

SOCIOECONOMIC DEVELOPMENT AND CONTROLLED DEFORESTATION IMPORTANT FOR THE SUSTAINABILITY OF THE EXTRACTIVE RESERVE RIO CAJARI?

Desenvolvimento socioeconômico e desmatamento controlado são importantes para a sustentabilidade da Reserva Extrativista Rio Cajari?

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Recebido: 19.03.2022

Aceito: 01.02.2023

Abstract

The inhabitants of the Extractive Reserve (RESEX) in Rio Cajari need investments from the state to strengthen public policies for education, health, basic sanitation, and incentives for extractivism activities, agriculture, and animal husbandry. This study evaluated the institutional public policies, survival conditions of the inhabitants, and their relations with the forest. Additionally, variables of the environmental, economic, social, and institutional groups were evaluated with 101 interviewees in 23 of the 31 communities of RESEX Rio Cajari. Here, we highlight the mistake of maintaining extractivism as an attribute, without knowing the market forces, lack of technology, technical assistance, improving social capital, and, more importantly, greater engagement with the extractivists themselves in seeking solutions rather than relying on the government. Deforestation must be part of environmental policy, especially when considering small producers.

Keywords: Social Policies; Productive Activities; Ecosystem Loss; Deforestation.

Resumo

Os habitantes da Reserva Extrativista (RESEX) Rio Cajari aguardam investimentos do Estado para fortalecimento de políticas públicas de educação, saúde, saneamento básico e incentivos as atividades de extrativismo, agricultura e criação de animais. Este estudo avaliou as políticas públicas institucionais, as condições de sobrevivência dos habitantes e suas relações com a floresta. Adicionalmente, foram avaliadas variáveis dos grupos ambiental, econômico, social e institucional com 101 entrevistados, em 23 de 31 comunidades da RESEX Rio Cajari. Aqui evidenciamos o equívoco de manter o extrativismo como apanágio, desconhecer as forças do mercado, falta de tecnologia, assistência técnica, melhorar o capital social e, mais importante, maior engajamento dos próprios extrativistas em buscarem soluções ao invés de dependerem do governo. O próprio desmatamento deve fazer parte da política ambiental, sobretudo para o segmento de pequenos produtores.

Palavras-chave: Políticas Sociais; Atividades Produtivas; Perda Ecológica; Desmatamento.

1. INTRODUCTION

Conservation Units (UCs)¹ have been established worldwide to conserve and preserve nature (MYERS *et al.*, 2000), sustain local and regional scales (BOERS *et al.*, 2017), maintain carbon sequestration, protect watersheds and environmental resources (BONAN, 2008), and become a global strategic priority to reduce human pressure (COATES *et al.*, 2018).

However, 73% of them suffer from deforestation and forest loss, exemplified by Asia (0.25% to 1%), Africa (0.1% to 1%), Latin America (0.1% to 1%), Australia, and New Guinea (0.03% to 1%) (WEISSE and Nughton-Treves, 2016). The forests, both within UC's and in general, have suffered these events for more varied reasons than those mentioned (BOISSIÈRE *et al.*, 2009).

In Brazil, large investments were intended to reduce the rates of forest loss in the UCs, but problems persist in the management of these units, such as illegal logging, burning, agricultural expansion (COLLINS; MITCHARD, 2017), ineffectiveness of government actions (FRANÇOSO *et al.*, 2015), and ecosystem destruction (DRUMMOND; FRANK; OLIVEIRA, 2012; LAGESSE; THONDHLANA, 2016).

Similar problems occurred in extractive reserves (RESEXs)², which came to light shortly after the assassination of Chico Mendes (trade union leader of rubber tappers) on

¹ Areas belonging to the Union that aim at scientific research, visitation, tourism and human actions that preserve and/or preserve fauna and flora.

² Category of UC of sustainable use that allows, under concession of use, in addition to scientific research, visitation and tourism, activities that seek to improve the living conditions of the inhabitants and environmental conservation.

December 22, 1988. The RESEXs, as a way to rescue and strengthen the extraction of rubber trees (*Hevea brasiliensis*), developed extractivism of the chestnut, collection of resins and vegetable oils, agriculture, and cattle ranching of subsistence, among others.

From an environmental point of view, the creation of RESEXs contributed little to making small producers aware of the importance of reducing deforestation (CARMETA *et al.*, 2016), both in high-impact areas (near vicinal and BR roads) and low-impact areas (on the banks of rivers and streams) (ADENEY; CHRISTENSEN; PIMM, 2009).

As identified by Silva *et al.* (2015) and Costa *et al.* (2015), in the social sense, public institutions do not present possibilities for quality education, supply of piped water, sewage treatment, and solid waste, in the following Amazonian UCs: Canutama Forest, Tapauá Forest, Matupiri Sustainable Development Reserve (RDS), Matupiri State Park, Madeira River RDS, Igapó-Açu RDS, Amapá River RDS, and Piagaçu-Purus RDS.

In economic terms, families in UCs are divided into two groups: the first (minority) depend on extractive production, and the second (majority) on agricultural and livestock activities (DASH; BEHERA; RAHUT, 2016). The combination of activities does not always ensure improvement in the living conditions of the inhabitants, because the inhabitants of the Chico Mendes RESEX have an income below minimum wage, and about 15% of the populace are below the poverty line (MACIEL *et al.*, 2018).

In this context, the following questions arise: Is the development in RESEXs considered sustainable? Why is there no improvement in the living conditions of the inhabitants and conservation of fauna and flora? Has the state contributed to conservation and development³? How do traditional RESEX communities behave? Based on these questions, our objective was to evaluate the relationship between the state actions, situation of inhabitants, and preservation of forests.

These questions complement recent measures adopted by the federal government in relation to UCs. On 13/1/2021, Law No. 14.119 (13/1/2021) created the National Policy of Payments for Environmental Services (PNPSA), and on 9/2/2021 signed Decree No. 10.623 that created the Program to Adopt a Park (PAP), to promote the conservation, recovery, and improvement of 132 federal UCs in the Amazon by individuals or legal entities, national or foreign, in which the Rio Cajari Extractive Reserve was contemplated. We hope that the

³ We defend as a development base in RESEXs, families that eat at least three meals a day, enjoy adequate housing, have financial conditions for clothing, supplies, transportation, as well as have access to health policies, education, agricultural implements (cleaning and soil management in secondary areas), and technological processes to support extractivists activities.

data from this research leads donors to promote solutions to the problems presented and allows for the creation of permanent and sustainable income alternatives for residents.

The remainder of this study is organized into four sections. First, we present the materials and methods, research subject, study delineation, specific procedures, and data analysis. Second, we analyze the results based on the data collected. Third, we validate the results based on state-of-the-art research. Finally, we highlight the novelty of this study.

2. MATERIAL AND METHOD

2.1. Research Subject

The Rio Cajari Extractive Reserve (1° 05' 10" South and 51° 46' 36" West) was created in 1990 (DECREE No. 99.145) and is among the first four RESEXs in the Amazon. The total area is 532.397 ha and is located in the municipalities of Laranjal do Jari, Mazagão, and Vitória do Jari, State of Amapá (Figure 1).

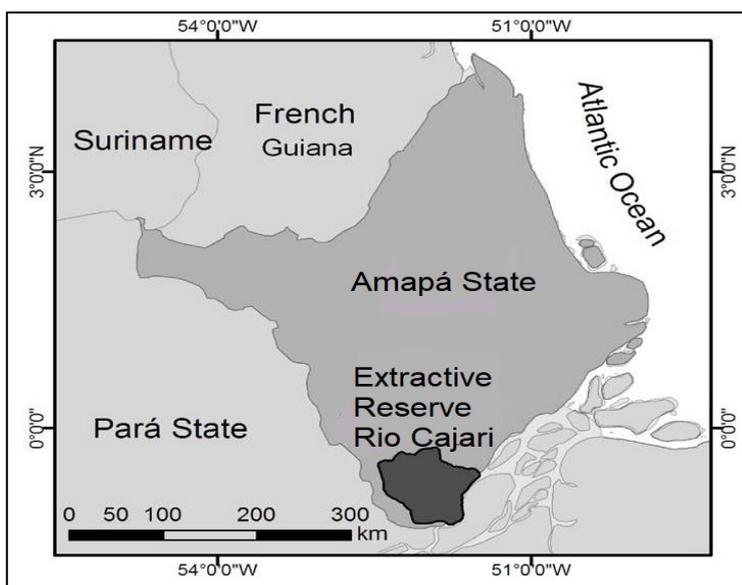


Figure 1 - Location of Extractive Reserve Rio Cajari, State of Amapá (Brazil, South America) and border limits (Pará State, Suriname, French Guyana and Atlantic Ocean).
Source: Funi and Paese (2012).

This RESEX has 2.293 inhabitants (IBGE, 2010), distributed in 31 terrestrial (BR-156 and vicinal roads) and lowland areas (rivers and streamlands). Bubalina breeding (highlighted by the typical conditions of soils and flooded areas), agriculture (production of flour, rice, sweet potatoes, and rice are among the main ones), and extractivism of the chestnut correspond to the three primary economies of subsistence and commercialization of surplus.

2.2. Study Delineation

The study was developed using the method of association with interference, since two or more variables have a dependency relationship (VOLPATO, 2015). For example, students in the RESEX need schools in communities such that there is no migration to urban centers. For the subsistence of local residents, encouraging the productive activities of extractivism, agriculture, and animal husbandry is necessary. Issues related to education, health, transportation, communication, technical assistance, energy, poor conditions of vicinal roads, basic sanitation, deforestation, and low household income prevent the environmental, economic, and social sustainability of local communities.

The association method allows the environmental, economic, social, and institutional variables to be distributed clearly and objectively, to facilitate analysis of the results. Even though it is not common to find studies in the human and social domains, specifically those that use the method of association, it is possible to affirm the validity of such collaboration for the present study and area of knowledge.

2.3. Specific procedures

Data collection at Rio Cajari RESEX occurred during February and March 2017 through semi-open forms, with 38 questions related to groups of environmental, economic, social, and institutional variables. This was complemented with the use of a sound recorder (when authorized) during the interviews, along with the questionnaires, so that the interviewee responses were not limited by the questionnaire.

About 101 household heads (22 to 85 years), of both sexes, were interviewed with questionnaires and sound recorders, in 23 of the 31 communities in the RESEX. The 22-year-old interviewee was the youngest person responsible for the household, the oldest being 85 years. The sampling was randomly stratified, since the communities and the population were predefined in the design phase of the research, and the collective representativeness and the different contexts of the interviewees were considered.

RESEX communities are located on the banks of the vicinal roads and rivers. Displacement occurred by means of a 4 × 4 pickup truck and river flight boats (fast river transport). The inhabitants who participated in the research live in the following communities: Açaizal, Água Branca do Cajari, Ariramba, Boca do Braço, Conceição do Mariacá, Dona Maria, Mazagão, Mangueiro, Marinho, Martins, Poção, Santana, Vila Santana, Santa Clara,

Santa Rita, São Luiz, São João Paraíso, São José, São Pedro, São Pedro Ajurixi, Sororoca, Tapereira and Terra Vermelha.

Additionally, some public managers of the Chico Mendes Institute for Biodiversity Conservation (ICMBio) working with the Rio Ouro Preto RESEX participated in the study. The objective was to identify the investments and the environmental, social, and economic policies of public institutions. The stratification of the groups of residents and managers of RESEX is aimed to facilitate the analysis, specifically on the occasions of data treatment from the collection.

2.4. Data analysis

Qualitative data collection, in the form of questionnaires and interviews, was complemented with a quantitative approach. This confirmation occurred during the research registration occasions in statistical software, where media, median, fashion, standard deviation, variance, and correlation tests were performed. The interviewees' statements served as a basis for including some variables in the statistical tests, since they uncovered novelties that were not included in the questionnaires.

The steps for drawing figures and tables in the results section are as follows. First, the data were registered in a statistical program, along with some variables from the interviewees' statements. Second, the aforementioned tests were performed to obtain clear and objective information. Third, the deforestation table was adapted to that of the Institute of Space Research (INPE).

The sum of the quantitative and qualitative approaches was fundamental to strengthen the study, to accurately present the reality of the residents, their ways of life, and their relations with nature. Additionally, the method presented in this study was tested using a new analysis.

3. RESULTS

Rio Cajari RESEX presents situations similar to other RESEXs in the Brazilian Amazon. The migration of young people to urban centers occurs because of the lack of schools, teachers, and vacancies for the following grades. Almost all schools are the responsibility of the municipal education network, but only elementary school I (1st to 5th year) works regularly (Figure 2).

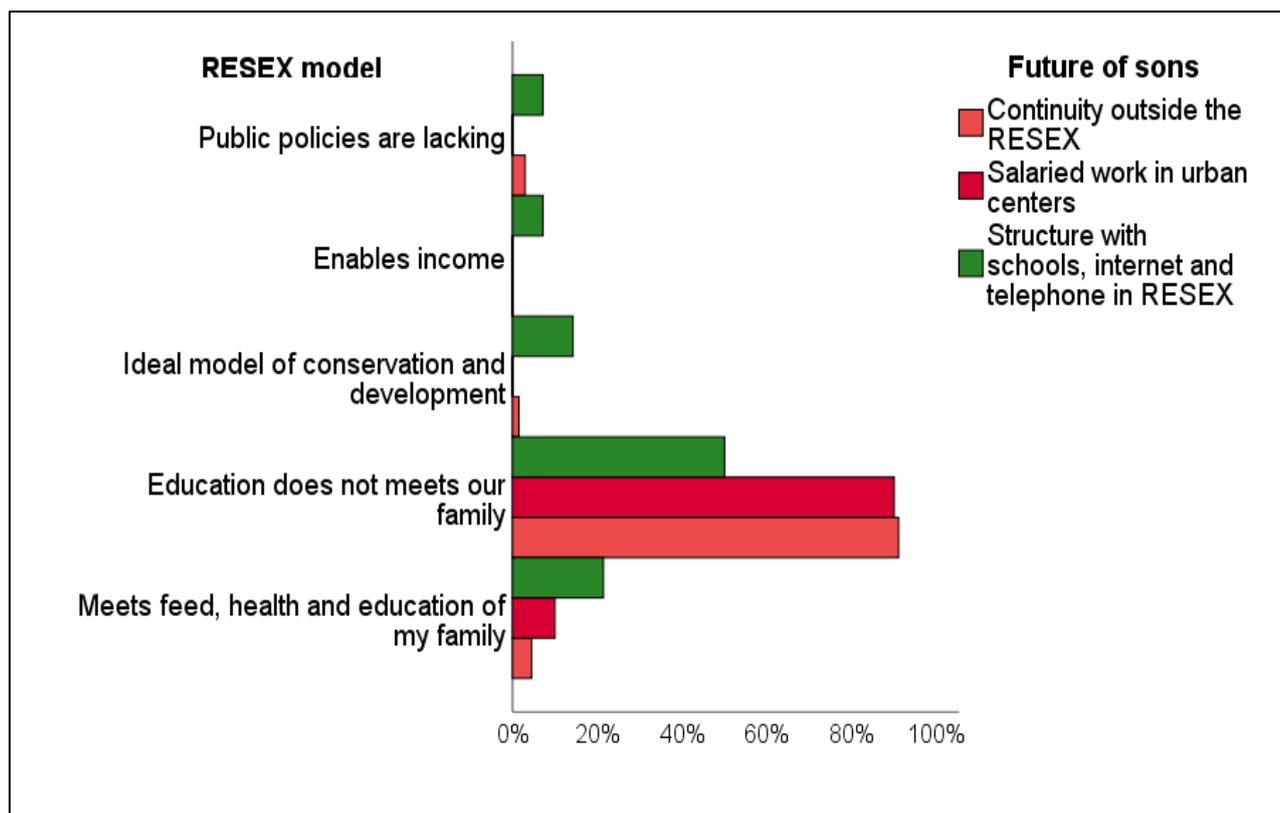


Figure 2 – Conception of the interviewees based on environmental, economic, social and institutional policies. **Source:** Field search.

According to the interviewees, no concern exists in terms of quality or quantity with regard to the educational levels and age groups of the students (manifested in school continuity). This is why parents migrate with their children to the urban perimeters of their nearest cities. Additionally, the option for children to establish themselves professionally outside the countryside shows distrust in the educational system and a lack of faith in the RESEX model.

Most families live in riverside areas on the banks of the Cajari River, where the main issues are the effectiveness of public social policies and subsidies for productive activities. The situations mentioned by the interviewees emerged spontaneously and revealed the biggest problems, causes, and effects of the public policies (Figure 3).

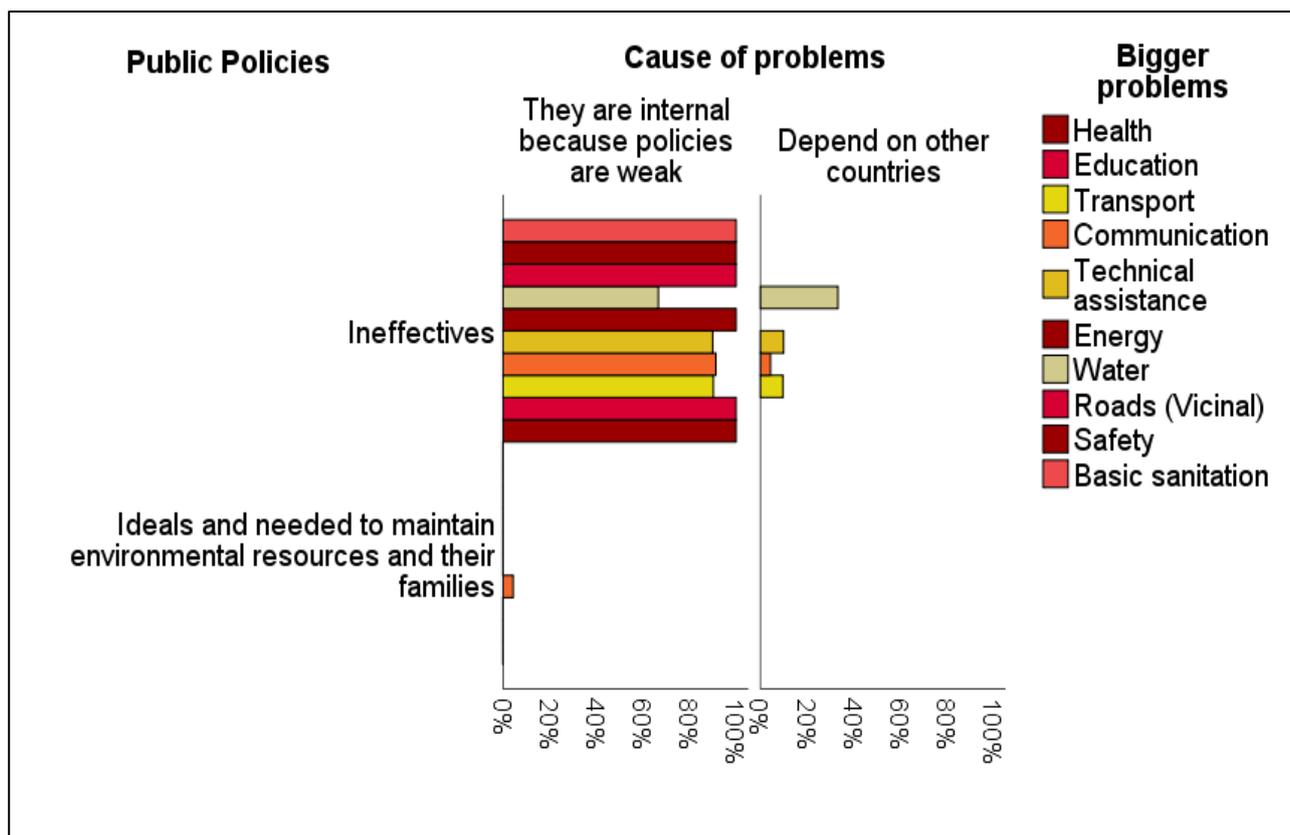


Figure 3 - Main problems identified by the inhabitants of the communities of RESEX Rio Cajari.
Source: Field research.

Based on the interviewees' notes, the planning, management, and implementation of socioeconomic policies do not meet the minimum requirements of local communities. The RESEX requires urgent reformulation of social public policies so that the environmental objectives do not deviate from their goals. The state, represented by the Ministry of the Environment (MMA) and ICMBio, is directly responsible for the failure in environmental and socioeconomic development.

For example, there are no incentives for production or significant financial support through rural credits for productive activities in agriculture (manioc flour, rice, beans, corn, sweet potato, etc.), extractivism (Brazil nuts and vegetable oils), or livestock (cattle, buffalo, poultry, swine) (Figure 4).

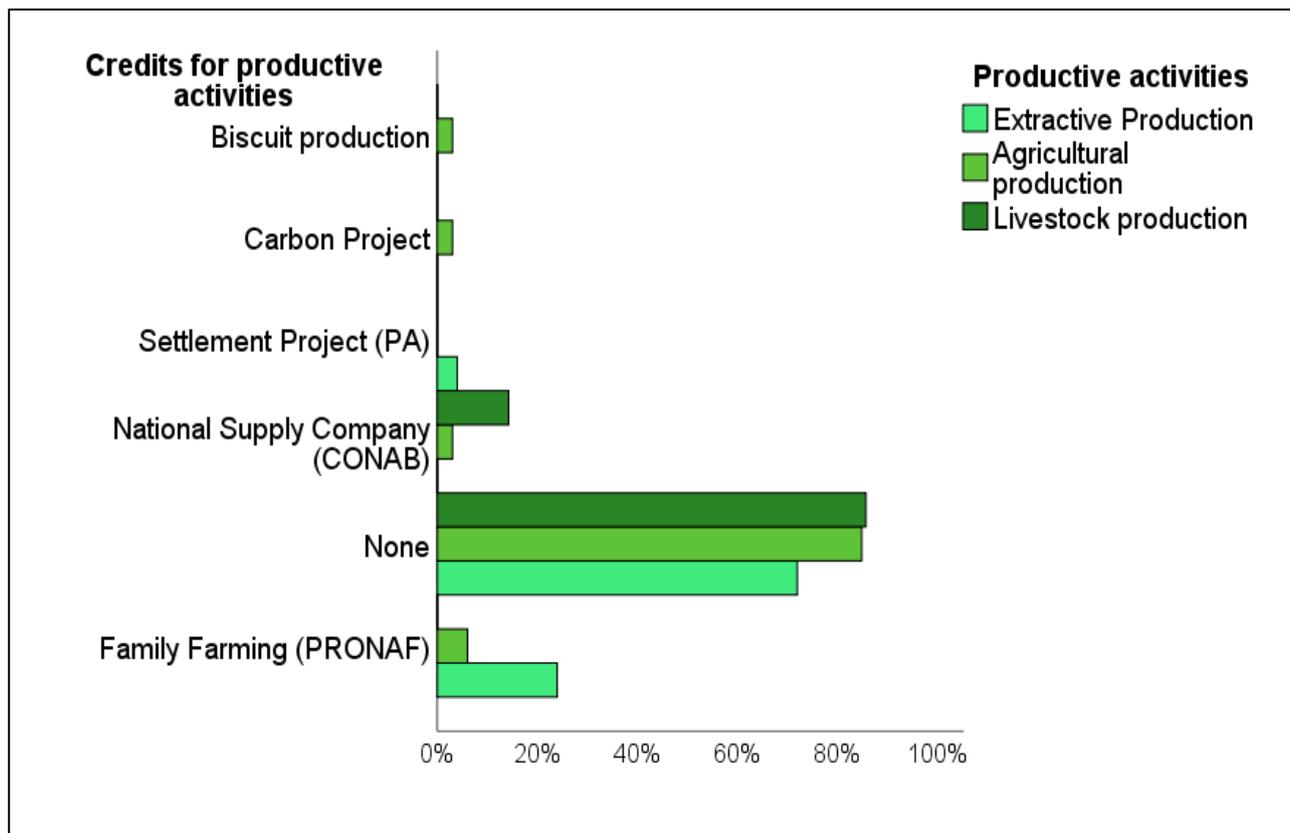


Figure 4 - Productive activities and availability of credits to promote improvements in life for inhabitants.
Source: Field search

Some interviewees confirmed that they received credits to strengthen extractive activities, with the National Supply Company (CONAB) and Family Farming (PRONAF) being the most expressive. However, the predominant issue is the lack of financial investments to enable the expansion of production, sale of surplus, and increase in household income.

Even under these conditions, the productive activities of agriculture and livestock stand out in the RESEX (Figure 5). Throughout data collection, we verified breeders with tens and hundreds of cattle heads and reported the same. In specific cases, the management plan allows a maximum of 20 heads of cattle; however, breeders rarely follow exactly what has been defined.

The interviewees raise cattle and buffaloes, and engage in agriculture (cassava flour, rice, beans, corn and sweet potatoes), in the expectation of guaranteed income and family support. Bovine and buffalo activities are predominant in relation to agriculture, since fur by economic bias; saving in times of need means meeting demands in emergency situations. For example, keeping children in urban centers, medical expenses, and building or

renovating houses depend on the "ox in the pasture." Those engaged in agriculture also justified their economic needs and knowledge of crop cultivation.

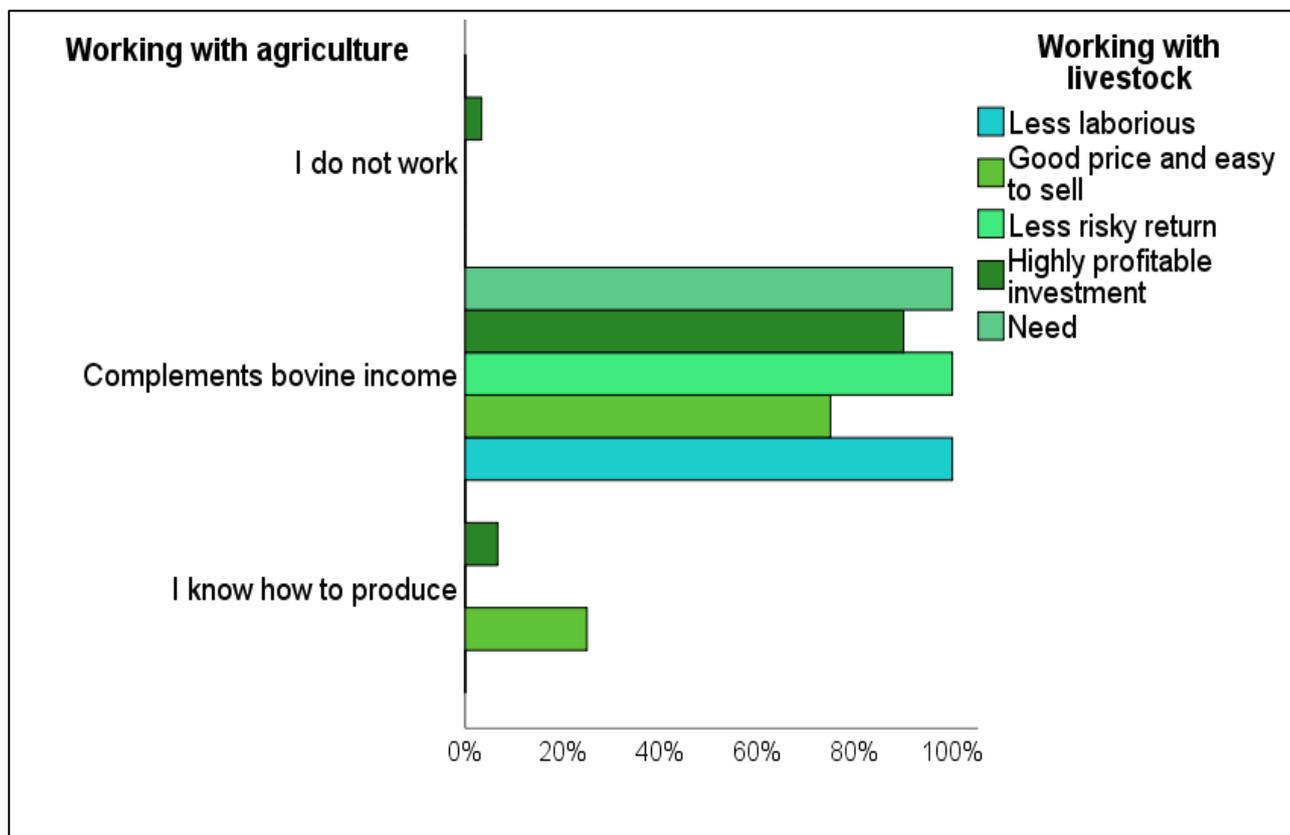


Figure 5 – Reasons for the combination of agricultural activities and livestock
 Source: Field search

Additionally, in the Tapereira community we find the Quilombolas, and in the other communities, the descendants of Caboclos and northeasterners. Agriculture and subsistence extractivism is a principal characteristic of the Quilombola community, along with a simple way of life and less apparent disturbance to fauna and flora. In general, the communities that were studied survived on livestock farming, agriculture, and chestnut cultivation. Although extractivism oscillates its annual production, we consider the supply and commercialization of the chestnut and its derivatives as a strong element for the local way of life.

However, deforestation remains the greatest threat to RESEXs environmental resources because of cattle. The objective of creation RESEXs was to reduce the destruction of environmental resources, which was punished by the advance of the agricultural frontier in the Amazon in the 1970s and the 1980s. The Rio Cajari RESEX area belonged to a large economic enterprise called the Jari Project, which operates in timber,

agricultural, vegetable, mineral, and industrial activities. Table 1 presents a historical series of the RESEXs deforestation projects.

Table 1: Historical series of deforestation in RESEX Rio Cajari.

| RESEX/Year of creation | Total area (ha) | Periods | Deforestation (ha) | % |
|----------------------------|--|------------|--------------------|-------------|
| Rio Cajari (Amapá) 1990 | 532.397 (ha) 2.293 (population) | Until 1997 | 7.720 | 1,45 |
| | | 2000–2005 | 1.454 | 0,27 |
| | | 2006–2010 | 1.940 | 0,36 |
| | | 2011–2015 | 776 | 0,14 |
| | | 2016–2021 | 966 | 0,18 |
| | | | 12.856 | 2,40 |

Source: Adapted from INPE/PRODES, 2023.

The information provided by the National Institute for Space Research (INPE) was adapted and divided into five periods. Although the INPE does not report the beginning of the first period, the findings show a high deforestation in relation to the following ones, perhaps as a result of the legacy left by the Jari Project and the pressure on the development of the Amazon from the 1960s onwards. Additionally, deforestation continued on the basis of clearing primary forests for the expansion of pastures, as well as for the development of productive activities by local inhabitants.

The considerable decrease in deforestation in the fourth and fifth periods in relation to the first period is due to the policies implemented to strengthen extractivism activity, as well as the strict surveillance action implemented by the managers of the ICMBio.

4. DISCUSSION

The high illiteracy rate and low level of education, inability of the state to foster subsistence for the inhabitants, and migration of children to urban centers are related to insufficient public service offerings. Residents expect education and health policies, incentives to produce through credits, agricultural machinery, soil management, as well as technical and technological assistance. However, the state is acting more clearly in terms of inspection, to reduce deforestation and maintain forest cover.

The lack of schools in most RESEX communities, low level of education (elementary I), and frequent lack of school meals are the main causes of the high illiteracy index and migration of RESEX students to urban centers. Costa et al. (2015, p. 52) showed a high percentage of deficit in the supply of teachers and vacancies for elementary schools in the Canutama Forest (79%), Floresta Tapauá (64%), RESEX Canutama (63%), Igapó-Açu

Sustainable Development Reserve (25%), Matupiri Sustainable Development Reserve (53%), and Matupiri State Park (74%).

The creation of RESEXs meant a strong Brazilian environmental policy. However, this model did not meet the basic needs of the residents. The creation of RESEXs, even if it guarantees land ownership, did not represent major changes (CAVALCANTI *et al.*, 2018), which has led residents to intensify predatory productive activities (MACIEL *et al.*, 2010), to ensure income, subsistence (SANTOS; BRANNSTROM, 2015), and alleviate poverty and rural exodus (MEDINA; BARBOSA, 2016).

The current situation draws attention because public policies have not integrated social development with the territorial dimension of RESEX (GRANDADA; CORTÉS, 2015). There is no integrated project targeting social, environmental, and economic sustainability (PIVETTA, 2002), either by disregarding sociodiversity (NELEMAM; CASTRO, 2016) or by focusing excessively on environmental conservation (FREITAS *et al.*, 2018).

Additionally, the ICMBio does not carry out social and productive projects, except when there are timid partnerships with the Brazilian Agricultural Research Company (Embrapa), and non-governmental organizations (NGOs), among the main ones. Commonly, inhabitants carry out productive activities that prioritize production systems in the following economic order: bovine and buffalo, agriculture, and extractivism.

In this sense, agricultural economic activity offers a valuable contribution to local development to different social actors (WALTER *et al.*, 2016), and is among the main economic activities of RESEX (CALLE; VIEIRA; NODA, 2014). The extractivism, in turn, was based on the belief of infinite (HOMMA, 2011) and could not sustain itself economically because of a lack of financial subsidies (LOPESA *et al.*, 2019) and necessary family support (LAVOIE; BRANNSTROM, 2019).

In this context, the marketplace activities of agro-extractivist products are central and necessary for the survival of individuals (MISES, 1987). They are associated with social constructions (LÉVESQUE *et al.*, 2001) and become subordinate to social action (GRANOVETTER, 1994), depend on prices and social relations (STEINER, 2001), or meet needs and desires (RAUD-MATTEDI, 2005).

The inhabitants of a RESEX perform some productive activities. However, cattle and buffalo farming stand out due to increased income, when compared to agriculture, which is engaged in out of necessity and economic complementarity. In these terms, we cannot disregard combined production because it is economically viable, allows sustainable flow

(KLIMAS *et al.*, 2012), and develops alongside socioeconomic and ecological dimensions (THALER; VIANA; TONI, 2019).

Because of the logic of environmental impacts, even with periodic reduction, deforestation has been associated with pastures and swiddens, in contrast to the exclusive focus on environmental conservation, a policy developed by the Protected Areas in the Amazon Program (ARPA), since 2003. The expansion of deforestation corresponds to the advancement of land use for the formation of pastures (MACIEL *et al.*, 2018, p. 407), illegal activities, low financing (PARENTE; BURSZTYN, 2012), and a devaluation of the extractive chain (MASCARENHAS; BROWN, 2010; SILVA, 2018).

In fact, no imminent and viable alternatives exist to reduce deforestation and burning, increase the legitimacy of interventions at the local level, allow farmers to practice small-scale agriculture, maintain ways of life, cultural identity, and food security to address environmental and socioeconomic issues (CARMENTA; COUDEL; STEWARD, 2019).

Usually, extractivists change their non-timber productive means for cattle raising (PERES, 2011) because they understand that the latter is a good alternative to address financial problems (MACIEL *et al.*, 2010, p. 491) stimulated by regional, national, and global factors, in addition to market forces (GOMES; VADJUNEC, 2012). Similar experiences take place at UC Kanha tiger reserve (India) and UCs of Koshi Tappu Wildlife Reserve (Nepal). In the first, cattle ranching activities represented 9% (AWASTHI *et al.*, 2016), and in the second, pastures increased by 54% (PEÑA *et al.*, 2016). The goal is to expand cattle ranching, because it allows for quicker income (KRÖGER, 2019).

In the 1990s, mainly from 1995 to 1999, RESEXs obtained considerable investment from international institutions and organizations through the Pilot Program for the Protection of Tropical Forests in Brazil (PPG7). However, after this phase, the exaggerated conservationism, through the action of the ARPA, did not allow investments with social priority. Currently, RESEXs suffer from low state attention related to social and economic policies, and the objectives of their institutional management are antagonistic or disproportionate to the needs of the inhabitants.

The PNPSA was created to provide a new configuration to RESEXs. Decree No. 10.623 of February 9, 2021, instituted the PAP, making the available 132 UCs in the Amazon to promote conservation, recovery, and improvement by private individuals and legal entities—both national and foreign. A ceiling value was established for domestic entities, with a minimum value of R\$ 50.00 per hectare, and a minimum amount equivalent to € 10.00 for foreign entities. The Rio Cajari RESEX is included in the schedule, and allows a contribution

of more than 26 million reais if this adoption occurs. We hope that these resources will provide long-term solutions to the problems identified in this survey.

5. CONCLUSION

Since the assassination of the union leader Chico Mendes (1944-1988) several proposals to end deforestation and burning, and also promote socioeconomic development in the region have been put forward. The 'standing forest' and extractive collection, extractive reserves, agroforestry systems, sale of carbon credits and environmental services, and community forest management, among others, are included in this list.

The common antithesis is to be against livestock, soybeans, corn, cotton, reforestation, logging, mining, hydroelectric, highways, railways, among the main ones. The microcosm of this survey carried out in the Extractive Reserve of the Cajari River, common to other RESEXs in the Amazon, is the lack of technological alternatives, low price of extractive products and agriculture, low productivity, dispersal in the forest, difficulty in joining the collected products, beneficiation, perishability, and transport. Few important extractive products exist, some of which have already been domesticated, and each extractive product has a specific behavior.

Added to these aspects is the low level of formal education, precarious health system, schools, transport and communication. This reflects a low dependence on government transfers in the survival strategy of the communities.

To overcome these limitations, this study highlights the mistake of maintaining extractivism as an attribute, ignoring market forces, lack of technology, domestication of extractive plants that have a market, technical assistance, improving social capital, and, most importantly, greater engagement of extractivists in seeking solutions instead of depending on the government. Deforestation itself must be part of environmental policy, especially for small producer segments.

In the context of concrete public policy, evidently, no magic solution exists for Amazon. Policies take time, are expensive, and require effort and dedication from the participating parties. For Brazilian public institutions, a clear message is that they are not acting as they should. On the contrary, international institutions must understand that the imposed solutions do not always meet the demands of local society.

ACKNOWLEDGEMENT

We thank the Chico Mendes Institute for Biodiversity Conservation (ICMbio), for allowing us entry and transportation to the displaced RESEX communities. Moreover, we lovingly acknowledge the residents who welcomed us into their homes and gave all the support we needed. Thank you very much.

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Recebido: 19.03.2022
Aceito: 01.02.2023