DOI: 10.5965/223811712142022468

Revista de Ciências Agroveterinárias 21 (4): 2022
Universidade do Estado de Santa Catarina

Urban and connected: a profile of the 21st century stingless beekeeper

Urbano e conectado: um perfil do meliponicultor do século XXI

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Submission: 15/Jul/2022 | Acceptance: 09/Aug/2022

ABSTRACT

Bees are responsible for pollination, which is an important ecosystem service. They also provide the production of honey, pollen or saburá, propolis, among other products. The breeding of native bees has been growing, because of the particular characteristics of each species and its products. Therefore, the objective was to know the profile of this breeder, called meliponicultor. Then, a semi-structured questionnaire was used, widely publicized on social networks, in April and May 2020. This was attended by 718 Brazilian and foreign breeders of native bees, of which 80.3% practice the activity as a hobby, most beginners in the activity, with the main objective of leisure and family consumption of honey. Over 80% keep bees in meliponaries in urban areas. Among the products, the swarm is the most commercialized, with species that are easy to handle, less defensive and adapted to the region being preferred. Swarms are also acquired through bait, rescue and division. The bees are created in boxes of different materials, the main one being wood and the tools are easily found in the commerce, as well as easy to improvise. Beekeepers reported concerns about deforestation, increasing urban areas, fires, global warming, pesticides, pest attacks and theft. Digital media was cited as the main source of information, followed by books and close people. The creators also stated that they do not trust 100% the information that reaches them, regardless of the source.

KEYWORDS: stingless bees; biodiversity; conservation; meliponiculture.

RESUMO

As abelhas são responsáveis por um valioso serviço ecossistêmico, a polinização, fornecendo ainda a produção de mel, pólen ou saburá, própolis, entre outros. A criação de abelhas nativas vem crescendo, impulsionada pelas características particulares de cada espécie e de seus produtos. Logo, objetivou-se conhecer o perfil deste criador, chamado de meliponicultor seus interesses e motivações, bem como suas fontes de informação e sobre a dinâmica econômica dessa atividade na atualidade. Para isso utilizou-se um questionário semiestruturado, amplamente divulgado nas redes sociais, nos meses de abril e maio de 2020. Este contou com a participação de 718 criadores brasileiros e estrangeiros, dos quais 80,3% praticam a atividade por hobby, maioria iniciantes na atividade, tendo como principal objetivo o lazer e o consumo familiar do mel. Mais de 80% mantém as abelhas em meliponários em áreas urbanas. Dentre os produtos, o enxame é o mais comercializado, sendo preferidas espécies de fácil manejo, pouco defensivas e adaptadas à região, sendo os enxames também adquiridos através de iscas, resgate e divisão. A criação é realizada em caixas de diversos materiais, sendo o principal a madeira e as ferramentas são facilmente encontradas no comércio, bem como, de fácil improvisação. Os criadores citaram preocupações com desmatamento, aumento das áreas urbanas, queimadas, aquecimento global, agrotóxicos, ataque de pragas e furtos. Os meios digitas foi citado como a principal fonte de informações, seguidos por livros e pessoas próximas. Os criadores apontaram ainda que não confiam 100% nas informações que chegam até eles, independente da fonte.

PALAVRAS-CHAVE: abelhas-sem-ferrão; biodiversidade; conservação; meliponicultura.

INTRODUCTION

Bees are important pollinators of angiosperms, thus providing a great ecosystem service to society. Pollination, both native vegetation and agricultural crops, provides the maintenance of several plant species (DE FREITAS et al. 2016). This ecosystem service is valued at R$ 43 billion in Brazil (WOLOWSKI et al. 2019), and between US$235 billion and US$577 billion globally (POTTS et al. 2016).

In Brazil there were 244 species of native bees, as mentioned by PEDRO (2014), and new species were continuously identified, *such as Trichotrigona camargoiana (*PEDRO & CORDEIRO 2015) *and Scaptotrigona guimaraesensis (*LAROCA & DE ALMEIDA 2017*),* bringing this number to 246. However, not all of these species can be kept in rational creations.

The permanence of these bees in places of cultivation can provide an increase in quality and yield, and even crops with self-fertilization, such as coffee, benefit from this ecosystem service (PERUZZOLO et al. 2019). In addition to pollination, each species produces honeys with unique characteristics, presenting a growing market, both for the sale of swarms, as well as in the commercialization of products such as honey, geopropolis and cerumen (DANTAS et al. 2020, PIRES et al. 2020).

However, many researchers have recorded a decline in the populations of these insects in recent years, and there are many causes. Deforestation, fires, the use of pesticides, the change in land use, the advance of urban areas and global warming are factors that directly affect biodiversity, especially native bees (BARBOSA et al. 2017, DA ROSA et al. 2019). Thus, beekeepers duly trained and working according to the laws, can be considered agents of preservation of many species of native social bees. This becomes more evident when it comes to endangered bees, such as the case of the mandaçaa (*Melipona quadrifasciata quadrifasciata),* an excellent honey producer, which is no longer in a natural environment in Rio Grande do Sul (WITTER & BLOCHTEIN 2009). Therefore, in the state of Rio Grande do Sul, beekeepers are responsible for maintaining the species, at least in farmers.

Meliponiculture is an activity that has been gaining new adherents annually, and this follow-up of animal husbandry is mainly formed by breeders with less than 10 years in the activity (MEIRELLES et al. 2020). These beekeepers contribute to the conservation of the various species of stingless bees existing, as well as with the flora. This it is essential to know the profile of this native bee breeder, especially because it is an activity that can be carried out in urban areas, since these insects do not offer risk to people, thus being able to present a different profile and breeding dynamics to other animals that we are accustomed to, in our daily lives.

Therefore, the objective was to know the profile of the creators, their interests and motivations, as well as their sources of information and about the economic dynamics of this activity today.

MATERIAL AND METHODS

To obtain the data, a semi-structured questionnaire was made through Google Forms®, similar to that reported by MEIRELLES et al. (2020), widely disseminated on social networks: Facebook, WhatsApp and Instagram, during the months of April and May 2020. Containing the following questions:

- Have you been a bee breeder for how many years?
- In which region do you have the meliponary?
- How many colonies do you own?
- What is the purpose of your breeding?
- For you, what is the main feature to breed a species of bee?
- Regarding the term "exotic bees" you can say:
- How do you get your bees? (You can select more than one alternative)
- If you buy swarms, what was the highest amount you've ever paid for one?
- Your main economic activity is:
- How did you learn to be a bee breeder? How do you stay informed? (You can select more than one alternative)
- Do you think any of these problems get in the way of meliponiculture? (You can select more than one alternative)
- Which of these pests have you ever had problems with? (You can mark more than one alternative)
- As for the boxes you use:
- What materials do you use, have used, or have tried?
- What is your level of confidence in the sources of information about meliponiculture, in a ladder from 0 to 5, in which 0 is not trust and 5 is fully trusted?
- And finally. What is the origin of the tools you use to manage your colonies?

The data was compiled and organized into a spreadsheet of the Microsoft Excel® software.

RESULTS AND DISCUSSION

The questionnaire was answered by 718 beekeepers. As to advance in the survey it was not necessary

to answer each question, and they could jump and even leave it blank, the number of answers of each question varied between 682 and 718. In question number nine, only 463 beekeepers answered, as many never bought swarms. Also, only 643 people answered question number 13, because not all beekeepers have ever had problems with pests.

Most participants (69.1%) reported raising bees less than five years ago, while 16.5% between five and ten years old, indicating that many beekeepers are beginners in the activity. In addition, it can be seen that 85.6% have been in the activity for less than ten years, which is approximately the time that the media and scientific research have been dedicated to showing the death and importance of bees (DANTAS et al. 2020). Of the oldest beekeepers, 8.4% answered that they have been active between ten and 20 years and only 6% for more than 20 years. In another study conducted with online forms, MEIRELLES et al. (2020) recorded more than 75% of beekeepers in general with up to 10 years of activity, reinforcing that meliponiculture is an expanding activity. BARBIERI JÚNIOR (2018) also recorded that the average time of activity of beekeepers in the State of São Paulo was only 4.14 years, 80% of which were less than five years old.

As for the location of these breeders, more than half (50.1%) stated that they keep their meliponary in the Southern region of Brazil. Since there were no questions about the economic or social reality of the interviewees, there is no way to make a relationship between the territorial distribution and these factors to explain why there was such a large concentration in this region. However, it is important to point out that the first groups in social networks that received the request to participate were from the state of Rio Grande do Sul, since the University responsible for the research is gaucho. The link was later shared in groups from other states and regions. There was a great effort to reach as many groups as possible, consequently, we obtained a considered number of participants, including foreigners (Figure 1).

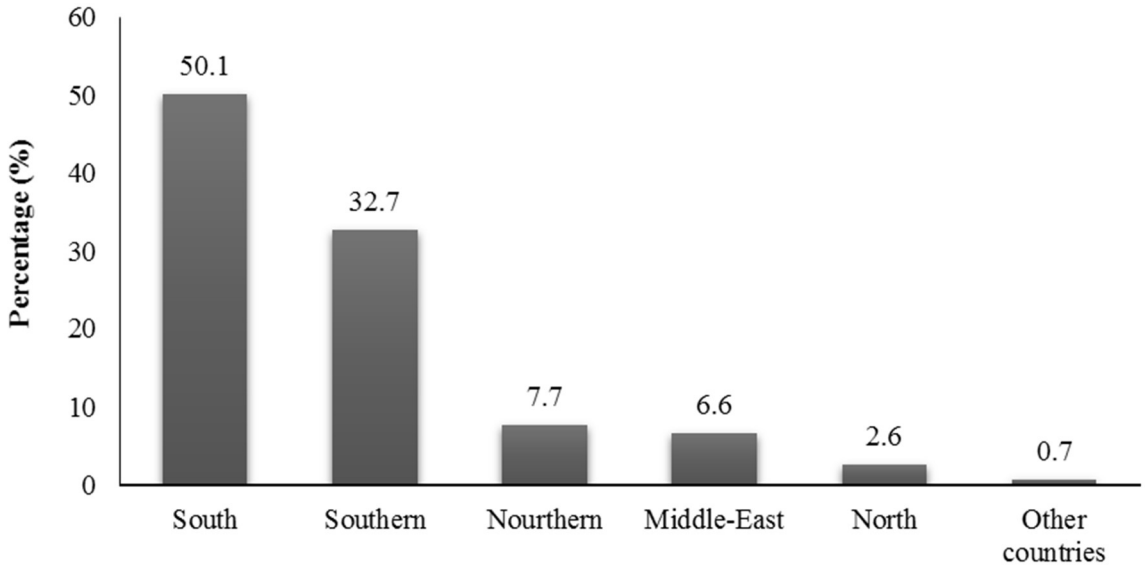

Figure 1. Percentage of beekeepers participating in the study in each region of Brazil and other countries.

At this point, it is appropriate to comment that a part of the beekeepers do not have access to the tools used in this study, considering that only 67% of Brazilian households have access to the Internet; the Southeast (74%), Midwest (76%) and South (69%) regions have the highest percentages of home access to the Internet, while the Northeast (58%) and North (58%) regions have the lowest, when it comes to rural areas this percentage is reduced to only 44% of households (CETIC.BR 2018).

Rural areas, as well as traditional Quilombola and Indigenous communities, are relatively distant from urban centers, making access precarious. These have as alternatives of internet access public Wi-fi networks, mobile networks, satellite or radio connection (BRAGAS & MAIA 2019). In addition, a portion of beekeepers may not be literate, or have basic literacy. Only 9% of illiterate or semi-literate Brazilians are users of this technology, with increasing use as the population's schooling increases (CETIC.BR 2018, DANTAS et al. 2020). FELIX (2015), in its survey in the state of Ceará, observed that 13.55% of beekeepers were illiterate, 14.84% literate, 29.03% have incomplete elementary school, 7.74% complete elementary school, 5.16% incomplete high school, 20.65% complete high school, 7.10% complete higher education and 1.94% complete graduate education, with an average age group of 50.05 ± 15.30 years.

DANTAS et al. (2020) observed that in the states of Paraíba and Rio Grande do Norte 60% of beekeepers are between 30 and 50 years old, 35.6% over 50 years and only 2.2% under 30 years of age. The age of people is also directly linked to contact with the internet, more than 80% of people between 10 and 34 years old have access to this technology, and this percentage is reduced to 76% in people aged 35 to 44 years, 54% between 45 and 59 years and 25% for people aged 60 years or older (CETIC.BR 2018). Therefore, online research is, at some point, discriminatory, without the intention of being it. This implies, of course, that these results underestimate a group of older, traditional beekeepers who learn and develop their activities in their traditional communities, tribes and quilombos.

Curious beekeepers, amateurs and beginners were the majority among the interviewees. In addition to the time in the activity, previously mentioned, two other data corroborate this information. First, the number of colonies (Figure 2).

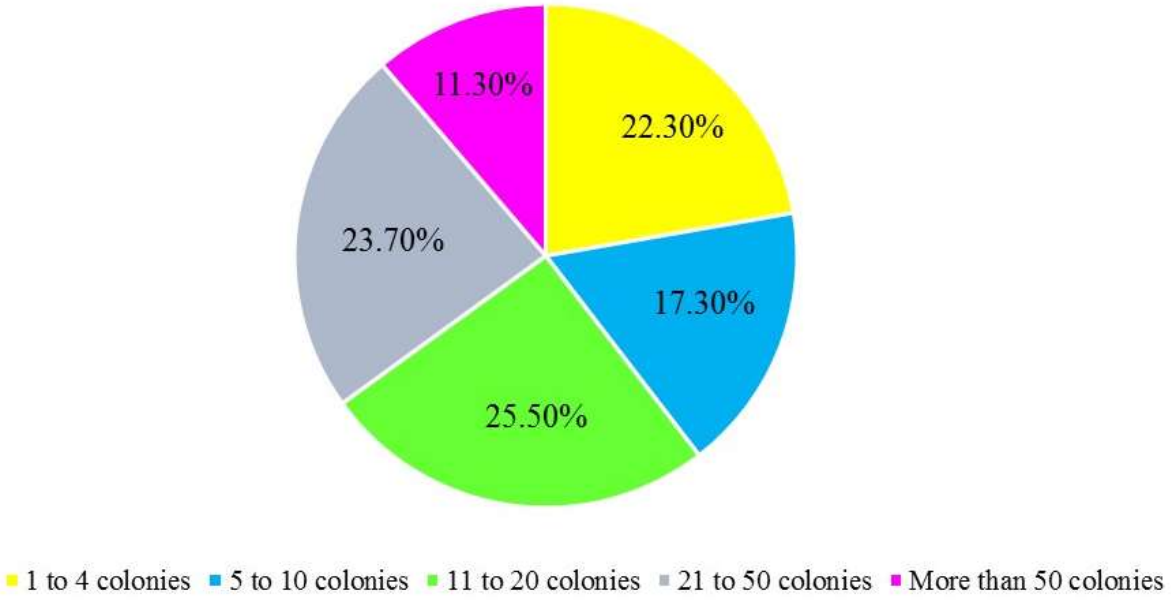

Figure 2. Number of hives (i.e., *colônias* in portuguese) per beekeeper.

It is important to point out that CONAMA Resolution No. 496 of August 19, 2020 (CONAMA 2020), defines that meliponaries with 50 colonies or more require registrations in the state environmental agency.

The second data that shows the importance of amateurs and hobbyists was the fact that 80.3% of the study participants declared that the goal of their creation is "Hobby, I am an amateur bee breeder and I raise bees because I like it". Interestingly, 80% is also the percentage of beekeepers who declared to raise bees by conservation or hobby in Australia, in a study conducted by HALCROFT et al. (2013). In São Paulo, BARBIERI JÚNIOR (2018) found that 65% were hobbyists, and the commercial purpose was a minority of the motivation of beekeepers.

The researchers, teachers, self-taught scholars and extensionists also participated in the study, because 10.7% of the answers indicated that the creations were for academic, teaching and research purposes.

Among the economic purposes related to the activity are the consumption of honey, the commercialization of honey and other products produced by indigenous bees (Figure 3).

Apparently, the most commercialized product in the current meliponiculture is the swarm (20.9%), followed by the commercialization of honey. According to DANTAS et al. (2020) in Rio Grande do Norte and Paraíba, honey is marketed by 94.52% of the beekeepers who obtain income from the activity, followed by the commercialization of the swarm (37.71%). Also, according to this author, 62.22% of the interviewees in their survey say they do not find difficulties in marketing their products, while 13.33% point to difficulties, of these 6.7% are members of social organizations and declare as the main problem in marketing the lack of specific legislation. Thus, it is suggested that at national level the commercialization of honey is the second most commercialized product, due to the lack of technical identity and quality regulation (RTIQ) of national scope.

The absence of RTIQ for meliponine honey restricts access to the formal market for the commercialization of products from this activity, in most Brazilian states (SANTOS 2019). Thus, most beekeepers sell their products informally, directly to the consumer, through direct contact or through social

networks, without hygienic-sanitary control (SANTOS 2019). Some Brazilian states such as São Paulo, Santa Catarina, among others, already have RTIQ, enabling their beekeepers, in addition to formally marketing their products in the municipality/state, also access the "Arte Seal", created through Law No. 13,680, of June 14, 2018 that allows the interstate marketing of handmade products of animal origin inspected regionally (SÃO PAULO 2017, BRASIL 2018, SANTA CATARINA 2020, REGINATO KOSER et al. 2020). The granting of the art seal to stingless bee honey and derived products is regulated through Ordinance No. 289 of September 13, 2021 (MAPA 2021). However, many states have not yet established their physical-chemical and sanitary criteria for quality control of meliponine ethos, and there is also no federal RTIQ. Thus, the elaboration of an RTIQ that adequately meets the characteristics of meliponine honeys, according to the species and biome in which it is inserted, becomes necessary for formalization of the commercialization of products of these bees and the opening of new market niches (REGINATO KOSER et al. 2020).

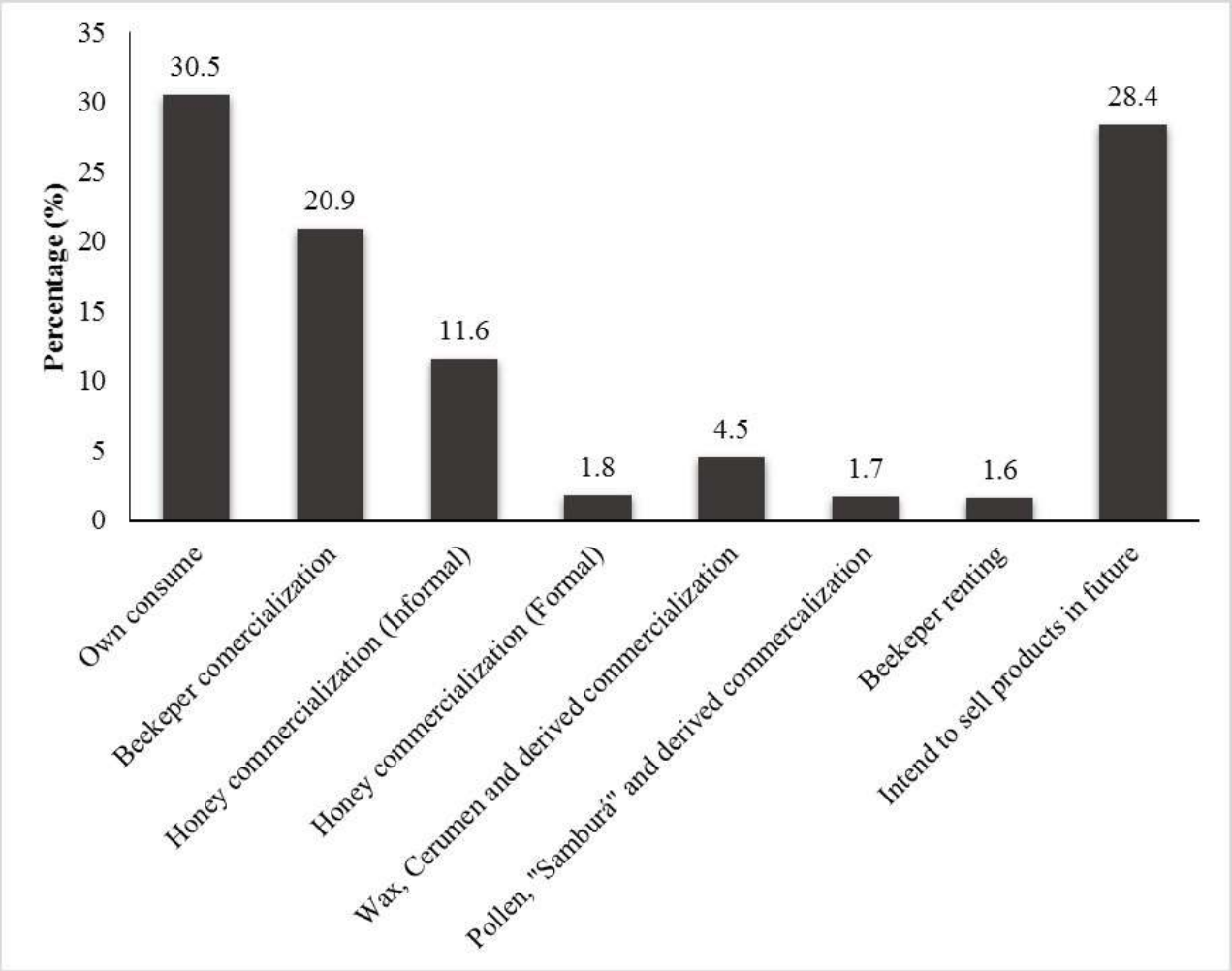

Figure 3: Purpose of breeding stingless bees.

According to MENDONÇA NETO et al. (2021) the same difficulty is reported to other honey products, such as saburá, which has high biological potential, antioxidant activity and favors health and well-being when used continuously, however, it is marketed informally, directly with the consumer, and it has no regulation, nor standardization established by the Ministry of Agriculture, Livestock and Supply-MAPA. Wax and geopropolis are used for the manufacture of ecological attractions and varnishes, thus being marketed in natura or already prepared among breeders (DANTAS et al. 2020).

Despite the great media appeal on pollination and ecosystem service of bees, only 1.6% of beekeepers can rent their colonies for pollination of crops. This is an emerging but little explored market (BARBIERI & FRANCOY 2020).

A significant portion of beekeepers (28.4%) answered that they have the objective of becoming professional and making money from the activity, but have not reached this point yet. DEMETERCO et al. (2015), in a community in the interior of Amazonas, recorded that the beekeepers had the intention of

marketing the honey of their bees. However, the researchers realized that the main motivation was not economic. The authors said "It is a zealous relationship with bees, as they observe in them a work effort that they themselves employ in all their activities. But the financial return is obviously one of the intentions of the meliponiculture practiced in the Amanã Sustainable Development Reserve, in the municipality of Maraã, located in the Middle Solimões region, Amazonas".

It is possible that the practice of meliponiculture has more intimate reasons on the part of beekeepers. In the present study, this was noticed in the question of the amount paid for hives. This was the only question that had room to write the answers, and many explained the "whys" of their decision to pay high amounts for a hive. And these explanations were based mainly on the admiration for bees and the sentimental value of their creations.

When asked about their main source of income, a considerable portion of the interviewees indicated that they worked in urban area jobs (Figure 4), reinforcing the idea that urban amateurs are a considerable portion among beekeepers. This result corroborates those already registered in São Paulo (BARBIERI JÚNIOR 2018) and Australia (HALCROFT et al. 2013).

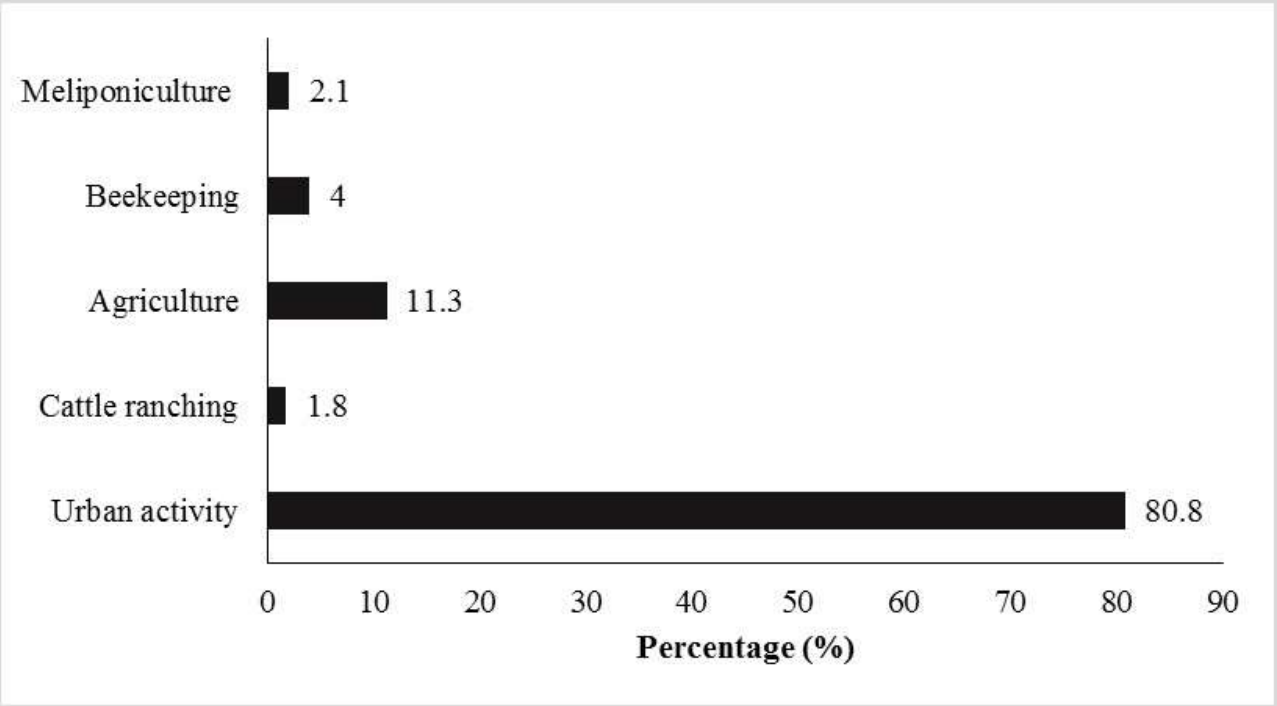

Figure 4. Main sources of income for beekeepers.

The urban public has higher income when compared to the one living in the rural environment (HOFFMANN 2019) and this is reflected in the average amount paid per swarm. More than half of the interviewees (463 people) have already bought swarms, paying on average R$ 418.68 ± 289.36. The maximum declared value was R$ 5,000.00, the minimum R$ 30.00 and 14 people said they had invested R$ 1,000.00 or more per colony. BARBIERI JÚNIOR (2018), in its survey in the state of São Paulo, observed that more than 50% of beekeepers have already bought colonies, a fact also observed by DANTAS et al. (2020) in the state of Paraíba and Rio Grande do Norte, where 57.9% of beekeepers have already acquired colonies of ASF (stinger bee), with values between R$ 15.00 and R$ 600.00 per colony. The value oscillates according to the species, degree of development of the colony, genetics among other reasons.

Another relevant information shared in the space for response on the purchase values of colonies was the significant number of reports of acquisition of swarms in baits, which is another practice sealed in Conama Resolution 496/2020 (CONAMA 2020). Some beekeepers (eight) declared that the amount was paid in a swarm on pet bottle bait. This has been a common practice, easily found in groups of beekeepers on social networks and on websites of buying and selling products, some including promises of shipments to other states of Brazil.

Regarding the bees that are raised, 27.3% of the beekeepers have more than one species, because they collect by hobby. The largest group, with 50.8%, creates more than one species, but one has a greater

amount. The set of breeders that focuses on a single species or group (genus) of bees accounts for 16.7%, while 5.2% maintain more than one species for academic purposes.

About the main characteristic that the bee species needs to have in order for the beekeepers to be interested in creating it, it was mentioned, from characteristics of behavior of the species, available studies on this, as well as its production specialty, when the objective was financial acquisition (Figure 5).

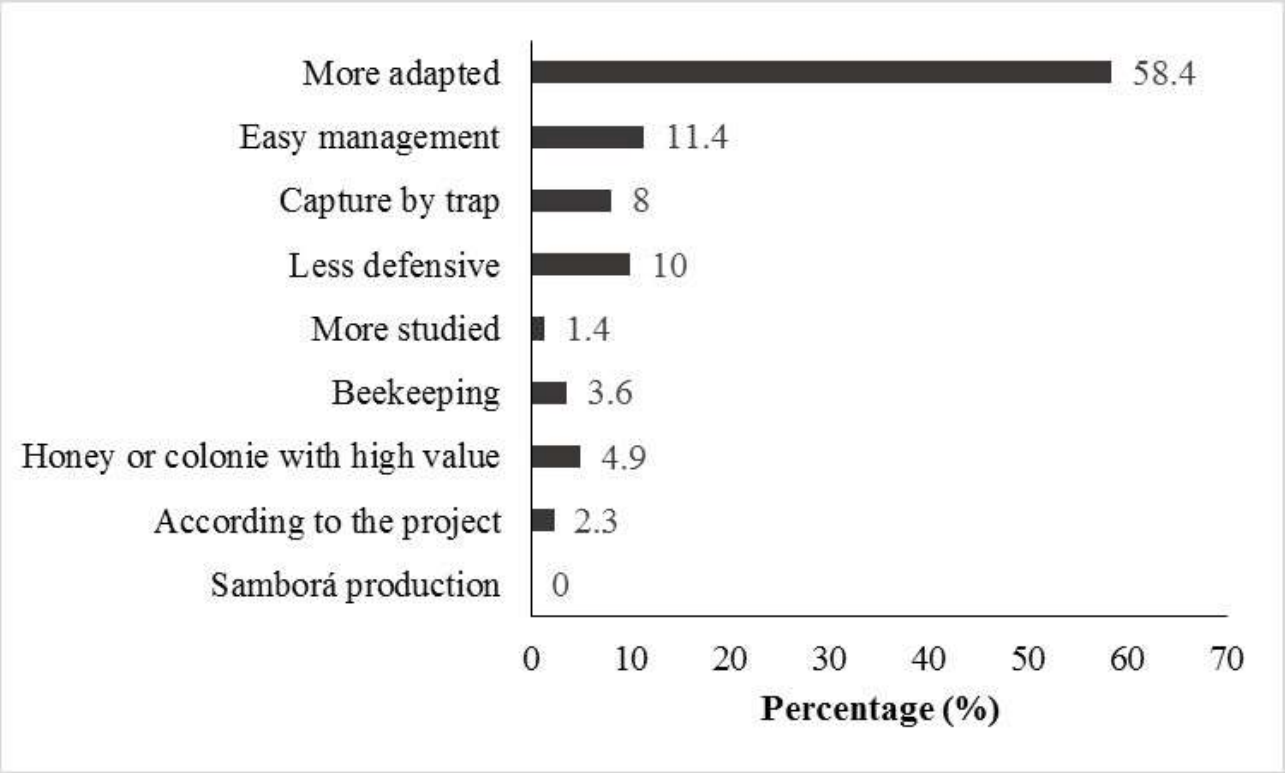

Figure 5. Desirable characteristics to choose the species to be raised by beekeepers.

The way of acquiring bees varied widely, since the survey allowed to mark more than one alternative. Bait capture (in pet bottle, milk carton, etc.) is preferred by 80.4% of people, while 55.9% buy swarms. These values are close to those recorded by BARBIERI JÚNIOR (2018) in SP. Forms that require a more refined technique or more appropriate training, such as divisions of strong swarms (56.2%) and rescue in places where swarms are at risk (42.1%) are practiced by half of beekeepers. Only 4.6% of the interviewees stated that they search ed in forests and remove them from the trees, with all care for the health of bees. It is noted that the alternative did not mention the health of trees that are nesting substrates. A gap is perceived that could be filled with environmental education and awareness of breeders. Only 3% receive swarms from various sources, including some not mentioned in the questionnaire, as they declared that meliponaries are for academic purposes.

Regarding the term "exotic bees", 46.6% stated that they know what it means, but do not have and do not want to have, 8% said they know what it is, own, but do not seek or buy new colonies and, 1.6% know what it is, but do not know if they have any colonies. These beekeepers have varying levels of knowledge of ecology. Some repeat some basic principles that exist in the literature most commonly shared online. They do not always know exactly the risks of exotic bees to ecosystems, yet they do not create them because they know that there is some risk, even though they do not understand them. On the other hand, there is a significant portion of creators who know the risks and pass the information through forums and groups on the internet.

In another sense, 19.2% know what exotic bees are, do not have, but would like to have and 8.6% know what it is, and they have it because they want it. This value is approximate to that recorded by BARBIERI JÚNIOR (2018), which was 10.36% in meliponaries in the State of São Paulo.

Many of the breeders who raise these bees know what it means to be exotic, but they don't know the ecological implications. Even if they know that they are informed, some do not trust research institutes and specialized companies, such as EMBRAPA (Brazilian Agricultural Research Company) or Universities, for example, and end up ignoring the recommendations and often breaking the laws.

Another worrying information is that 16% of breeders do not know what exotic bees are, a fact also verified by DOS SANTOS & DUARTE (2018), since it is an animal of great ecosystem importance and its action is so fundamental for the maintenance of various ecosystems (BARBOSA et al. 2017). Environmental education is a possible way to inform and sensitize beekeepers on this subject. Perhaps the events and consultation materials do not bring enough information on the subject.

The purchase of swarms, combined with little knowledge of the basic principles of ecology of the population in general and the desire to obtain high honey production capacity, causes a large circulation of exotic species in the Brazilian states (DANTAS et al. 2020). The breeding of animals from other biomes, in places of which they are not native, can cause a number of environmental problems and impacts, such as the displacement of niche native bees; interference in pollination, as they can visit plants of which they are not effective pollinators, consequently, competition for food; habitat loss (SIQUEIRA et al. 2022, TOLEDO-HERNÁNDEZ et al. 2022), among others.

Beekeepers learn about this activity in various ways, as observed in Figure 6. It should be noted that in this issue there was the possibility of marking more than one item.

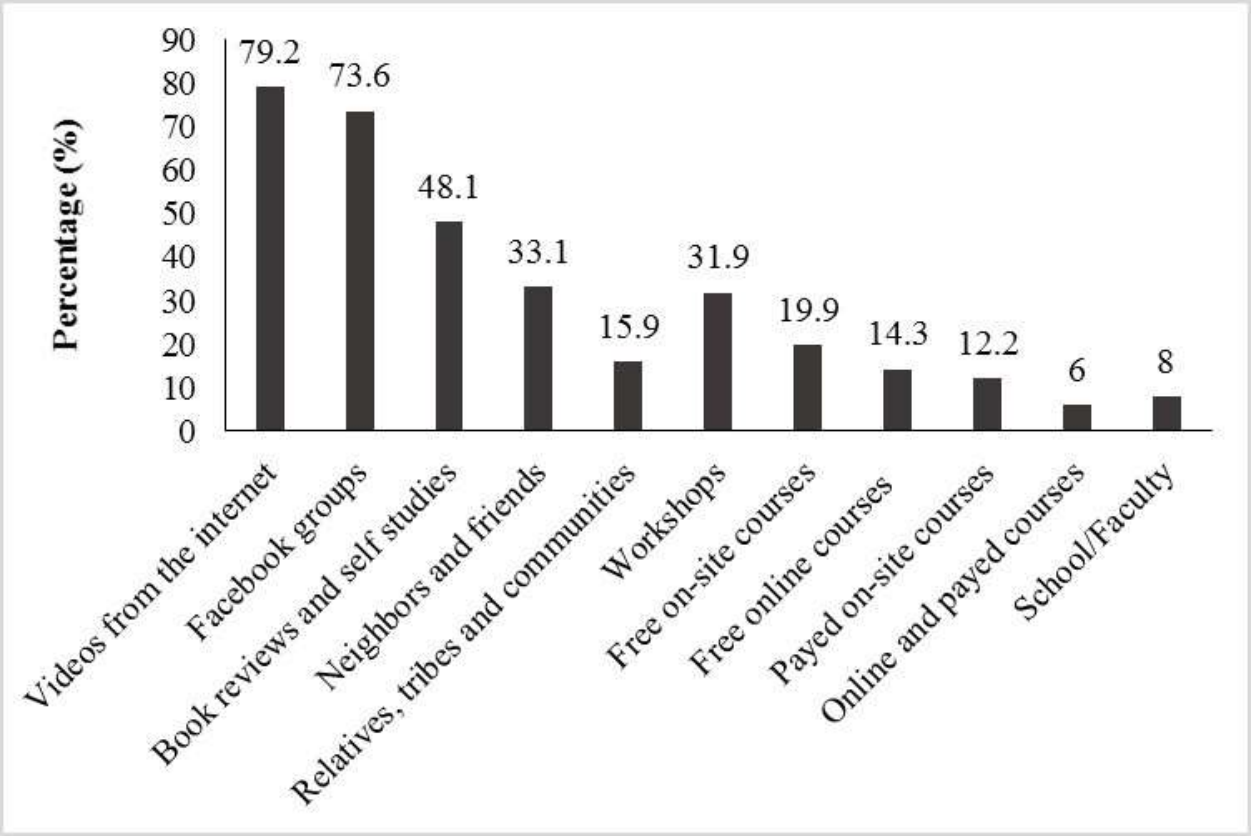

Figure 6. Sources of learning about stingless bee farming used by breeders.

In view of the extent of the origin of information used by stingless beekeepers, consequently, credibility is tended to vary according to each source. EMBRAPA, INPA (National Institute of Amazonian Research) and Universities were cited as the most reliable sources of information, with an average score of 4.16; 4.00 and 4.00, respectively (Table 1).

NGOs (Non-Governmental Organization), ICMBIO (Chico Mendes Institute for Biodiversity Conservation) and IBAMA (Brazilian Institute of the Environment and Renewable Natural Resources) were cited as unreliable sources, being close to sources without scientific control, such as Facebook and WhatsApp. There are two choices for that. The first would be the lack of knowledge about these institutions, which is evident in the fact that 86.6% say they do not know ICMBIO, even though it is an important deliberative and supervisory body in Brazilian environmental policy. The second hypothesis would be an opinion based on political forces, which have exerted a strong influence on public opinion, discrediting bodies linked to environmental causes, mainly due to pressure from sectors interested in releases and relaxation of farm rules and penalties for the suppression of preserved areas or for projects with high environmental impact (DE ARAÚJO & SIMAS 2020).

Table 1. Trust of beekeepers in the main sources of information on beekeeping.

Source of information	Trust level (%)							
	5 - Fully trust	4	3	2	1	0 - Not trust	Don't know	Medium confidence
University	37.4	34.9	21.7	3.9	1.0	1.1	13.5	4.00
EMBRAPA*	49.8	27.7	15.1	5.1	1.2	1.2	15.9	4.16
Extension companies (EMATER, ATER, ASCAR, etc.)	34.8	29.5	20.8	8.3	2.3	4.3	35.1	3.73
ICMBIO	23.7	27.4	18.8	11.8	4.6	13.7	86.6	3.13
NGOs	16.3	23.7	24.0	11.5	4.8	19.6	33.7	2.76
IBAMA	24.1	24.1	23.5	12.2	5.1	11.0	23.0	3.17
State Research Institutes	36.5	32.9	18.2	8.4	2.0	2.0	38.1	3.88
INPA	43.8	30.9	13.5	7.2	2.9	1.8	41.7	4.00
Facebook	5.7	19.5	40.2	22.1	7.4	5.1	4.7	2.79
WhatsApp	12.0	24.7	37.2	14.9	5.6	5.6	5.5	3.06
Specialized Books	49.3	36.0	11.1	2.0	0.9	0.6	8.3	4.29

*EMBRAPA = Brazilian Agricultural Research Corporation. ICMBIO = Chico Mendes Institute for Biodiversity Conservation. ONG = Non-governmental organization. IBAMA = Brazilian Institute of Environment and Renewable Natural Resources. INPA = National Institute of Amazonian Research.

It is observed that greater access to Facebook and WhatsApp groups makes them good channels for dissemination of reliable information materials on topics related to activity, notions of ecology. BARBIERI JÚNIOR (2018), in the state of São Paulo, despite addressing a mostly urban public with a high educational index, also observed the great use of the Internet for learning meliponiculture, as well as the large participation of beekeepers in Facebook groups. This same author pondered that the far-fetched language used in books and teaching materials makes it difficult to understand beginners, evidencing a distance between academia and beekeepers, which needs to be overcome, because universities and official research and extension companies are reliable sources of information.

Stingless beekeepers believe that the activity is negatively influenced by several factors, as shown in Figure 7.

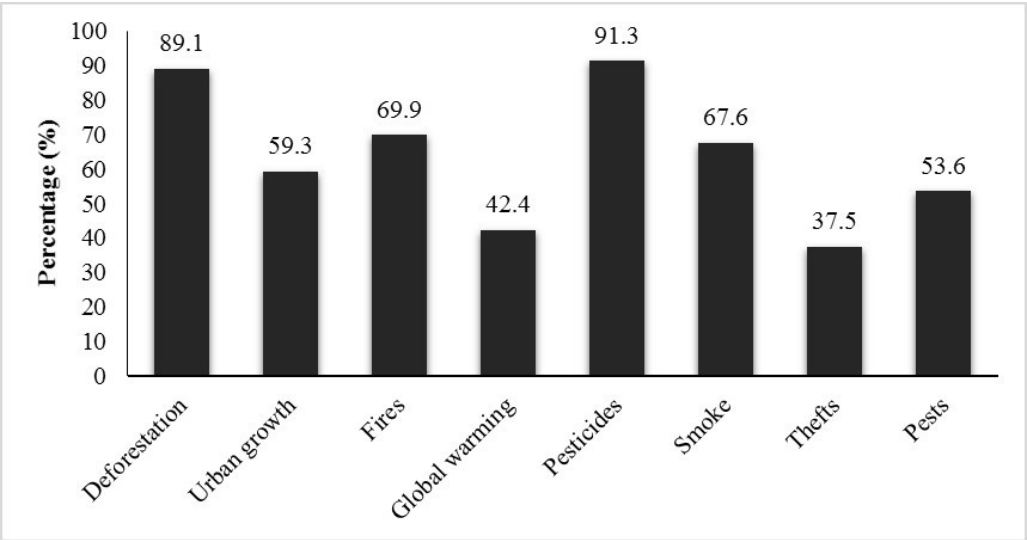

Figure 7. Limiting factors for the creation of stingless bees, according to beekeepers.

Deforestation, the increase of cities, the decrease of gardens and trees in the urban area and the fires are directly linked with the suppression of native vegetation and the change in land use, consequently, with the suppression of food sources, also reducing nesting sites (BARBOSA et al. 2017, DA ROSA et al. 2019).

Global warming, in turn, will have an impact on temperature, and the expected increase in the coming decades may interfere with the behavior of eusocial bees. SILVA (2017), for example, observed that *Melipona subnitida* with the increase in temperature directs its foraging to obtain nectar and water, reducing pollen collection, also occurring the reduction of offspring cells, which can lead to the collapse of the hive in the long term.

Exposure to agrochemicals can affect the olfactory system, cause flight disturbances, compromise the immune system, reduce the survival rate of bees (PACÍFICO-DA-SILVA et al. 2016) and cause death (SILVA et al. 2021). Malathion, for example, is an organosphosphate insecticide, used to control *Aedes aegypti,* through nebulizers (Ultralow Volume) popularly known as smoking (DA SILVA et al. 2020). PADILHA et al. (2020), during its analysis under acute lethal toxicity, reports that Malathion was highly *toxic to Plebeia emerina* and *Tetragonisca fiebrigi*. Malathion still has carcinogenic potential in humans (BASTOS et al. 2020). Despite all these problems already reported in the literature, this product is widely used in urban centers to combat the vector mosquito of diseases.

Hive theft is characterized by a limiting factor of the activity and may even make it impossible. According to MEIRELLES et al. (2020), although man is a promoter of the activity, through rational creation, he can receive pest status, since through theft actions, it becomes a limiting factor.

Finally, the attack of pests (forids, lemon bees, ants, frogs) was pointed out by 53.6% of beekeepers as a negative influence factor to the creation of melipones (Figure 8).

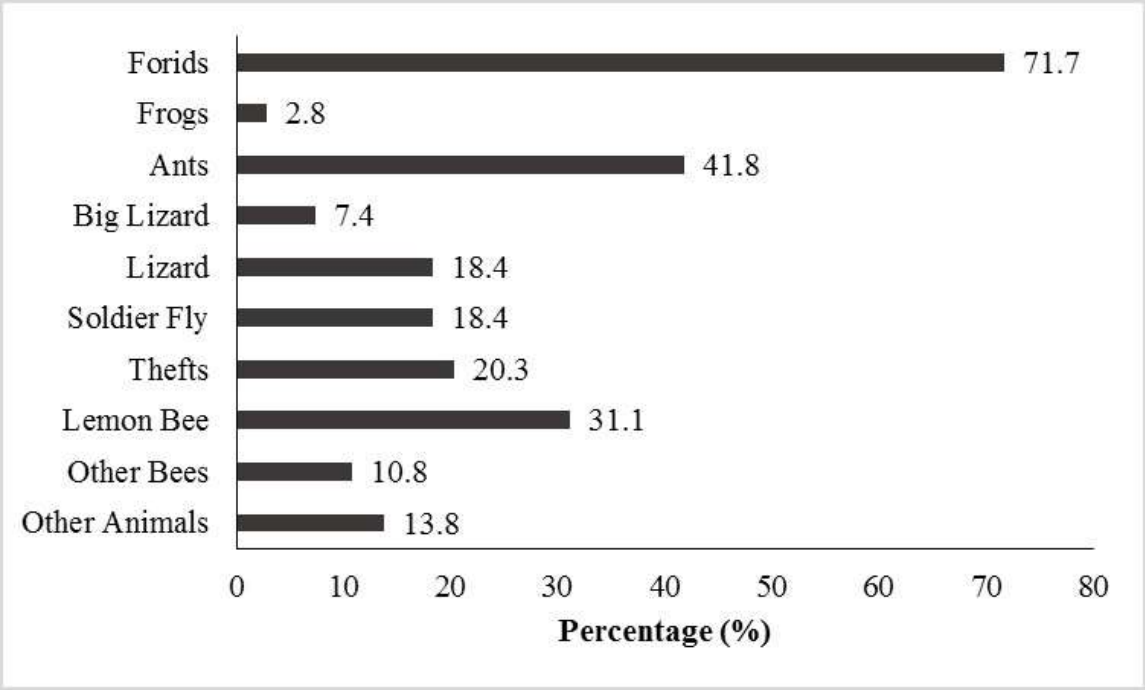

Figure 8. Percentage of pests in stingless bee farms, according to reports from breeders.

These results on limiting factors corroborate BARBIERI JÚNIOR (2018), whose study pointed out that the greatest concern of beekeepers in São Paulo were pesticides and deforestation, with several other problems at different levels being mentioned later.

The creation of native bees is conducted in boxes of various materials (Figure 9). However, 75.4% stated that they only use wood, or test other materials, while 12.5% only use wood, but have tested other materials, 11.1% have several materials, but mainly wood, 1% do not like wood and prefer other materials.

The materials needed to conduct the activities are easily accessible, being found in agricultural stores (30.2%), in supermarket (8.2%), bought over the Internet (32.6%), purchased from other beekeepers in Facebook groups (17.9%). However, many manufacture (53.1%) and improvise several tools (54.4%), demonstrated that meliponiculture is an easily developed activity, but that it demands inputs and tools, and this may be a market to be explored.

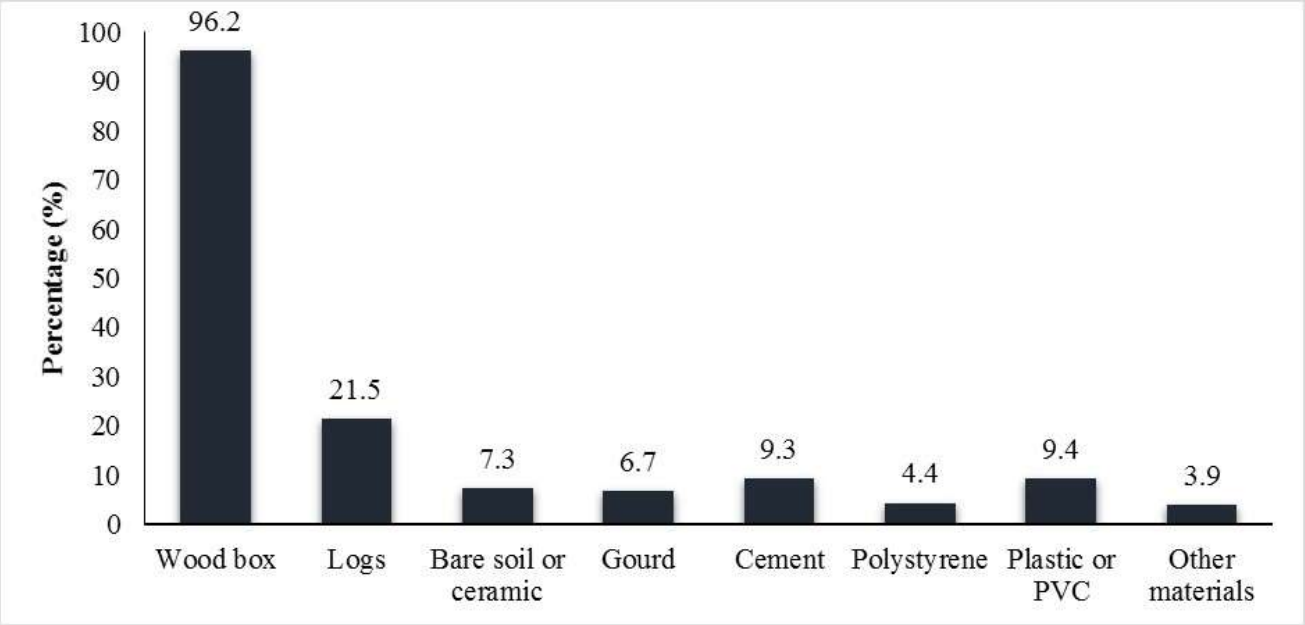

Figure 9. Materials used to make beehives/boxes.

In the state of São Paulo, the most used cash model is the INPA (78.57%), followed by Ailton Fontana (23.93%), Paulo Nogueira Neto - PNN (13.93%) among other models, in Ceará, the most used model is horizontal northeastern (67.97%), followed by INPA (15.69%), wooden trunks (9.80%), PNN (1.965) and 4.58% used gourds, ceramic pots among others, 83.11% of the beekeepers declared that they did not buy the boxes, but made them handmade (FELIX 2015, BARBIERI JÚNIOR 2018). Therefore, it is possible to observe that the great preference for wood, can be directly related to the models of boxes used, as well as the ease of access and handmade clothing. Also, the use of trunks and gourd or gourd may be linked to creation for conservation purposes, besides being characteristic materials of certain regions and culturally traditional, since in this type of colony the honey harvesting process is more difficult.

The other materials such as cement mixed with coconut fiber or coconut fiber, PVC, or other related materials, in a lower percentage, are more innovative and may be related to the large number of hobbyists and curious residents in urban areas. They have usually great familiarity and access to these materials because they are easy to acquire in store markets.

CONCLUSION

Today's beekeepers are mostly beginners, living in urban areas, performing the creation of stingless bees as a hobby.

The honey produced mostly is intended for family consumption itself. Thus, the item that stands out in the commercialization are the swarms.

The creation of swarms occurs in boxes of different materials, the wood being the most common. And the tools used in the activity are mostly made and/or improvised.

Native beekeepers use the internet as their main source of information, although universities EMBRAPA and INPA are cited as the most reliable.

It was observed that beekeepers have intimate motivations, such as the admiration for bees and the sentimental value of their creations, as well as, economically, to the realization of meliponiculture activity.

ACKNOWLEDGEMENTS

Authors wish to thank to the Rio Grande do Sul State University and FAPERS to the concession of scientific scholarships to the students. Also, for local producers that answer to the proposed questions.

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