REVISTA DELOS DESARROLLO LOCAL SOSTENIBLE

Socioeconomic aspects of meliponiculturists in the Amazon: challenges for the effective creation of stingless bees aiming at the maintenance of environmental and ecosystem services

Aspetos socioeconómicos dos meliponicultores na Amazônia: desafios para a criação efetiva de abelhas sem ferrão visando a manutenção de serviços ambientais e ecossistêmicos

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ABSTRACT
There is an intense debate in society regarding the implementation of actions, programs and projects aimed at maintaining environmental and ecosystem services. In this debate, different metrics, dimensions and objectives are presented. Among these environmental and ecosystem services is the creation of stingless bees, which is a way of including small farmers in concrete actions, enabling them to obtain additional income in the production unit. The productive inclusion of this activity includes women, young people and the elderly, increasing food production and directly contributing to the well-being and community development. It is in this perspective that the present research identified farmers, profiles, perceptions and social dynamics related to beekeeping. For this, we used the exploratory methodology and the *snowball* technique. As a result of the research, we created a map of the location of beekeepers in the Amazon and a profile in which the motivation for the activity is found. We conclude that the creation of stingless bees can be an activity that contributes to the production of food, income generation and maintenance of environmental and ecosystem services.

Keywords: sustainability, biodiversity, pollination, production units, food security.

RESUMO
Há um intenso debate na sociedade sobre a implementação de ações, programas e projetos destinados a manter os serviços ambientais e ecossistêmicos. Neste debate, são apresentadas diferentes métricas, dimensões e objetivos. Entre estes serviços ambientais e de ecossistema está a criação de abelhas sem ferrão, que é uma forma de incluir os pequenos agricultores em ações concretas, permitindo-lhes obter rendimentos adicionais na unidade de produção. A inclusão produtiva desta atividade inclui mulheres, jovens e idosos, aumentando a produção de alimentos e contribuindo directamente para o bem-estar e desenvolvimento da comunidade. É nesta perspectiva que a presente investigação identificou os agricultores, perfis, percepções e dinâmicas sociais relacionadas com a apicultura. Para tal, utilizámos a metodologia exploratória e a técnica das bolas de neve. Como resultado da investigação, criámos um mapa da localização dos apicultores na Amazónia e um perfil em que se encontra a motivação para a atividade. Concluímos que a criação de abelhas sem ferrão pode ser uma atividade que contribui para a produção de alimentos, geração de rendimentos e manutenção de serviços ambientais e ecossistêmicos.

Palavras-chave: sustentabilidade, biodiversidade, polinização, unidades de produção, segurança alimentar.

1 INTRODUCTION

Peixoto (2011, p.11) states that decision-making on issues related to "ecosystems and their services can be especially complicated, because different disciplines, philosophical points of view and schools of thought" emit their values and opinions differently, which makes it difficult to create consensus and common strategies.

Parron *et al*., (2015, p.30) understand that "a large portion of society does not recognize the role of ecosystems in human well-being", however, in recent decades, the theme of environmental services has become part of reflections and construction of public policies. The actors consider that "environmental services can be configured as new rights, subject to regulation, in order to be able to result in compensatory benefits, not necessarily economic, to their suppliers". Daily (1997) states that ecosystem services are essential conditions and processes for sustaining human life, maintaining biodiversity and producing products such as wood, fibers, food and drugs.

The Millennium Ecosystem Assessment (MEA, 2005) pedagogically establishes the division of services into four categories: 1) provision – food, water, firewood and genetic resources; 2) regulation – pollinators, climate, diseases and nutrients; 3) culture – non-material benefits such as recreation, spiritual and educational aspects; 4) support – soil formation, nutrient cycling and primary production, considered by Prado (2021, p.12) as " essential for the production of other ecosystem services".

With the awareness of world society and the increased pressure for policies and programs aimed at maintaining environmental and ecosystem services, support and implementation of solutions aimed at reducing impacts on ecosystems and climate change have grown. Projects such as the Low Carbon Agriculture Program (ABC) and crop-livestock-forest integration projects (ILPF) are among the agricultural formulations considered innovative and sustainable. Initiatives such as the Rural Environmental Registry (CAR), the Payments for Environmental Services Law nº 14.119/2021 (AUBERTIN; JESUS, 2021) are examples. Many governments, at the most different levels, local, national and international organizations have been encouraging initiatives, projects and programs to reduce emissions from deforestation and forest degradation, conservation and management of ecosystem resources and preservation of fauna and flora species.

As in Brazil, the state of Amazonas has several initiatives aimed at the conservation of environmental services and ecosystems: the Environmental Services Law, state and federal conservation units, actions to encourage the sustainable management of natural resources, lake agreements and the Program Forest Bag. All of them are initiatives of "financial compensation for the services provided by the traditional and indigenous populations of the Amazon: the conservation of the forests" (VIANA, 2008, p.145), which involves an arrangement of cooperation and state interrelationship, private partners, international donations, such as the Amazon Fund/BNDES, in addition to establishing a systematic action with the communities, which seeks to influence the economic, social, organizational and commercial dimensions of the families and communities involved.

In the path of expanding actions aimed at forest conservation and maintenance of environmental services and ecosystems, at the end of 2019, the government of Amazonas regulated the State Fund for Climate Change, Environmental Conservation and Environmental Services, with the creation device that provided for the creation of the State REDD+ Plan and presented to the "German government, the Pioneiros REDD+ project to be implemented in the state to raise funds through environmental conservation. The proposal was taken to the German Ministry of Economic Cooperation and Development (BMZ), in Bonn (CORNETTA, 2021, p. 60).

Although there are actions related to the maintenance of environmental services, Homma (2021, p. 25) states that the economic opportunities for "small producers" in the Amazon region will depend on the "development of productive activities that meet food security, produce materials labor-intensive raw materials, recover environmental liabilities and generate surplus for export in a more sustainable way". Evidently, large projects, involving a large number of local, national and international actors, have great visibility in various sectors of society.

This article aims to present an initiative to maintain ecosystem and environmental services developed in the family production unit: the creation of stingless bees or indigenous bees. It is an ancient activity, carried out by different indigenous ethnic groups, with reports among the Mayans, the Kayapós in the Amazon Basin, as well as in Guatemala, several other African and Australian groups. Stingless bees already existed in many Brazilian properties, communities and territories long before the arrival of *Apis mellifera* in the 19th century (ABELHAS, 2020). The Jesuit José de Anchieta (1988, p.133) was one of the first to report the

presence of stingless beekeeping among the native Brazilian peoples: “Almost twenty different species of bees can be found, some of which make honey in the trunks of trees, others in tenements built between the branches, others under the ground, where it happens that there is a great abundance of wax”.

Cortapassi-Laurindo *et al*. (2006) say that the keeping of stingless bees is not a new activity, but has been practiced for centuries by indigenous communities; however, recently, the beekeeping activity has been increasingly considerate as an important activity to supplement income, produce food, medicines and expand the production of agricultural crops. Maues *et al*. (2021, p.126) prove that introducing stingless bees in açaí plantations “improves fruit yield and socioeconomic indices for açaí producers in different types of management (native açaí plantations in the floodplains and plantations on dry land), as well as impacting changes in the surrounding landscape”. Studies by Schultz & Valois (1974); Krug *et al*. (2015) show that the introduction of melipona contributes to increase the productivity of guarana; in turn, studies by Menezes (2021) proves that bees in coffee farming generate an increase in coffee production.

Studies by Moure *et al*. (2008) concludes that in the Neotropics there are more than 400 species of meliponas. Kerr *et al*. (2001) and Silveira *et al*. (2002) identified more than 130 meliponous species in the Amazon region.

The great diversity of stingless bee species leads to reflection on strategies and actions that seek better use of this natural resource, ecosystem and environmental services to achieve objectives related to food production, socioeconomic development and sustainability based on endogenous factors (SILVA; MENEGHETI; PINHEIRO, 2021). Oliveira *et al.* (2013, p. 25) points out that beekeeping can stimulate “ the implementation and management of diversified agroforestry systems, seeking to guarantee a varied and flowering bee pasture throughout the year”; provides “increase in the food security of families, who now have the guarantee of the production of diversified, nutritious, energetic and medicinal foods ”; and adds at low cost another system with the possibility of generating income in the family unit.

It can be said that we are facing a great potential for social, economic and environmental gains, with the possibility of becoming an essential asset in family production units. It is an activity that can include young people, women and the elderly in productive practice, since it is not demanding in terms of labor and requires almost no physical effort. Despite so much importance and potential, the activity remains almost invisible, plus, strengthening actions on the

part of public bodies are very incipient, due to the fact that it is an activity that is not yet included in the statistical information of official bodies, such as the Brazilian Institute of Geography and Statistics (IBGE), and others, as well as the puerile specialized technical assistance for management, with this *expertise being* restricted to research institutions and some governmental organizations, which means that there are still many "gaps with regard to the record data and production information related to this activity in the Amazon (SEDECTI ,2021, p.9).

The present study made a brief survey of the creation of stingless bees in family farming units in the state of Amazonas. The idea was to use the *snowball* technique, a research technique that uses reference networks, to reach stingless bee farmers, considering that they are dispersed and distributed in a non-homogeneous way throughout the state of Amazonas.

As a result, information was produced from 97% of the Amazonian municipalities, that is, from the 62, data from 60 of them were collected. This information constitutes a small part of reality, a photograph based on some socioeconomic data related to farmers who raise bees in the state of Amazonas. We know that reality is much broader, and that more accurate data collection requires a more robust research strategy capable of covering the challenges of distances and logistics in the state of Amazonas, as well as an arrangement that involves several partners and public and private institutions. However, the data already indicate the appreciation of production, growing market demand, as well as difficulties related to the need for improvements in the production process, lack of information, strategies to encourage the formulation of policies and efficient actions to support meliponiculturists that strengthen the activity as an action capable of contributing to the improvement of the productive system, income generation and conservation of ecosystems and environmental services in the Amazon.

2 METHODOLOGY

This research is characterized as exploratory, with a qualitative approach. Barros and Lehfeld (1990, p.14) define exploratory research as a strategy that allows discovering, explaining and understanding the context of reality, which means a systematic study with the "purpose of incorporating the results obtained into communicable and proven expressions to levels of knowledge obtained". The approach is qualitative in that it deals with a dimension of reality that cannot be quantified, that is, a universe of motivations, aspirations, beliefs, values and attitudes (MINAYO, 2014).

There are several organizational forms that bring together stingless bee breeders, mainly associations, groups organized by non-governmental institutions and articulation networks, among others. These organizations are local, community, territorial and statewide. Currently there are also WhatsApp groups, which facilitate communication, mobilization and articulation between beekeepers and other agents.

To reach the apiarists, we adopted the non-probabilistic snowball approach, using "reference chains" (VINUTO, 2014, p.203).

We started with the chief informant, who was most often a technician, a farmer leader, a marketer, a religious or an agent who knew the communities and productive activities in the municipalities of Amazonas. In this way, the sampling frame grew with each interview. The perspective of the research was to identify breeders and obtain some information that would guide the socioeconomic reading of meliponiculture. In this sense, we had an initial conversation script, which guided and allowed the beginning of the dialogue with the interviewees. Due to scarce resources and the pandemic, most information was obtained via telephone and WhatsApp, in addition to occasional visits to some communities in the municipalities of Itapiranga, Presidente Figueiredo, Urucará, Maués, Tefé and others. It should be noted that we started contact with stingless bee breeders in 2019, then experienced, in 2020, 2021 and early 2022, a strong pandemic period, which prevented the visit to many family units that have among their activity the creation of bees.

The data we collected were systematized, and with this information we built a map that momentarily and partially translates the distribution of beekeeping in the Amazon[1], in addition to systematizing information related to the profile of farmers who raise bees in Amazonian communities.

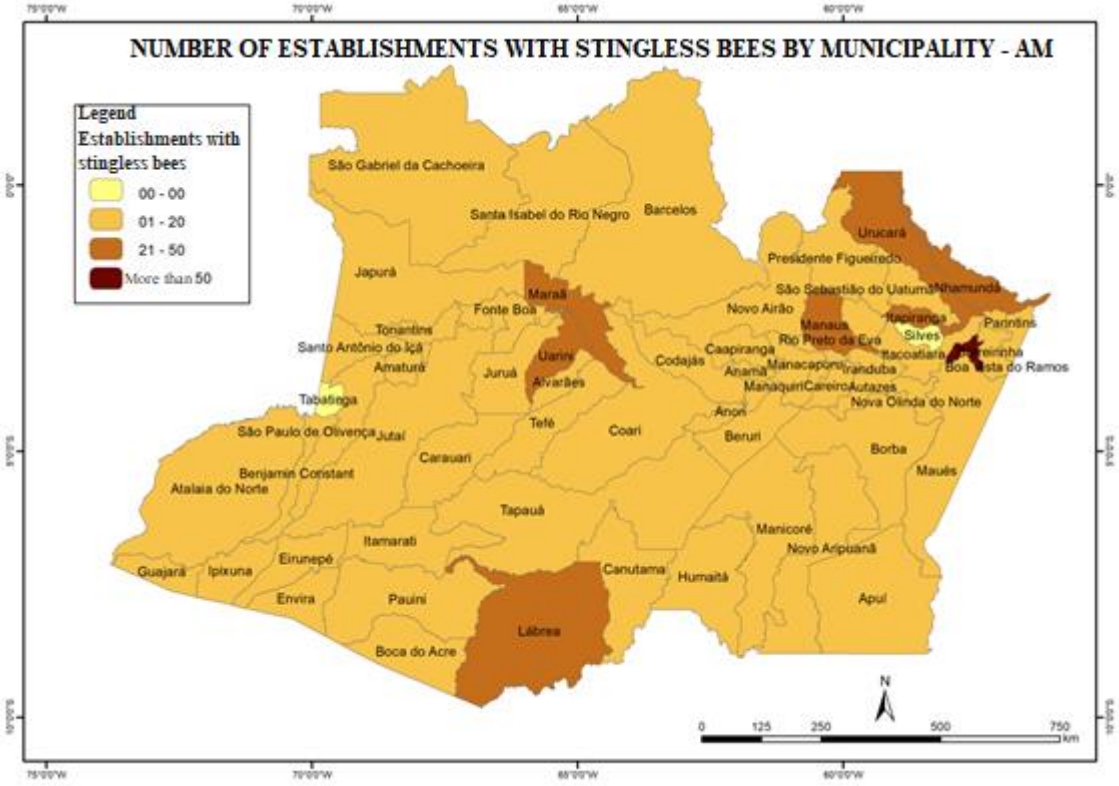
3 RESULTS AND DISCUSSION

The data collected in the articulation network formed around the stingless bee breeders show the vitality of the activity, which, even overshadowed by more productive, profitable

[1]It is important to point out that the data collected had farmers, extension agents and other territorial actors as the main sources of information. It represents part of reality, a partial view. More reliable information requires more effective actions by research bodies, including the activity among those monitored by the IBGE and other censuses.

activities and with greater financial appeal of labor, it is still part of the production system of many family units in the Amazon. The amount of bee boxes among breeders ranges from 1 to 20 per farmer. Municipalities that have farmers with 20 or more than 50 boxes are those that have or had some form of development, as is the case of Urucará, Nhamundá, Barreirinha, which had a Petrobras-Fome Zero project in 2005, and Itapiranga, which between 2009 and 2012 received support from the Iraquara Institute for the Meliponiculture Program in partnership with the Itapiranga Rural Workers Union (STRI), and Boa Vista do Ramos, which has a history of interaction and cooperation between local, state and federal, which made honey from stingless or indigenous bees the main product of the municipality. The described design can be seen in figure 1.

Figure 1 – Municipalities with establishments that have stingless bees.

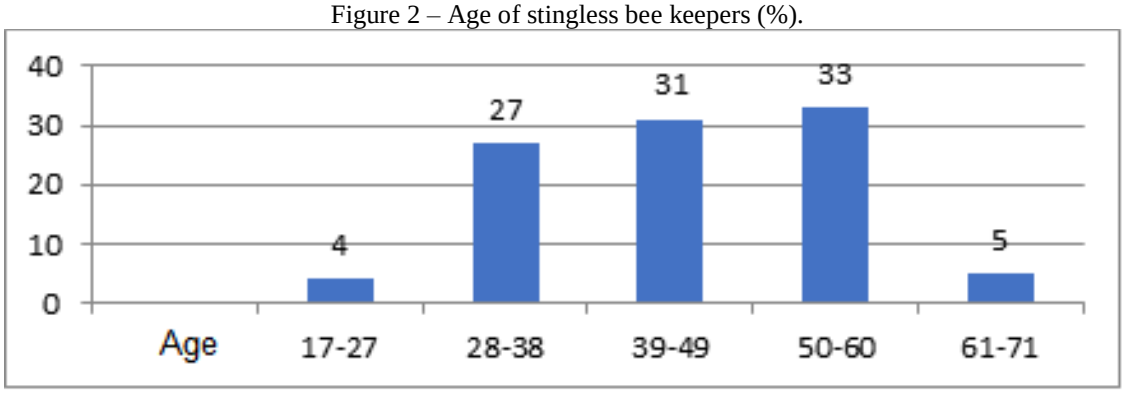


Source: Organized by the authors based on the field survey, 2023.

In the profile of stingless bee breeders, it is possible to observe that meliponiculture is a predominantly male activity, representing 75% of respondents, and 25% are women who develop the activity. The breeders' age varies between being 29 and 60 years, as shown in Figure 2. These

two pieces of information show that the incentive to the activity occurs in a productive logic, focusing on a rationality without the perspective of greater inclusion of young people, women and elderly people over 60 years old.

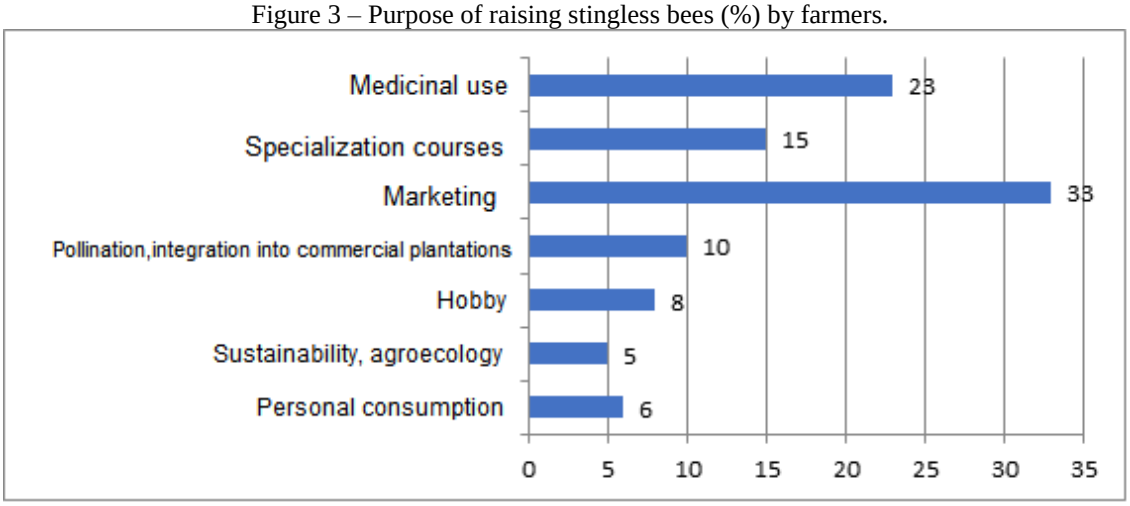
Figure 2 – Age of stingless bee keepers (%).



Source: Field survey, data organized by the authors, 2023.

The motivation for raising stingless bees is as varied as possible, such as: medicinal use, beekeeping based on training and courses promoted by the National Rural Learning Service (SENAR), by the Institute of Sustainable Agricultural and Forestry Development of the State of Amazonas (IDAM), Iraquara Institute, Dramel, National Institute for Research in the Amazon (INPA) and other institutes. The survey identified a young farmer who started raising bees during the pandemic, based on virtual courses provided by the Brazilian Agricultural Research Corporation (Embrapa). He kept bees in the açai groves, with the prospect of expanding fruit production. This environmental service had repercussions in the debate among farmers, who began to reflect on the activity and, as a result, have sought to keep bees for the purpose of pollinating crops and commercial plantations (10% of respondents); for medicinal purposes (23%), commercialization (33%), leisure (8%), sustainability and agroecology (5%), for own consumption (6%), as can be seen in Figure 3.

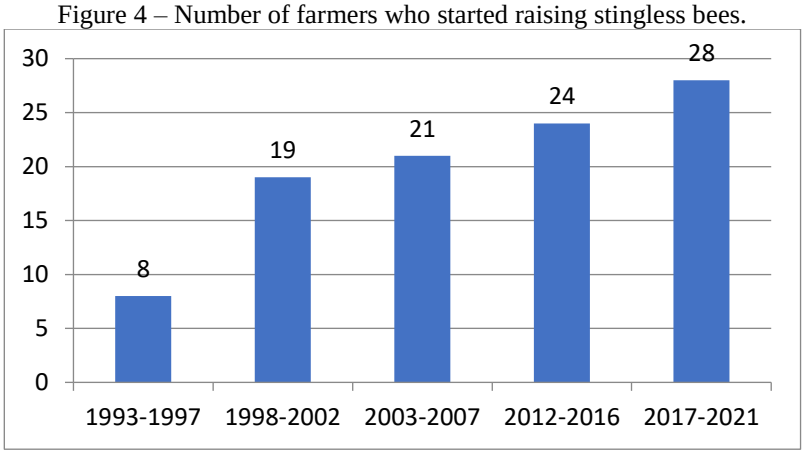
Figure 3 – Purpose of raising stingless bees (%) by farmers.



Source: Field survey, data organized by the authors, 2023.

An interesting aspect of the survey is the fact that this activity is recent and growing among farmers. This shows that there is considerable room for advancement in the state of Amazonas (Figure 4). The farmers who started to adopt the activity within their family production unit, the vast majority among them (52%) did so as an economic and environmental alternative from 2012 onwards. Such aspect can be seen due to the fact of the increasing of information about the economic and environmental importance of the bees, greater articulation of farmers with the formation of contact networks and greater availability of training for those who wish to join the activity.

Figure 4 – Number of farmers who started raising stingless bees.

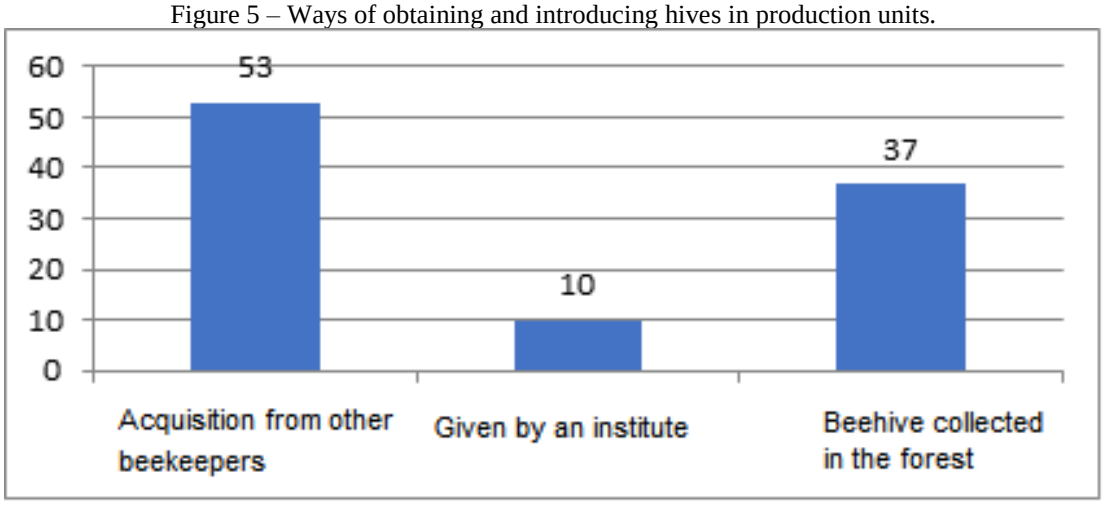


Source: Field survey, data organized by the authors, 2023.

According to provided information, hives are acquired mainly from bee breeders (53%), collected in the forest (37%) and from initiatives or projects developed by some institution (10%),

as shown in Figure 5, below. These aspects show a process of transferring knowledge between breeders, a direct communication action between farmers who breed and those who wish to join the activity, as well as the collection of species in the forest, which needs to follow certain environmental and legal procedures and techniques. Such aspects require more studies and knowledge, mainly regarding the guarantee of the breeding system, the management and conservation of stingless bee species in the Amazon. An example of the acquisition of hives through technology transfer actions and research carried out by public institutions, rural extension services and non-governmental organizations is the Jaturarana community, in the rural area of Manaus city, an action of training and formation from INPA (National Institute for Amazonian Research). This training enabled the introduction of the activity in the community, and today there are farmers who have more than 100 hives in their production units

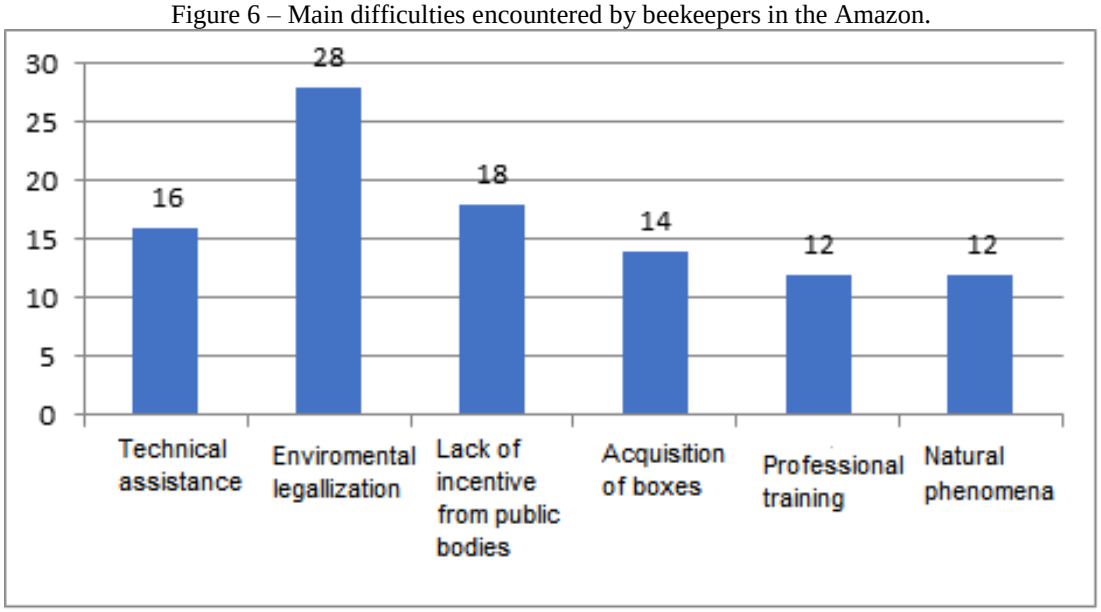
Figure 5 – Ways of obtaining and introducing hives in production units.



Source: Field survey, data organized by the authors, 2023.

Among the main problems reported in the creation of stingless bees is the lack of technical assistance, environmental legalization, lack of public incentive, acquisition of boxes, training and natural phenomena, such as floods, attack by other animals and those related to natural dynamics, as shown in figure 6.

Figure 6 – Main difficulties encountered by beekeepers in the Amazon.

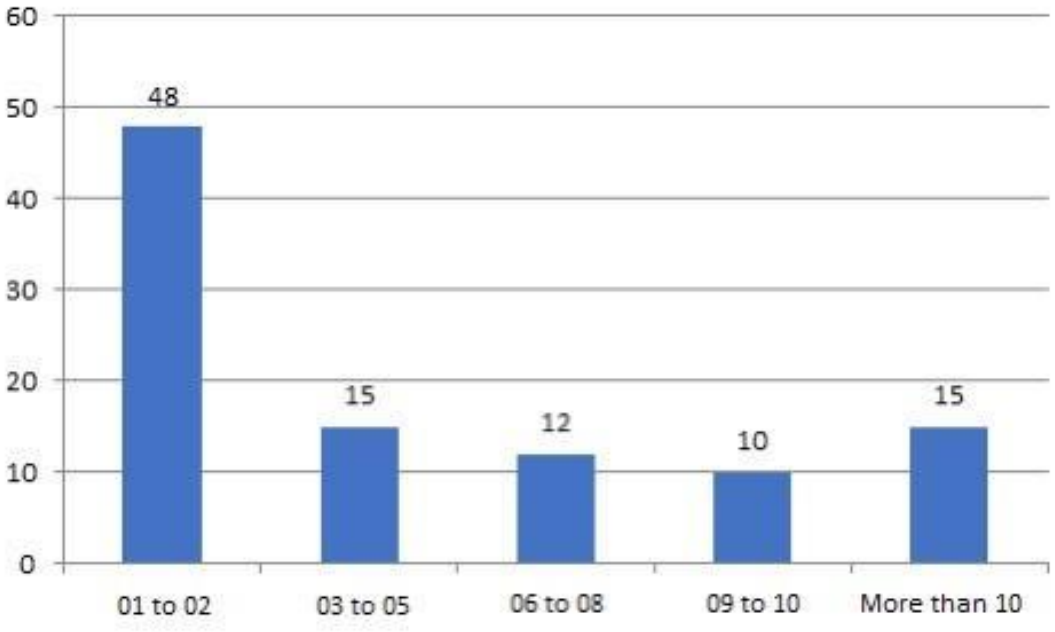


Source: Field survey, data organized by the authors,2023.

Sedecti (2021, p.7) point out that, within the scope of legalization of the Institute for Environmental Protection of Amazonas (IPAAM), "the declaration of acquisition or origin of the colonies is required, which has created an obstacle for the meliponiculturists who already worked in the area of activity before the legislation came into force, not being able to present the required document, which is the case of the vast majority of meliponiculturists in the Amazon". Therefore, there is a set of state actions that need to be resolved along with funding and training actions for those who wish to enter the activity.

One aspect that draws attention in the survey is the fact that the activity involves few families, normally shared with a close neighbor, and the two begin to develop the activity, exchanging information, inputs and other aspects related to creation, as shown in Figure 7. Keeping bees is often a solitary action, one of accompaniment, contemplation and patience. It differs from activities in which it is possible to monitor fruit growth, weight, observe color, texture and others. Everything takes place inside the box, without much fanfare. In communities where many farmers are involved in the activity, there is a project that encourages breeding, whether governmental or non-governmental.

Figure 7 – Families involved in beekeeping



Source: Field survey, data organized by the authors, 2023.

The collected data indicate some ways to boost the activity of raising stingless bees within family production units as a productive practice capable of generating income and expanding the contribution of farmers with the maintenance of environmental and ecosystem services. Within a proposal for management and arrangement in production units, beekeeping can contribute to reducing pressure on forest resources, especially in relation to secondary and primary forests, contributing to the maintenance of Amazonian ecosystems (MATOS; MINHÓS; PEREIRA, 2021). Furthermore, as we stated earlier, it is an activity that can be carried out by any member of the family, such as women, teenagers and young people, as long as they have knowledge. It is an alternative to other activities since they do not use technologies, equipment and make work painful and unhealthy, which causes young people to leave the rural environment, as they claim (BRUM; DEPONTI; MENGEL, 2021) and, in addition, can contribute towards an agroecological transition desired by many farmers, who are increasingly concerned about climate change and changes in biodiversity (REIS; SILVA, 2021).

From an economic point of view, the creation of stingless bees can provide a considerable income for farmers. There are still deficiencies related to economic aspects, but there are already studies that show that the inclusion of bees in fruit plantations increases productivity, and from an income perspective, an average 1L of honey is being sold between 80 and 120 Reais.

It turns out that, in order to carry out the beekeeping activity, with the use of production as an economic asset and contribution to the maintenance of environmental services, a set of actions and public policies is necessary, such as specialized technical assistance, legalization actions and regulation of creations, introduction of management innovations, financing, and encouraging the adoption of social technologies that facilitate the development of the activity (GUTIERREZ, 2020; GUTIERREZ, 2015).

As Aidar states (1996, p.14), the meliponiculture must be "understood as a vital activity in our society, not only for the production of honey and other by-products, but also for the maintenance of plant life in the tropics through the pollination of plants and maintenance of the genotypic diversity of this important ecosystem". Therefore, a meliponiculture integration strategy can enhance the management of different Amazonian ecosystems by farmers (PEREIRA et al., 2015). Unfortunately, as reported by Sedecti (2021, p.14), "despite all the effort and articulation of the GT- Meliponiculture since 2016, the implementation of a state policy for meliponiculture and its products in Amazonas has not been successful. As a policy, it is primarily understood the planning and promotion of actions" that strengthen the productive chain of meliponiculture in the Amazon.

4 FINAL CONSIDERATIONS

The survey carried out allows us to understand that the activity of raising stingless bees is expanding. In some places, the activity finds institutional synergy and greater support from other beekeepers. However, the development of the activity also takes place in family production units, as an alternative to increase productivity in production systems, without the implementation of many techniques and planning. It is essential to think about beekeeping within the logic of making possible the diversification and improvement of production, including raising productivity. There is the possibility of involving women, young people and the elderly in the activity. Meliponiculture integrates family farmers into the debate related to climate change and the maintenance of environmental and ecosystem services.

Finally, it is important to point out that meliponiculture contributes to improving the performance of productive systems by increasing productivity, through the environmental service of pollination. It contributes free of charge to food security and enables income

improvement. And one aspect that is sometimes ignored is that the activity contributes to maintaining the biodiversity of different biomes.

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