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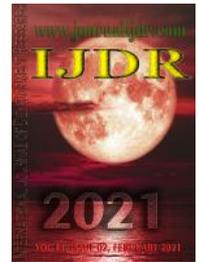
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RESEARCH ARTICLE

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THE ROÇA SEM QUEIMAR SYSTEM PERCEIVED AS A PRODUCTIVE ALTERNATIVE IN THE AMAZON

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ABSTRACT

The Rural Workers Union - STTR of Medicilândia, in Pará, since 2000, has been carrying out the Roça Sem Queimar project. Experience with the initiative to implant the crops without fire in the preparation of the areas. The third version of the project, from 2011 to 2013, was supported by the Ministry of the Environment - MMA through the Demonstrative Projects A Program - PDA / PADEQ, and 38 farming families were monitored to verify: a) the factors that influenced the adoption of the system; b) the practices adopted in preparing the area; c) the perception of implications for the production system through the adoption. The experience's preliminary results are systematized based on the monitoring and interviews with 35 families. It was possible to identify the decrease in the use of the cutting and burning system, enabling improvements in soil quality, higher production quality, and benefits for workers' health and the environment. The perception of farmers regarding all these changes in production systems is the focus of the study. Another aspect studied is the perception that producers have of the project's capacity to contribute to new markets, especially in the cocoa culture.

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INTRODUCTION

In their various categories and scales, the agricultural activities were some of the leading promoters of the development and configuration of the various productive dynamics in the Amazon. Thus, over the years, practices have been adopted that, to some extent, have degraded and degraded natural resources. In the case of the itinerant agriculture model, based on the system of cutting and burning of primary vegetation (and in some cases secondary) as preparation of areas for the agricultural cultivation of an area for one to two years, followed by several years of fallow (Schmitz, 2007; Freitas *et al.*, 2013). This model has always been the subject of many debates and criticisms, mainly due to the dichotomy between the low production cost and the environmental damage caused, mainly because almost all family farmers primarily practice it. For Carvalho (2009, p. 4), the itinerant model of agriculture directly contributes to the increase in the deforestation rate in the Amazon. Corroborating the author, data from the National Institute of Space Research - INPE (2013) presented deforestation of 402,615 km² of native vegetation in the Brazilian Amazon. According to interpretations, despite the oscillations, rates increase in the intervals of the last 25 years. According to Sampaio *et al.* (2007, p. 2), fire is part of farmers'

traditional crop, one of the oldest technologies incorporated into the production system. However, although cheap, it is fast, the itinerant system of cutting and burning contributes to the degradation of the soil's physical, chemical, and biological properties. For this author, it is necessary to discover productive alternatives in place of fire. From the above by Sampaio (2007), this text's scope has an alternative to family farming's production systems. The results of the experience of a group of farmers in Medicilândia, State of Pará, in the Brazilian Amazon, are presented, which resulted in the proposition of the "Roça Sem Queimar system." The experiment was started in the 1990s, spontaneously and without any pretensions, in 2000, gains the institutional support of the STTR of the municipality, which immediately sought financial support to monitor families and monitor the swidden systems without burning in the perspective of socializing the alternative for other farmers in the region. The Roça Sem Queimar project, as it became known after institutionalization, aimed to provide family farmers with an alternative to fire in implementing their crops, without entailing high costs with the acquisition of equipment and inputs as provided in mechanized systems. Also, it aimed at environmental recovery through forest replacement through commercial agroforestry systems (APS), thus ensuring, in addition to

the physical benefit to the soil, an extra income for families with the production of the species in the region. This project was conceived in 1997 by the farmer Francisco de Assis Monteiro, who, after participating in a seminar on agroecology in the State of Mato Grosso, proposed an experiment that would put into practice the principles seized at the opportunity. According to Serra (2005, p.30), the initiative, as proposed, was an alternative to the cutting and burning system and the consequent negative impacts of this practice. Between 2000 and 2006, with the Union of Rural Workers of Medicilândia - STTR's coordination, the initiative's first stage was developed. In this first attempt, monitoring and systematization activities were carried out in the agricultural areas of eleven municipalities that make up the Transamazonian and Xingu Territory. Due to the sample size, the follow-up technical team judged the results insufficiently. At the end of the first step, it was evaluated that there was a need to resume the project on a smaller scale, thus establishing evaluation parameters necessary to implement and monitor the system. In this sense, with the Ministry of the Environment's financial support - MMA through the Demonstrative Projects Program A - PDA /PADEQ, the Roça Sem Queimar project (The second stage), from 2006 to 2010, accompanied farmers only from the municipality of Medicilândia. Part of the results of this stage can be verified in work developed by Serra (2005).

In 2011, based on the results obtained with the second stage of the project, the Ministry (MMA) renewed the partnership. The STTR of Medicilândia assumes the responsibility of expanding the sample of farming families. This exercise was done in partnership with the STTR of Brasil Novo (bordering municipality), which indicated families who would have an interest and potential to implement the demonstrative units in their properties. At this stage of the project, the third stage, the objectives were also expanded. In addition to the technical gains and objectives previously recorded, it was intended from that moment on to also record families' impressions regarding social and economic gains for having adopted the Roça Sem Queimar system. At this stage of the project was established an arrangement formed by institutions such as the Brazilian Agricultural Research Company - EMBRAPA, the Federal University of Pará - UFPA, the Executive Committee of the Cocoa Plantation Plan - CEPLAC and the Technical Assistance and Rural Extension Company - Emater, for monitoring the implementation of the gardens and evaluation of the results in various areas of scientific knowledge. Another important aspect related to the Roça Sem Queimar system concerns its characteristics that differ from traditional models, revolving around the best quality of production, under several issues: respect for the environment, rational use of natural resources, non-use of chemical sources, more significant generation of employment. Some of these characteristics align with recent market trends that require, among other things, products from more sustainable and clean production systems. According to Santos *et al.* (2012), products originating from innovative production models can be valued with the consumer through a seal or a designation referring to the origin and the way they are produced by have a reputation linked to their origin, which creates the potential for differentiation within the market. The Roça Sem Queimar system's products can be valued as an innovative production model once it respects the environment and the families' health. In this text, we will take as central axes: 1) the perception about the changes in the production practices of farmers who adopted the Roça Sem Queimar system from the actions of the project and; 2) how the Roça Sem Queimar system can be a factor for Amazonian family farmers to have access to markets guided by the innovative production models.

Identify, Research and Collect Idea: The municipality of Medicilândia is in the Southwest of the State of Pará, into the integration policy of the State of Pará, belongs to the Xingu Integration Region (Figure 01). The municipal office is on the bank of the BR-230 (Trans-Amazon highway), 902 km from the city of Belém, the state capital. The municipality has a territorial area of approximately 8.27 thousand km², with an estimated population in 2014 of 27,328 habitants, 37% of them with origin in other regions of the country, according to data from the Brazilian Institute of

Geography and Statistics - IBGE (2010), the population density of the municipality of 3.33 habitants/km², below the national average. According to the same institute, 73.3% of the population is concentrated in the municipality's urban area. This division does not apply to economic activities because the municipality has, to no small extent, the so-called "urban farmers," despite living in the city having rural properties where they develop their economic activities. This characteristic is influenced by the fact that the city is surrounded by rural communities located in purple land areas, suitable for cultivating cocoa culture. The cocoa plantation is one of the municipality's main economic activities, occupies an area of 22,467 hectares (IBGE, 2010), a significant contributor to the income formation of the municipality's families. According to IBGE (2010), the average monthly income of families who survive from the agricultural and extractive activity was approximately R\$1,372.00, significantly more than the Pará state media that is R\$ 806.76. In addition to the cocoa plantation, the municipality presents cattle ranching as another crucial economic portfolio activity. During the follow-up of families, from 2011 to 2013, action research was adopted as a method. Considering how Thiollent (2009, p. 16) did, that is, action research as "a type of empirically-based social research that is conceived and carried out in close association with an action or with the resolution of a collective problem and in which researchers and participants representing the situation or problem are involved in a cooperative or participatory manner." It is noteworthy that having action research as a method is to seek "a research strategy by aggregating various methods or techniques of social research, with which a collective, participative and active structure is established at the level of information capture" (THIOLLENT, 2009 p. 28). Based on this statement, we sought researchers from different areas of knowledge, establishing a network, strife with thinking and acting, based on research as a transforming action. Thus, the researchers experienced the research to overcome the limits of conventional investigations, extrapolating the academic and bureaucratic aspects usually adopted, thus during the research, planned actions were adjusted because of constant evaluations of the planned activities. The research was carried out in three complementary stages: nucleated meetings with families in the training centers or community school, socioeconomic diagnosis with the families in their properties, and monitoring the implementation and maintenance of the swiddens without burning. During the project, 35 families of the 38 participants were followed and interviewed. The sample was not total due to three farmers being outside the municipality when families' monitoring began. The spatial distribution includes 12 of the 15 country roads in the municipality. In the research, we seek to value farmers' knowledge and practices to quantitative and qualitative techniques. There is an understanding that this knowledge is fundamental to preserving biodiversity since the relationship with the environment has guaranteed families the possibility of social reproduction over time without limiting the natural resources available in their properties. Finally, it is worth mentioning that it was possible to treat and analyze quantitative information due to software like Microsoft Access 2010 and Microsoft Excel 2010, statistical functions, and dynamic table features, which allowed better analysis and grouping of data with tables and graphs.

RESULTS AND DISCUSSION

With the research, it was evident that 60% of the families interviewed are from other states of the country and migrated to Medicilândia in the 1970s and 1980s, influenced by government policies of colonization of northern Brazil. In their statements, nobly appear the difficulty of adaptation while causing changes in the newly occupied territory. According to Leal (2010, p. 1), the cultural, social, and even environmental shock experienced by migrant families caused significant changes in the territory's dynamics. The families interviewed, mainly (74%), were composed of more than three (03) family members. However, the family labor is not enough to maintain the systems, and the families hired a workforce to ensure the viability of the properties. It is interesting to emphasize that among the

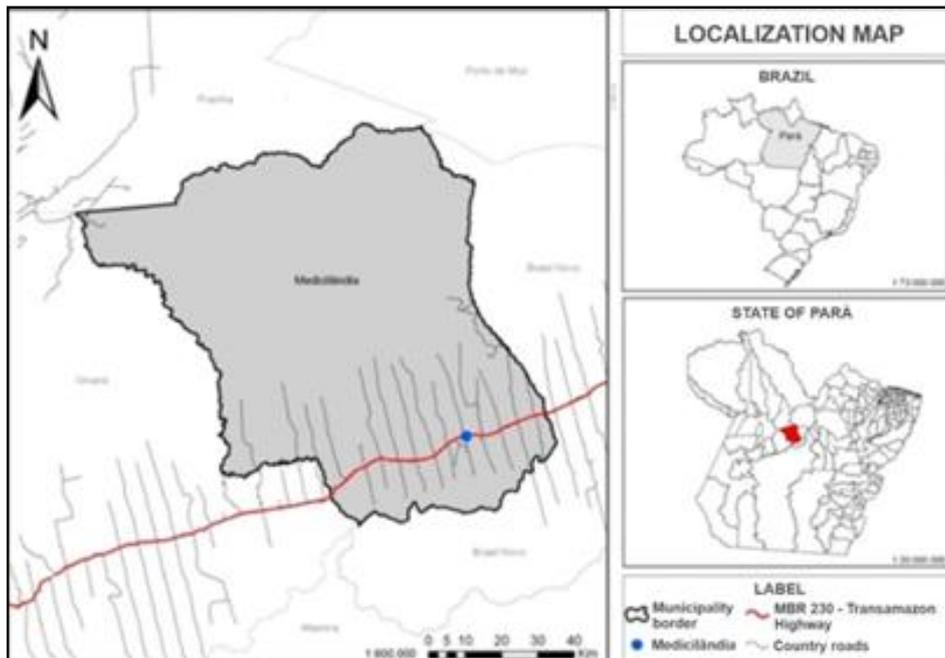


Figure 1. Location map of the Medicilândia-Pará. Source: adapted from IBGE, 2020

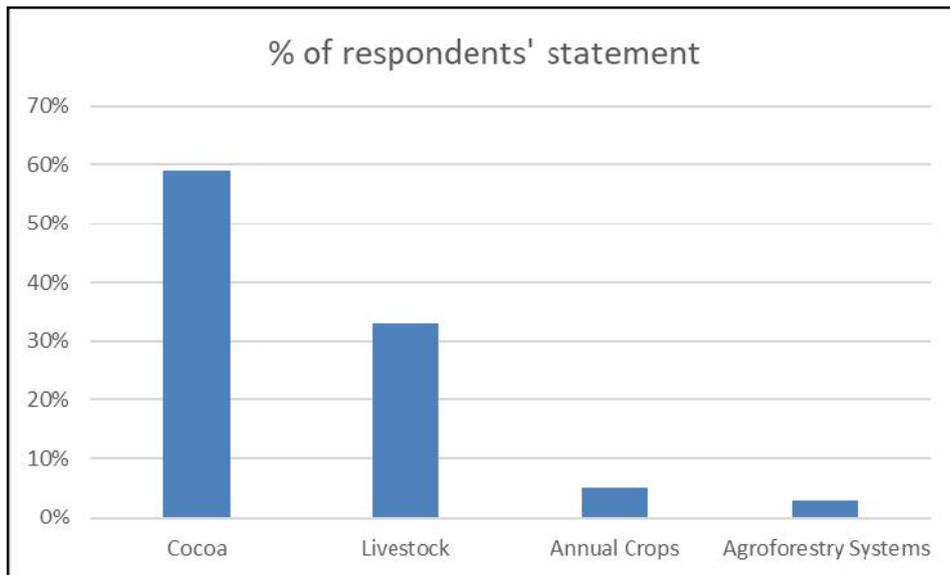


Figure 2. More profitable agricultural activities for family agricultural producers. Source: Field Research (2013)

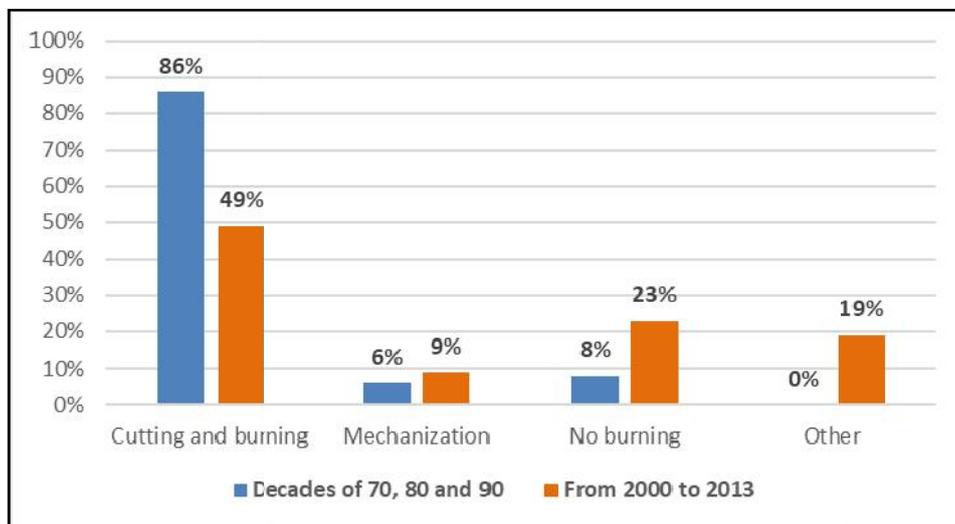


Figure 3. Statement of the percentages of the systems adopted in the evolution of production systems. Source: Field Research (2013)

families accompanied, 34%, they counted only in the patriarch's workforce to manage and execute the main activities (cocoa farming and cattle ranching) of the property. The concentration of activities with the person responsible for the property occurs due to the children's need to study. In the communities that do not have high school classes, the young people migrated to the urban center of Medicilândia seeking the studies' continuity. Due to the scarcity of labor, the families' alternative was hiring a workforce, mainly like a partnership or exchanging days with neighbors. Therefore, the low availability of family labor was a limiting person for maintaining the systems because it was not always possible to count on third parties to perform certain activities. In this sense, what was verified by Ferreira (2003, p. 92) in his studies applies to the realities of the agricultural families of the third stage of the Roça Sem Queimar project of Medicilândia, that is, "labor as one of the decisive factors for strategies for conducting production systems in family units," compromising the sustainability of agricultural activities. The demand for labor force was evident when verified in the expenses of the properties, which 40%, on average, was destined to hire third parties to maintain the cocoa crop, especially for the cutting and pruning of the crop. The aggravating factor is that even the production of cocoa guaranteeing a significant part in the financial income of the property (67% of the income), at many times the families, 42%, mainly in the period before the harvest, use resources from the family grant or retirement, to ensure the hiring of third parties in the property. It is worth clarifying that to carry out the maintenance of the cocoa farming area, on average 10 hectares, in each property, farmers make their labor available as a labor force to the neighbors, thus ensuring another form of income and consequently entry of investment in the crop. Therefore, it was recorded the existence of a daily exchange network among farmers who grow the cocoa crop in the municipality of Medicilândia. This informal labor force market enables the continuity of crops in the municipality. The socioeconomic diagnosis interviews drew attention because 90% of families accessed financing during the 1990s, financing primarily for planting short-cycle crops (so-called annual crops) and cattle herd acquisition. According to the interviewees, the strategy was to ensure the permanence in the property and start implementing the permanent crop, the cocoa crop. The funding went from R\$ 9,000.00 to R\$ 12,000.00, according to 54% of the families interviewed.

During the research, two recurring arguments were ratified in the debate on family farming in the Amazon, the vulnerability in the family installation on the property, when the majority resorted to financing as a continuity strategy, and the workforce as a limiting factor conduct productive systems. The occupation of the territory directly influenced the municipality of Medicilândia in general and its specific agrarian space. With the colonization projects developed by the Federal Government in the 1970s, it was possible to fix many municipality farmers in their current properties, these with 100 hectares, respecting the fiscal module proposed for the region during that period. Among these farmers who settled in the 1970s, the research participants indicated that they did not exceed 20% of the open area during the first decade. That is, initially, the native forest of the properties was maintained according to the legislation. After the public incentive via credit, especially in the 1990s, the properties alter the landscape dynamics. They now have less than 50 hectares of native forest area, predominantly in the coverage areas of capoeira, pasture, and perennial crops, with emphasis on cocoa farming. According to Hurtienne (2005, p. 2), the construction of highways, official and private colonization programs, spontaneous migration, and tax incentives stimulated more than 17% of deforestation in the Amazon, consequently creating degraded agrarian landscapes, especially near the road axes, where live the majority of the rural population. During the research, the farmers' desire to recover their areas and mitigate the degradation carried out during previous decades was evident. Thirteen (13) different production systems' arrangements were found, highlighting the cocoa crop's predominance, where 30% presented the vegetation cover composed of primary forest, capoeira, cocoa crops, and pastures. Cocoa farming and livestock were predominant in properties with more than 50 hectares, being the first activity to be the most profitable for 59% of

farmers, followed by livestock, according to Figure 02. According to the farmers' statements, the cocoa crop's highlight in the production systems occurs due to the quality of the municipality's soils, classified as Red Nitisols, with high fertility, favoring the excellent performance production. The research showed the need for farmers to have other activities to subsidize cocoa production. Crops with less economic importance such as rice (*Oryza sativa* L.), beans (*Phaseolus vulgaris* L.), and cassava (*Manihot esculenta* C.) assume the function of regulating the systems, ensuring the subsistence of families as they allocate investments to improve cocoa crops. Historically, family farmers have adopted traditional techniques in agricultural practice, mainly transmitted between generations. For example, the cutting and burning system is verified in most family production properties in the Amazon. With the Roça Sem Queimar project's implementation, it was possible to verify farmers' acceptance for incorporating new procedures to exploit their agricultural activities. In these terms, there is an agreement with Miguez et al. (2007, p. 6), who considers it possible to influence new technologies in agriculture families' daily lives. The system of cutting and burning of the primary and secondary forest, for decades, was the main way of preparation used by farmers in the territory of the Transamazonian. The interviewees reported that fire was the most used procedures in the openings of primary forests to implant crops. After the first openings implemented short-cycle crops, annual crops are planted to ensure family support and the possibility of land maintenance for survival reasons. With the annual crop harvest (rice and corn, mainly), pastures were made, or, in most cases, perennial crops were implanted, especially cocoa crops. The use of the itinerant system in agriculture, based on cutting and burning, was significantly reduced from opening properties to the research time. It was evidenced in a study that 49% of the interviewees still use fire as land use and management practice. However, 63% of them reported not performing area preparation in the same way they did in the initial years of agricultural activities. Emphasis on the increase of the systems accomplished to the detriment of monocultures and the mechanized system's adoption in the area's preparation.

In Figure 03, it is possible to verify the decrease in percentages of fire use among the properties followed. In previous decades 86% of respondents used cutting and burning as a practice to prepare the areas. More recently (2000-2013), this number drops to 49% of respondents who still use fire to prepare their planting areas. In Medicilândia, the significant increase in farmers who have adopted fire-without practices is linked to STTR initiatives, which since the beginning of the 2000s, has stimulated and sought incentives to implement the Roça Sem Queimar project. The techniques proposed in the system are based on agroecological principles, such as the use of secondary vegetation areas for planting. Initially, the undergrowth is rotated with a machete. Then, the cutting of the smaller trees and, finally, the more giant trees' felling and lowering to allow the marking, preserving the native species and food, medicinal and other interest. In this first stage, the vegetation accumulated with the drill and the felling is chopped or cut into smaller pieces and distributed homogeneously in the area to protect the soil, facilitate decomposition, and reduce the appearance of weed species (WILKE, 2004, p. 21). Figure 04 shows images of the steps described here. According to farmers, the main argument in changing practices recognized the damage generated by itinerant agriculture. Farmers point out that one of the significant damages is the decrease in water retention capacity, consequently decreasing soil moisture, conducive to phenomena such as erosions and the absence of microorganisms to help soil capacity. These consequences were perceived in other studies with Amazonian soils, highlighting the diagnosis of Trindade et al. (2011, p. 9), which points out that Amazonian soils, over time, tend to the scarcity of specific nutrients due to the nature having low levels of phosphorus availability. About 94% of the farmers interviewed, the perception of the problem generated with itinerant agriculture, with cutting and burning, was possible with a clarification after the Roça Sem Queimar project, which became a reference and an alternative to fire Medicilândia agriculture. According to them, it is noticeable in the swidden the Roça Sem Queimar system's benefits, especially regarding humidity and microorganisms in the area. In an

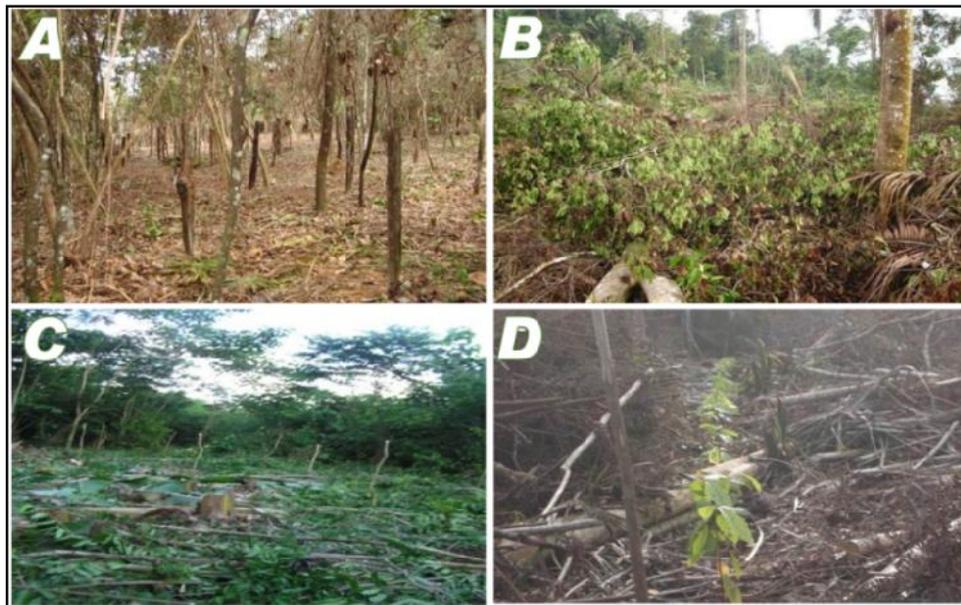


Figure 4. Steps of the area preparation process via the Roça Sem Queimar system. (A) Realization of the drill in a capoeira area; (B) felling of trees, with the conservation of species of interest; (C) Recipicing and distribution of the felled material; (D) Planting of the species in the medium of the decomposing material. Source: Roça Sem Queimar project, (2004).

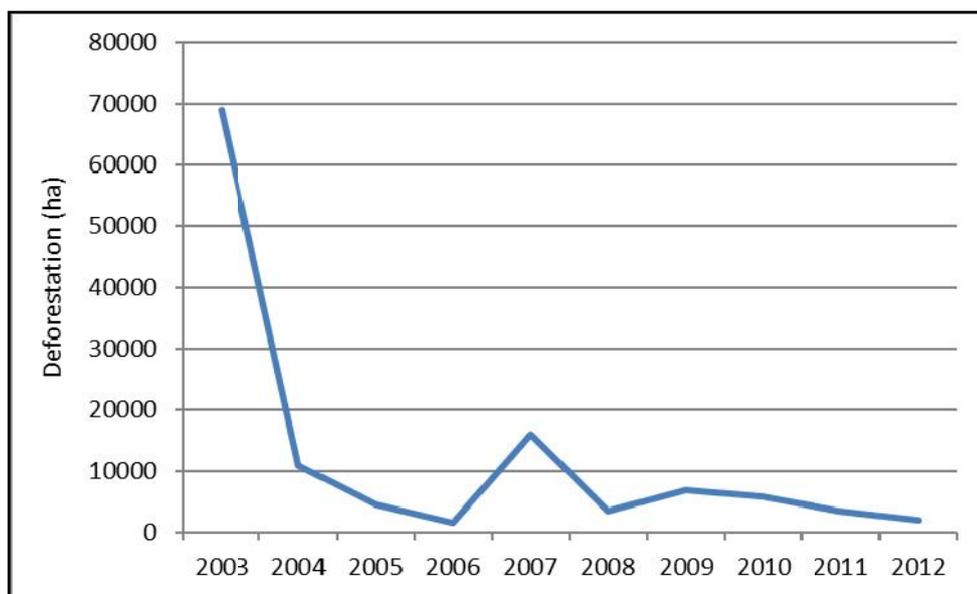


Figure 5. Reduction of deforestation in Medicilândia from 2003 to 2012. Source: Geoprocessing Laboratory of the Socio-Environmental Institute, 2013

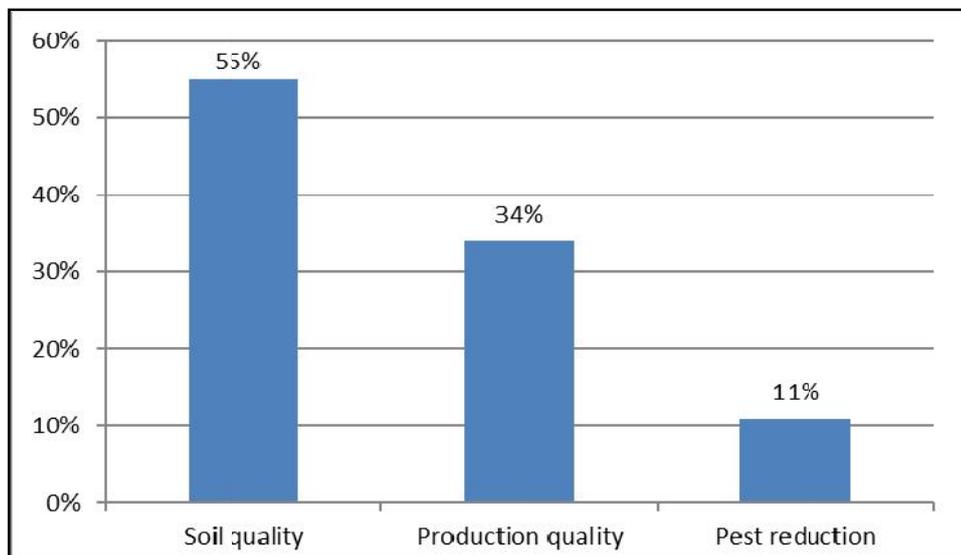


Figure 6. Main benefits of the Roça Sem Queimar system pointed out by the interviewees, 2013. Source: Field Research (2013)

interview with leaders of the STTR of Medicilândia, it was pointed out that coincidence or not, after the wide dissemination of the Roça Sem Queimar system's results among the municipality's family farmers, observed a significant drop in deforestation rates in the municipality. Notified that factors such as increased supervision and the reduction of openness areas contributed to reducing deforestation. However, according to the interviewees, the awareness tied to good production results corroborated the change in the deforestation scenario in the municipality can be observed in Figure 05 below. Figure 05 shows the decreasing rates from 2003 to 2012, especially in 2007, which coincides with the partnerships between family farmers and logging entrepreneurs. They would use timber from areas opened by family farmers. This partnership became known as Safra Legal. In the following year, 2008, surveillance actions were encouraged in the deforestation arc, which directly contributes to decreasing deforestation rates. It is interesting to note that 49% of the farmers claimed that fire was used because they believed in the benefits generated by the ashes deposited in the soils after burning. This argument was stated during the monitoring of the experimental units. In the first year of burning, it was verified with the removal of the primary forest, a gain of nutrients compared to the mowing made without fire. However, after two years, in the third year of swidden, the areas without fire are significantly better. It was observed that the material decomposed by practice without burning resulted in a larger volume than in the area in which fire was used. A significant factor in decision-making for fire use was the lack of workforce to perform the necessary management in the swidden without burning. Although the crop gains are verified, some families seek the alternative with fewer expenses and burn because they do not have the conditions to hire a workforce to maintain the mowing. It was recorded among the interviewees that 43% of them still use pesticides to clean and control undergrowth in cocoa crops. The use of these products is generally the cheapest way to manage mainly larger areas of cultivation. However, Bohner et al. (2012, p. 329) warn that these chemicals, when widely used in agriculture to combat pests and pathogenic organisms, can compromise agricultural production and cause many problems because they are inadequately applied cause harm to the environment and the rural workers and consumer health. The project's initial objective was to reduce the pressure on the primary forests and enable commercial species cultivation, increasing quality and productivity gains while protecting, conserving, and enriching the soil through a swidden application system without using fire. It is interesting to highlight that at each stage of the project, and goals were set to verify the proposed production system's actual viability, considering the agroecological principles. Several studies have already noted the benefits of this alternative system, which point to a trend of improving crops through the substantial increase of organic matter favoring the restoration of desired soil fertility levels. The Roça Sem Queimar system provides the soil's gradual recovery as a function of the deposit of nutrients and carbon via cycling in the deep layers to the surface and supply of organic matter by the deposition of the foliage. According to Trindade et al. (2011, p. 10), this process improves the soil's chemical and physical properties, improving the availability of nutrients for crops. Figure 06 shows the main benefits pointed out by farmers during project follow-up.

The Roça Sem Queimar system was experienced on its initiative by 52% of the interviewees, who participated in initiatives before the third edition of the Roça Sem Queimar project. The results of the experiences with the system were considered positive by 94% of the interviewees. The system was used in the implantation of the crops: cocoa (*Theobroma cacao*), açai (*Euterpe oleracea* Mart.), beans (*Phaseolus vulgaris*), banana (*Musa* sp), coffee (*Coffea canephora* L.), and black pepper (*Piper nigrum* L.). Regarding the benefits of this system, 80% of the interviewees reported positive changes in swidden areas without burning, significantly increasing soil quality. They highlighted that the soils were less dry, a more significant organic matter and microorganisms presence, becoming more protected and well structured. The farmers' statement was detected in other studies, of which the one made by Branco et al. (2001, p. 21) stands out which stated that the presence of vegetation, dead branches, leaves, decayed organic matter, and humus are offering nutrients and carbon to the

soil and help in the absorption of rains. For the same authors, when there is no vegetation or other cover on the soil, erosion can occur, caused by rain or wind, resulting in losses that are difficult to recover. Among the farmers participating in the third stage of the Roça Sem Queimar project, 46% assume to have participated in the previous edition. At the same time, 32% confirm having participated in the two other editions of the Roça Sem Queimar. For 62% of the farmers who had already participated and who have implanted swiddens assume they are in good condition and complete the production phase. In the third edition, the swiddens were implanted in their entirety. In all participating farmers, the systems' main component species were andiroba (*Carapaguianensis* L.), açai, cocoa, and African mahogany (*Khaya ivorensis*). It is essential to highlight that the crops were growing and still do not present production results that allow economic analysis. When asked what led them to participate in the project, many reported that the Roça Sem Queimar system "works." They also reported that the aspiration to continue is the longing to no longer use fire in their properties, since it is already possible, even if the swidden is in the initial phase, to perceive changes and benefits. According to the interviewees, the meetings and lectures contributed significantly to increased knowledge about land use. Agricultural markets have become more attractive to international capitals, and there is a new institutionality of trade circuits. This fact has resulted from an interest in capturing the potential of the still little-exploited financial values of some agricultural products, such as traditional agricultural markets and the transformation of new quality markets into agri-food systems. For the actors who work in the chains to compete in more egalitarian conditions, it is essential to understand the new ways of functioning of globalized markets (GARCIA-PARPET, 2011). The origin and quality of agricultural products' raw material play a decisive factor in generating a product that meets the consumers' demands and establishes quality markets' requirements. The context of value creation among the actors of the value chain reinforces the importance of discussing and consolidating programs and policies to foster the productive activity of farmers so that they have competitive conditions for insertion in quality markets with the possibility of an equal distribution of the value generated in the productive chains. In this sense, it is essential to identify aspects that can differentiate cocoa production in a production system with characteristics that meet new markets. Seeking new strategies that enable the valorization of products produced in systems that respect ecosystems and promote the generation of employment and income and the fixation of families in rural areas should be a priority.

Conclusion

Although less costly and faster, the practice of using fire is already considered by farmers as a cause of various damage to the environment and health. The impacts have contributed to the increase in the Roça Sem Queimar system's use, along the interviewees' trajectory. The traditional system has been decreased, being used in parallel or associated with other less impactful systems. The adoption of the Roça Sem Queimar system by the interviewees happened mainly due to the benefits obtained from the use of the system through tests carried out spontaneously and from the project, mainly concerning the improvement of soil quality and production, in addition to reducing the incidence of pests. One of the Roça Sem Queimar project's main objectives was achieved, greater sustainability of production systems and property. The producers' perception verified that these had decreased the forest's pressure, besides enabling producers to maintain their perennial crops, specifically cocoa cultivation. Despite the Roça Sem Queimar project's positive experiences and participation, farmers' adoption of the proposed system is still considered low due to high costs. More time and investment is needed. Especially in hiring a workforce, considered the main obstacle to adopting the system without burning in Medicilândia due to the low availability of family labor. The data obtained from the research showed that the project benefited from the changes caused in families' production systems and livelihoods indicates the conversion of the production system to a model less aggressive to the environment and more rational use of natural

resources. The Roça Sem Queimar system's production model proved to meet these requirements to be considered a model for cocoa production to meet a portion of the market that requires products from more environmentally sustainable and social models. It is essential to highlight that this study is a starting point for future research to contribute to the proof of the benefits caused by the use of the Roça Sem Queimar system, to propose public policies that support the use of this system. Since it was evident that the Roça Sem Queimar was accompanied by public policies, mainly guaranteeing family members' fixation in their properties, it is an alternative for more sustainable paths to the Brazilian agrarian space.

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