length of residence, income sources, production methods, commercialization strategies, and agricultural practices.

DATA ANALYSIS

Data were stored in spreadsheets using Excel 2010, which was also used to generate graphs for visualization. Qualitative data from open-ended questions were analyzed using Bardin's (2020) content analysis methodology, while closed-ended questions were treated using descriptive statistics, maintaining attention to participants' perceptions.

For open-ended questions, multiple responses per participant were allowed. Percentage calculations for subjective questions were based on total responses rather than number of respondents. Both objective and subjective data were analyzed based on response frequency within mapped categories and subcategories.

RESULTS AND DISCUSSION

FARMERS' PROFILE

This study revealed a relatively balanced gender distribution among participants, comprising 52.73% men and 47.27% women. Regarding educational attainment, a predominance of low schooling levels was observed: 65.45% of respondents had completed at most elementary education (40% incomplete and 25.45% complete). Only 14.55% had completed secondary education, and 3.64% had reached higher education (including incomplete degrees and specialization). Additionally, 5.45% had never attended school.

This scenario of limited formal education is recurrent in several Brazilian rural communities. Chagas et al. (2023), studying rural producers in Canaã dos Carajás (Pará), reported similar findings, with 47.62% having incomplete elementary education and only 9.52% holding a completed university degree. According to Silva and Malaquias (2020), education level and access to information are essential for rural development, directly influencing farm management and potentially increasing productivity.

Low educational attainment, as noted by Chagas et al. (2023), may also be associated with household income constraints, which hinder school attendance among youth from low-income families. In traditional extractivist communities of the Jari Valley, where basic education is typically available only through the early years of elementary school, pursuing further studies requires family migration to urban areas or sending children away to study—an option that is financially unfeasible for some households (Caramello et al., 2026).

Beyond education, another relevant aspect is high residential stability: 83.6% of respondents have lived in the community for more than 20 years. The most common length of residence is 36–40 years (20%), followed by 26–30 and 41–45 years (12.7% each), while only 16.3% have lived there for less than two decades. Deep historical roots are further evidenced by 7.2% of residents reporting more than 70 years of local residence, corroborated by a historical timeline indicating that the first resident arrived in 1932. Such long-term permanence, also observed by Chagas et al. (2023) in their study area (where 40.48% had lived there for over 30 years), may reflect strong community ties but may also be associated with limited mobility and rural outmigration of younger generations seeking opportunities elsewhere.

Regarding livelihoods, retirement pensions constitute the main source of household income (40%), indicating a population with a significant elderly component or strong dependence on social security benefits. This finding aligns with observations in other rural communities where social benefits complement or constitute primary household income (Chagas et al., 2023). Nevertheless, traditional activities remain essential: agro-extractivism (25.5%) and extractivism (10.9%) represent important primary income sources. Public sector employment contributes 3.6%, while the “Other” category (20%) includes diverse occupations (formal jobs, services, skilled trades) and social benefits (e.g., Bolsa Família), reflecting multiple livelihood strategies.

As a secondary income source, extractivism becomes even more prominent (41.8%), followed by agro-extractivism (27.3%), confirming its role as a frequent complementary activity. Public employment remains modest (3.6%), and the "Other" category (16.4%) includes informal activities, varied employment, social assistance benefits, and absence of a second income. These data reinforce the profile of a community that combines traditional practices with diversified income strategies. While common, such diversification is often associated with economic vulnerability, as discussed by Chagas et al. (2023), who identified limitations such as restricted access to credit and inadequate technical support. Understanding these local socioeconomic dynamics is central to formulating effective public policies for rural development (Pinheiro; Atroch, 2015).

MICRO-PRODUCTIVE CHAINS IN AGRO-EXTRACTIVISM

The analysis of micro-productive chains in agro-extractivism within the Braço community must be understood in the broader context of Brazil's forest bioeconomy. According to the Brazilian Forest Service (2022), approximately BRL 1.9 billion were generated in 2020 through the commercialization of non-timber forest products nationwide. Beyond their economic value, forests and their products "play a fundamental role in ensuring food security and human development" (Brazilian Forest Service, 2022, p. 9). This dimension is particularly relevant for communities such as Braço, where agro-extractivism represents not only a complementary income source but also a key element of food security and the maintenance of traditional livelihoods.

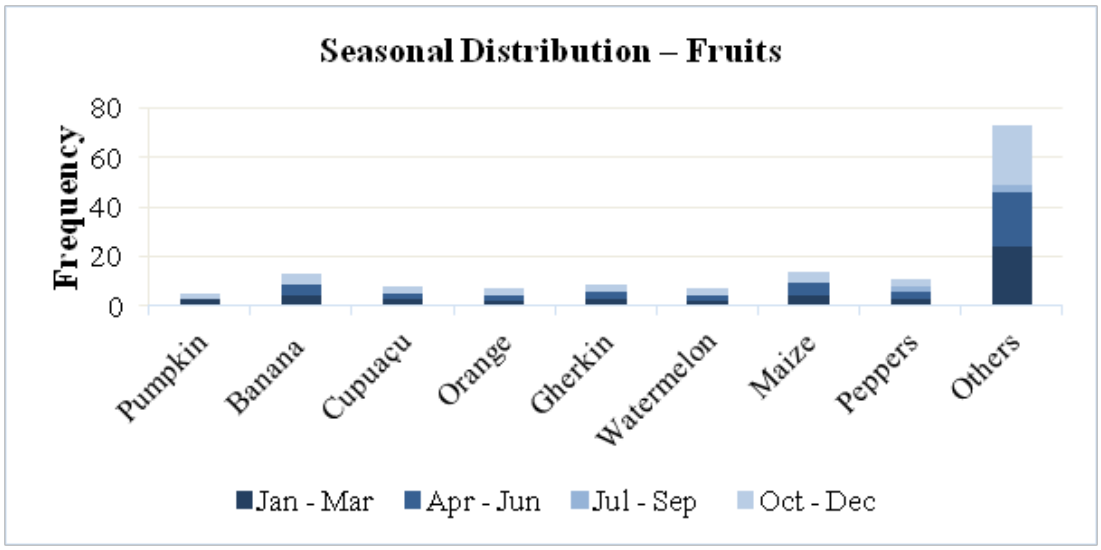
It is therefore essential to distinguish between conventional bioeconomy and the sociobiodiversity bioeconomy practiced in Braço. While conventional bioeconomy emphasizes replacing fossil resources with biological ones and improving industrial biotechnological efficiency (Abramovay, 2019), sociobiodiversity bioeconomy is grounded in the interdependence between biological diversity and the cultural systems of traditional peoples and communities (Santos et al., 2025). In this context, "micro-productive chains" refer to production and marketing systems characterized by shorter development cycles and lower temporal and logistical complexity compared to large-scale chains.

This definition aligns with discussions on Short Food Supply Chains (SFSCs), defined by Deverre and Lamine (2010, p. 61) as "alternative agri-food systems that include different forms of distribution, mainly characterized by few (or no) intermediaries between consumers and producers, or by short geographical distances between them." Local agro-extractivist micro-chains can thus be understood as manifestations of SFSCs, where proximity and logistical simplicity are fundamental.

The results reinforce and expand debates on the role of agro-extractivism in Amazonian regional development, highlighting the need to overcome dependence on intermediaries and strengthen cooperativism. These findings corroborate Homma's (1993) thesis regarding the transition from predatory extractivism to managed cultivation systems that ensure long-term economic sustainability. By focusing on local specificities, micro-productive chains, and family-based arrangements, this study contributes to the literature on management and regional development.

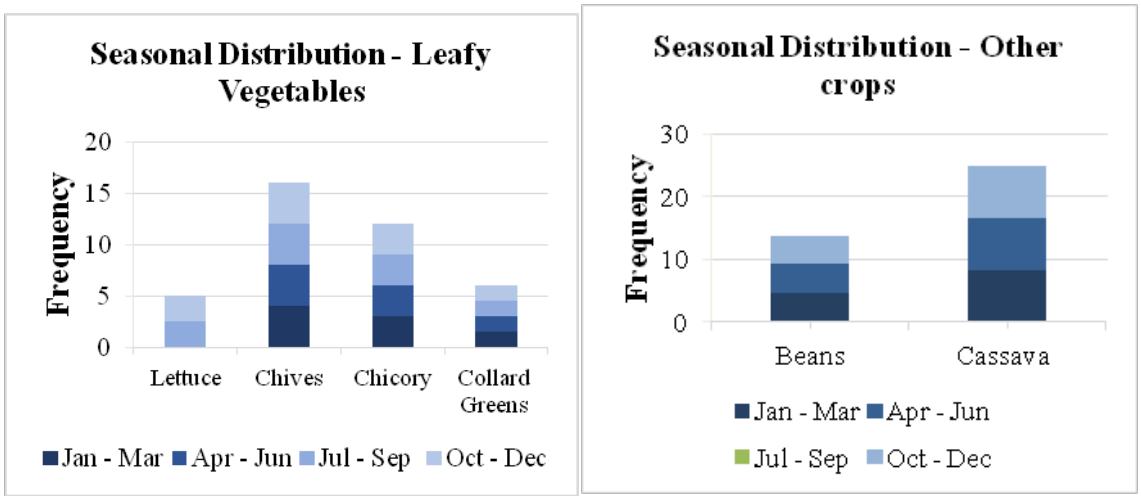
The cultivation of 16 agricultural products (Figs. 2 and 3) is embedded in the community's daily life, including açaí and peach palm, which combine forest extraction with seasonal cultivation in a reforestation process aimed at expanding production and facilitating access. The vast majority of respondents (90.9%) reported that their families engage in at least one of the identified agricultural activities. Except for orange, cupuaçu, peach palm, açaí, and banana—which have production cycles longer than one year—the remaining crops form an active micro-productive chain.

Figure 2 | Seasonal distribution of crop cultivation by period



Source: Prepared by the authors (2025)

Figure 3 | Seasonal distribution of vegetables and other crops by period



Source: Prepared by the authors (2025)

Together, these products with different cycles keep the local economy active and sustain the community's presence in markets in the municipality of Laranjal do Jari (Amapá) and the district of Monte Dourado (Pará), highlighting the relevance and diffusion of this practice in the local context. This tradition is reinforced by long-term engagement in agriculture: a substantial majority (62%) of participants have practiced agricultural activities for more than 16 years. In contrast, a smaller group (12%) began between one and three years ago, and only 6% started within the last 12 months. This pattern suggests consolidation and intergenerational transmission of agricultural knowledge, with few new entrants in recent years. The continuity of these traditional practices is vital for maintaining agrobiodiversity and local knowledge, both emphasized in discussions on sustainable development in the Amazon (Uma Concertação pela Amazônia, 2023).

Short supply chains, as noted by Scarabelot and Schneider (2012), promote closer producer–consumer relationships and foster trust through direct interaction. Marsden, Banks, and Bristow (2000, p. 425) argue that the crucial aspect of SFSCs is that products reach consumers with information enabling trust-based connections with the place of production, the values of those involved, and the methods used.

Such systems offer significant benefits. For producers, short chains represent "an attractive opportunity for production diversification, capture of greater added value, and more stable incomes" (ECLAC; FAO; IICA, 2014, p. 165). For communities, they can "retain added value in the production

region/territory, create jobs, and become an important growth driver" (ECLAC; FAO; IICA, 2014, p. 166). Brandenburg, Lamine, and Darolt (2013) add that these chains enable better remuneration for producers, fairer prices for consumers, local production valorization, job creation, and local economic dynamization.

Strengthening these short productive chains, as advocated by initiatives such as Uma Concertação pela Amazônia (2023), which supports the commercialization of family and agroecological production, is essential for sustainable development and the valorization of agro-extractivism in the region.

DETERMINANT FACTORS FOR THE ADOPTION OF AGRICULTURAL PRACTICES

The predominance of economic necessity as the main driver, indicated by 58.18% of participants, is a finding that resonates with the literature on family farming. This result underscores that agriculture is often perceived as a practical alternative for overcoming financial hardship, thus constituting a survival strategy. Indeed, Ferreira, Peixoto, and Santos (2023, p. 6) note that "many rural producers in situations of socioeconomic vulnerability engage in family farming to ensure household subsistence and to access public policies and other types of markets, thereby generating work and income."

Similarly, subsistence assurance and self-consumption were identified as relevant motivations by 27.27% of respondents. This percentage reinforces the fundamental role of agriculture in providing daily food for households, thereby reducing dependence on external markets and directly contributing to local food security. This function is central to the definition of the Family Agricultural Production Unit, which utilizes production factors "with the purpose of meeting both household subsistence needs and society's demand for food" (Decree No. 9,064/2017, cited in Ferreira; Peixoto; Santos, 2023, p. 3). Family farming is therefore particularly relevant in this regard (Ferreira; Peixoto; Santos, 2023).

Family tradition, mentioned by 16.36% of farmers, also stands out as a significant factor. This aspect highlights the intergenerational transmission of agricultural practices and knowledge, demonstrating the deep cultural embeddedness of the activity within the community's way of life. Ferreira, Peixoto, and Santos (2023) emphasize that family farming contributes to biodiversity conservation and the preservation of cultural traditions, constituting a distinct way of life.

Factors such as personal preference (5.45%) and the perception of external opportunities—such as company incentives or market demand (5.45%)—were cited less frequently but signal the presence of individual choice and an entrepreneurial outlook in engagement with agricultural production. Although less prevalent, these aspects indicate a diversity of perspectives within the community, where agriculture may also be viewed as a field for personal fulfillment or a response to external stimuli.

In summary, the motivations for agricultural practice in the studied community are complex and interconnected, with a strong component of economic necessity and subsistence, but also a significant foundation in cultural and family tradition. These findings corroborate the view of family farming as a multifunctional activity, crucial for "food security, socioeconomic development, and social inclusion" (Ferreira; Peixoto; Santos, 2023, p. 6). Understanding these diverse motivations is fundamental for designing support policies and strategies that are effective and sensitive to local realities, recognizing both the challenges faced by farmers and the intrinsic value of their practices.

The analysis of production and commercialization forms in the community reveals complex dynamics marked by the pursuit of income and the need for subsistence, as well as challenges related to product marketing. The data indicate that the majority of respondents (65.45%) commercialize the products they produce or collect, highlighting commercialization as a central economic practice in agricultural and extractivist activities. This finding is consistent with the observation that, although family farming may initially aim to "meet the needs of the household itself" (Ramírez; Sousa; López, 2018, p. 124), the sale of surplus is a common and necessary practice.

In contrast, 25.45% of participants allocate production exclusively to self-consumption, reinforcing agriculture's role in ensuring household "food security and sovereignty" (Ramírez; Sousa; López, 2018, p. 127). This is a fundamental characteristic of Amazonian family farming, which seeks to "guarantee production for self-consumption and subsequently sell surpluses" (Ramírez; Sousa; López, 2018, p. 126).

Regarding work organization, 52.73% of participants carry out agricultural activities individually, indicating a strong tendency toward independent work. However, a significant proportion (38.18%) performs these activities collectively, generally involving family members. This collaborative dimension may be related both to family tradition—a pillar of family farming—and to the need for mutual support in optimizing production and marketing processes.

The main commercialization pathway identified, reliance on intermediaries (50.9%), reveals considerable dependence on middlemen. This scenario is common in many rural communities and may be associated with the absence of direct sales channels, barriers to entry into conventional markets, and limited producer coordination. Sales through intermediaries, or "long marketing channels," although they may reduce transportation costs for farmers, often result in "price imposition by buyers, sometimes at levels low relative to production costs" (Ramírez; Sousa; López, 2018, p. 128).

Direct sales in local markets, including fairs and nearby towns, practiced by 20% of respondents, represent a short marketing channel. Despite potential transportation costs, these channels offer advantages such as "linkages between producers and consumers, as well as new relationships between production and consumption, seeking fair trade," while promoting "horizontality, trust, knowledge, information, and proximity" (Ramírez; Sousa; López, 2018, p. 128). The existence, albeit limited, of this form of direct sales suggests potential for strengthening producers' commercial autonomy.

Alternative and more restricted marketing strategies, such as made-to-order sales (1.8%) and the share that does not commercialize production (25.5%), broaden the spectrum of adopted strategies, ranging from marginal market participation to a total focus on subsistence. Understanding these diverse forms of production and commercialization is crucial for developing policies and initiatives that support family farming by reducing dependence on intermediaries and strengthening fairer and more direct sales channels, such as local markets and collective organizations.

INCOME GENERATION AND ECONOMIC IMPACT

The analysis of results concerning family farming in this locality reveals persistent challenges aligned with a well-established body of research in Brazil. The very low level of cooperative membership (90.91%) indicates productive isolation that may limit access to markets, technical assistance, and bargaining power—a historical marginalization already highlighted by Junqueira and Lima (2008) as a consequence of agricultural policies focused on large-scale farms. Although cooperativism in southern Brazil has demonstrated potential to boost productivity, the lack of participation may stem from limited access or a culture of autonomy. Delgado and Bergamasco (2017), synthesizing studies prior to 2014, reinforce that the heterogeneity of family farming and the variable effectiveness of incentive policies influence collective

organization, making this a longstanding challenge for sector strengthening.

The variability of agricultural income, often modest, and the fact that a significant portion of farmers (43.6%) lack clarity about their earnings or are not directly involved in commercialization, underscores the complexity of family farming as a primary livelihood source. As observed in interviews conducted for this study, most respondents reported monthly agricultural incomes below BRL 1,000. This scenario of low monetary income from agriculture aligns with recent analyses indicating a growing proportion of rural families primarily dedicated to subsistence production, with occasional surplus sales (Nascimento; Aquino; Delgrossi, 2021). These authors further discuss how difficulties in generating income exclusively from land lead many families to diversify their income sources through pluriactivity, seeking non-agricultural work to supplement household budgets.

The existence of a smaller group with higher agricultural earnings, also identified in this study, suggests greater organization and market access, as discussed by Delgado and Bergamasco (2017) regarding the importance of marketing circuits. In addition, marked seasonality in income generation—reported in interviews as being concentrated mainly between January and March—poses significant challenges for household financial management throughout the year, reflecting intrinsic dependence on natural cycles and specific crop calendars. These obstacles—limited collective organization, often insufficient agricultural income complemented by other sources or focused on self-consumption, and strong seasonality—demand effective and context-adapted public policies.

IDENTIFIED OBSTACLES

The multifaceted challenges faced by agricultural producers in the community, ranging from pest and disease control and the complex maintenance of cultivation areas to transportation and logistics barriers, farmers' health issues, and the perceived absence of government support, echo findings from studies on family farming in Brazil. Difficulties in maintaining crop health and proper land management—such as the need for frequent clearing and irrigation problems—are often associated with what Neves et al. (2021, p. 438) identified as limiting factors: "low levels of education and schooling, which, combined with the lack of technical assistance policies and rural credit, were cited as the main constraints to optimizing cultivation [...], especially regarding

the use of technologies and agrochemicals, in addition to infrastructure deficiencies." This lack of technical support and access to appropriate technologies exacerbates producers' vulnerability to phytosanitary problems and management difficulties.

Furthermore, logistical barriers, such as difficulties in transporting inputs and marketing production due to distance and inadequate road infrastructure, are critical and corroborate the infrastructure deficiencies noted by Neves et al. (2021). These constraints limit market access and reduce production profitability. Added to this are health issues among older farmers, which restrict physical performance, and criticism regarding the lack of technical and governmental support, including limited subsidies and assistance. It is therefore evident that more effective and comprehensive public policies are needed, encompassing qualified technical assistance, improvements in rural infrastructure, facilitated access to credit and technologies, and attention to farmers' health and well-being.

PROPOSALS FOR IMPROVEMENT

The analysis of community perceptions regarding necessary improvements for strengthening agro-extractivist activity reveals a complex and multifaceted panorama, in which demand for government support, collective organization, overcoming infrastructural constraints, and the need for technical assistance emerge as central and interdependent axes. These results strongly resonate with the scientific literature, which consistently highlights the crucial relevance of these factors for sustainable development and the autonomy of rural and extractivist communities.

In this context, a significant proportion of participants (23.6%) emphasized the indispensability of government support. This perception aligns with studies underscoring the crucial role of public authorities in promoting agro-extractivism, not only through direct incentive policies but also through robust technical and financial support and the assurance of active institutional presence to guarantee access to essential rights and resources. Albuquerque et al. (2025) emphasize that public policies are fundamental instruments for addressing structural social problems and, in agro-extractivist contexts, must be designed to improve living conditions while promoting environmental and economic sustainability.

Specific community suggestions—such as direct incentives for planting, distribution of quality inputs, and support with modern agricultural machinery—reflect needs that, if properly addressed, could significantly boost production and strengthen local autonomy. State intervention is vital to ensure sustainable use of natural resources and the well-being of traditional populations, particularly through the implementation and monitoring of policies such as the Food Acquisition Program (PAA) and the National Program for Strengthening Family Agriculture (PRONAF) (Albuquerque et al., 2025).

Complementing the need for external support, internal community organization through the creation and strengthening of cooperatives was identified by 21.8% of respondents as an important resilience-building strategy. This perspective aligns with the literature on regional development and solidarity economy, which highlights the significant potential of collective organizations to enhance producers' bargaining power, facilitate access to fairer markets, optimize integrated production management, and strengthen social cohesion and social capital within communities.

However, even with more effective government support and strengthened community organization, infrastructural challenges remain a substantial and sometimes insurmountable barrier, as indicated by 18.1% of participants. The lack of adequate infrastructure—particularly roads, efficient and safe transportation for product outflow, and storage and primary processing facilities—imposes serious constraints on activity development. Chronic deficiencies in these areas not only hinder and increase the cost of product outflow, raising operational costs and post-harvest losses, but also compromise final product quality, directly affecting income generation potential and economic viability.

Additionally, the need for qualified and continuous technical support was expressed by 10.9% of respondents, who seek training, specialized guidance on good agricultural and extractivist practices, and easier access to updated information to optimize production and management systems. Technical support, formalized through Rural Technical Assistance and Extension (ATER), is widely recognized as essential for improving sustainable crop and natural resource management, implementing effective pest and disease control practices with lower environmental impact, and promoting more sustainable production techniques, thereby contributing to food security, productive sovereignty, and income generation (Albuquerque et al., 2025). On a smaller scale, demand for inputs and equipment (3.6%) signals a desire for technological modernization and increased productive efficiency, which also requires

technical guidance for proper use and maintenance.

Finally, it is noteworthy that 9% of responses indicated a lack of knowledge or uncertainty regarding necessary improvements for the sector. Although a minority, this finding suggests the presence of a segment of the community that could greatly benefit from participatory training processes, enabling deeper engagement in strategic discussions about the future of agro-extractivist activity in their territory.

FINAL CONSIDERATIONS

The study achieved its main objective by elucidating the complex dynamics shaping these micro-productive chains, from producers' socioeconomic profiles to production and marketing systems. Agricultural and extractivist traditions coexist with challenges such as low educational attainment, intermediary dependence, and infrastructure deficiencies, which together shape prospects for sustainable development.

Despite resilience and traditional knowledge, local micro-chains operate under significant vulnerability. Subsistence remains strongly linked to agro-extractivist activities, which are constrained by limited access to fair markets and weak collective organization. Intermediary-dominated commercialization and low cooperative participation represent critical bottlenecks.

The findings provide an empirical basis for more effective public policies aimed at strengthening productive chains, food security, and local autonomy. The study contributes to regional development and management scholarship by reinforcing bioeconomy as a development paradigm for the Amazon and demonstrating that community strengthening depends not only on government aid but also on integrated management valuing productive sovereignty and local social capital.

Future efforts should promote effective public support, expanded access to quality inputs and machinery, and continuous ATER services, alongside cooperative development, infrastructure investment, and training programs. Further research should examine governance mechanisms within these organizations, assess the impact of policies such as PAA and PRONAF on community resilience, and conduct comparative studies with other Amazonian communities to identify best practices and shared challenges for sustainable regional development.

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