REVISTA O UNIVERSO OBSERVÁVEL

O Conhecimento é o horizonte de eventos.

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

REVISTA O UNIVERSO OBSERVÁVEL

v.1, n.6, 2024 - Outubro

Revista Multidisciplinar

AGROECOLOGY AND BEEKEEPING: APIS MELLIFERA BEES AS ALLIES OF FAMILY FARMING

VIVIANE MALLMANN, LUCAS WAGNER RIBEIRO ARAGÃO, ROGÉRIO CÉSAR DE LARA DA SILVA

Fonte: https://copilot.cloud.microsoft/?fromcode=cmc&redirectid=23A0829B72E54DC888FA159D3FD0E43F&auth=2

PERIÓDICO CIENTIFÍCO INDEXADO INTERNACIONALMENTE

DOI: 10.5281/zenodo.

DOI: 10.69720/Crossref

ISSN
International Standard Serial Number
2966-0599

www.ouniversoobservavel.com.br

O Conhecimento
é o horizonte
de eventos.

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

AGROECOLOGY AND BEEKEEPING: APIS MELLIFERA BEES AS ALLIES OF FAMILY FARMING

Viviane Mallmann ; Lucas Wagner Ribeiro Aragão;
Rogério César de lara da Silva

Revista o Universo Observável
DOI: 10.5281/zenodo.14014339
ISSN: 2966-0599

O Conhecimento é o horizonte de eventos.

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

Abstract:

The family agropecuary sector plays a crucial role in food production, with a greater focus on local consumption and a social relevance that surpasses its economic importance. Although productivity is often on a small scale, family farming reduces rural exodus, generates resources for low-income families, and significantly contributes to national wealth, benefiting not only the agropecuary sector but the country's economy as a whole. Discussing family agriculture is intrinsically linked to agroecology, which is dedicated to using resources that enhance production without the use of agrochemicals. This includes practices such as raising animals in conjunction with crops. In this context, beekeeping stands out as a strategy that not only provides an additional source of income for families but also acts as a catalyst for increased productivity. Accordingly, this study aimed to compile information on beekeeping and its benefits, as well as to present the results obtained from its implementation on a site located in the Carlos Jacob Franciozi-Princesa do Sul settlement in the municipality of Japorã/MS.

Keywords: *Agroecology: Family Farming: Beekeeping: Food Production: Rural Developmen*

1. Introduction

Beekeeping, defined as the management of bees without confinement under human supervision in artificial hives, utilizes methods and equipment that maximize the natural capabilities of these insects (PERUCA et al., 2002). By its nature, this activity is both economically beneficial and species-conserving, as it has a low environmental impact and promotes the sustainable use of natural resources, preventing the degradation of rural areas. Thus, beekeeping stands out for addressing the three pillars of sustainability: the economic, generating income for beekeepers; the social, providing employment for family labor and reducing rural exodus; and the ecological, as beekeeping does not require deforestation, actually necessitating the presence of living plants for the collection of pollen and nectar, its basic food sources (ALCOFORADO FILHO, 1997; 1998). Additionally, beekeeping contributes to all 17 Sustainable Development Goals (SDGs) by improving food production systems without generating pollution or waste and positively impacting biodiversity. This practice, therefore, aligns with the principles of sustainability in its economic, social, and ecological dimensions (APIMONDIA, 2024).

Domestic bees, of the species Apis mellifera, have a vast distribution, extending from Southern Scandinavia to Central Asia and Africa. However, due to their economic relevance, they have been introduced on all continents, being used in the production of honey—the first known sugary animal-derived food since prehistoric times (CRANE, 1999)—and wax, with religious applications, as seen in Brazil. Beekeeping has played a significant role in human societies, even improving the quality of life for underprivileged populations, thanks to the quick financial return it offers to beekeepers. In 2007, honey, its main product, reached a global commercial value of $1.25 billion (ENGELSDORP and MEIXNER, 2010).

In Brazil, many farmers have intensified beekeeping activities, contributing to ecosystem conservation by reducing harmful practices such as firewood extraction, deforestation, and burning (SOUZA, 2002). However, this reality is challenging. Vilela (2002) points out that the region still faces technological and economic immaturity in beekeeping, needing techniques to enhance scientific knowledge about local natural resources, essential for honey production. To progress, it is crucial to develop hive management methods that increase productivity and improve honey quality, challenges also recognized for consolidating beekeeping as an economically viable activity in the Pantanal (REIS, 2003).

Currently, production in the region predominantly focuses on honey, with limited use of other bee products such as royal jelly, pollen, propolis, bee venom, and wax, which could diversify and add value to the production chain. One alternative to boost the sector's economy is transitioning from a conventional to an organic production system. However, to achieve certification, existing issues must be overcome, such as inadequate management practices and lack of sanitary inspection, through adjustments that promote professionalism and profitability in the Pantanal (REIS, 2003).

The questioning of traditional agriculture fits into a context of growing environmental and food awareness, seeking a healthier lifestyle. This shift opens the door for alternative agricultural practices that respect the environment, avoiding inputs and pesticides that compromise the quality of both the environment and food (SOUZA, 2002). In the last 40 years, honey production in Brazil has grown more than tenfold. However, between 2009 and 2013, honey

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

exports fell by approximately 38%, reflecting hive losses in producing regions, especially due to severe droughts, such as that of 2012, which affected production in the Northeast, leading to a 52% decrease in production and 25% in exports, transferring the title of the largest exporter to the Southern region (ETENE, 2013).

The following Graph 1 illustrates the participation of the main states in Brazilian honey production, which totaled 64,188,949 kilograms in 2023, representing a total value of R$ 908,084, with Rio Grande do Sul leading production.

Graph 1. Map - Bee Honey - Production Value (Thousand Reais).

Bee Honey - Production Value (2023)

Location	Value	Unit
Rondônia	7,795	Thousand Reais
Acre	557	Thousand Reais
Amazonas	1,888	Thousand Reais
Roraima	4,584	Thousand Reais
Pará	15,986	Thousand Reais
Amapá	501	Thousand Reais
Tocantins	4,294	Thousand Reais
Maranhão	37,224	Thousand Reais
Piauí	106,938	Thousand Reais
Ceará	56,845	Thousand Reais
Rio Grande do Norte	13,174	Thousand Reais
Paraíba	7,697	Thousand Reais
Pernambuco	16,179	Thousand Reais
Alagoas	9,915	Thousand Reais
Sergipe	2,849	Thousand Reais
Bahia	55,245	Thousand Reais
Minas Gerais	86,366	Thousand Reais
Espírito Santo	11,928	Thousand Reais
Rio de Janeiro	18,618	Thousand Reais
São Paulo	69,959	Thousand Reais
Paraná	149,166	Thousand Reais
Santa Catarina	61,731	Thousand Reais
Rio Grande do Sul	124,187	Thousand Reais
Mato Grosso do Sul	13,693	Thousand Reais
Mato Grosso	17,464	Thousand Reais
Goiás	12,322	Thousand Reais
Federal District	976	Thousand Reais

Source: IBGE, 2024.

The Graph 1 illustrates the revenue generated by honey production in various Brazilian states, highlighting the diversity and economic potential of beekeeping in the country. Midwest states like Mato Grosso do Sul and Mato Grosso, while not the largest in revenue, make significant contributions, with revenues of R$ 13.693 million and R$ 17.464 million, respectively. The region's climatic and floral variety favors the production of honey with different characteristics.

In contrast, Northeast states such as Piauí and Ceará achieve significantly higher revenues, with R$ 106.938 million and R$ 56.845 million, respectively. This highlights the importance of beekeeping as a vital economic activity in the region, providing a sustainable and profitable alternative for beekeepers.

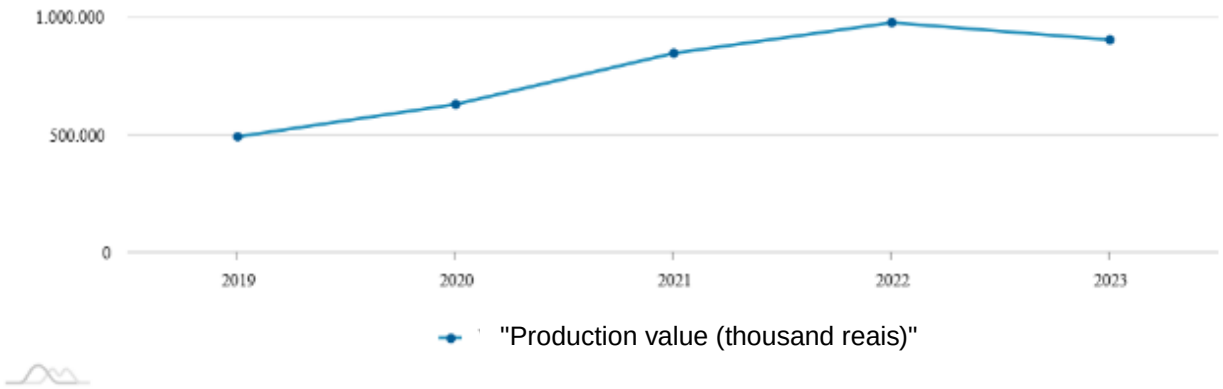
Additionally, Southern and Southeastern states like Paraná and São Paulo also present significant revenues, with R$ 149.166 million and R$ 69.959 million, respectively, reinforcing the central role of these regions in honey production in Brazil. In summary, beekeeping not only generates significant revenue but also contributes to economic, social, and environmental sustainability, revealing the need for public policies that encourage honey production and commercialization.

Analyzing other data, it is observed that, despite Brazil's considerable honey production and significant exports, the country lags behind nations such as Vietnam, Germany, and Hungary in terms of the value obtained from honey sales. In 2011, these countries, while lower than Brazil in export volume, surpassed it in value. Graph 2 presents the appreciation of Brazilian honey, indicating a rising market.

Bees play a crucial role in pollinating over 70% of the agricultural areas that feed the world, as well as contributing to the pollination of flora in general, enhancing the resilience of green spaces that provide oxygen. Albert Einstein, the renowned 20th-century scientist and 1921 Nobel Prize winner in Physics, predicted that if bees disappeared from the Earth, humanity would only have a few years left to live. This prophecy is alarming and could come true if there is no conscious mobilization to reverse the situation, as the extinction of bees is an increasingly pressing reality, as warned by beekeepers and reported in the media.

O Conhecimento é o horizonte de eventos.
ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

Graph 2. Historical series - Honey production value.



Source: IBGE, 2024.

One of the main causes of bee mortality is the excessive use of pesticides in crops, especially on large farms. There are known alternatives for pest control that are less toxic to bees, allowing agricultural productivity without harming the environment and, in particular, bee colonies. Brazil is one of the largest consumers of pesticides in the world, resulting in significant profits for the multinationals that produce them, including neonicotinoid pesticides, which are extremely harmful to bees.

The community must demand ecological solutions, as companies prioritize immediate profit over environmental health. While some less toxic pesticides are being adopted, pest resistance to these products necessitates the use of more harmful pesticides. Therefore, it is believed that only a drastic ban or the prohibition of systemic products, especially neonicotinoids, can resolve the crisis in beekeeping, as new research confirms their detrimental effects (DESNEUX et al., 2007; RATIA, 2008; RITTER, 2011; GONÇALVES, 2012; PETTIS, 2011; LU et al., 2012).

Despite some doubts about the impact of pesticides on bees, studies show that neonicotinoids affect bee physiology, interfering with their memory and behavior. Research with honeybees (Apis mellifera) indicates that these pesticides impact the brains of worker bees, making it difficult for them to return to their colonies after foraging (DESNEUX et al., 2007; HENRY et al., 2012; LU et al., 2012; WHITEHORN et al., 2012). This explains why beekeepers find hives with few individuals or empty, a typical situation of Colony Collapse Disorder (CCD), where previously populous hives are found without bees, yet still containing brood, honey, pollen in light of this scenario, some farmers in Mato Grosso do Sul have been seeking new environmental management approaches to ensure the survival of bees and the continuity of beekeeping while preserving agricultural production. This manuscript presents the results of work developed by a family unit in Japorã, MS, in the Carlos Jacob Franciozi-Princesa do Sul settlement, lot 172, introducing beekeeping as a complementary activity to other income sources and highlighting the benefits obtained after this inclusion.

3. General Objective

Document the practices of organic honey production and the pursuit of autonomy and agricultural sustainability of a family in the Carlos Jacob Franciozi-Princesa do Sul settlement, located in Japorã – MS.

4. Specific Objectives

Conduct visits to the site to directly observe the practices developed by the family in focus. Carry out interviews with the owners, guiding questions based on observations made over time regarding the implemented practices.

5. Methodology

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

This study was conducted over the past five and a half years, with semiannual visits to the site. During these visits, interviews were carried out, guided by a pre-prepared questionnaire. The responses were handwritten in a 100-page notebook, meticulously preserving the linguistic regionalisms of the owners, who are descendants of German families. After each interview, photographs were taken of all areas of the site related to bee management, using a Samsung ES90 camera with a resolution of 14.2 MP.

5. Development

The Carlos Jacob Franciozi-Princesa do Sul settlement had 268 settled families as of April 2009. However, the implementation process faced challenges, and shortly after the delivery of the lots, water and electricity systems were installed. Initial incentives were released, and construction materials were provided to begin the construction of 20 houses. Unfortunately, allegations of irregularities led the Public Ministry to intervene, resulting in the suspension of the program. As a consequence, none of the settlers were able to access available resources through credit programs, forcing each family to organize according to their means.

One of these families is that of Renata Mallmann, married to José Mallmann. They implemented an innovative project on their property, diversifying income sources to ensure family sustainability and recover the degraded environment. Their lot, number 172, spans about 10 hectares, had already been mechanized, and was covered with Panicum maximum Jacq. var. Colonião grass, with only a few mature trees. At the end of the lot, there was a space with around fifty milkwood trees (Peschiera fuchsiaefolia) planted closely together, where they began to establish an apiary.

Today, the apiary houses approximately 60 hives, which have been added gradually. In the early days of the settlement, when people discovered swarms on their lots, they would call José to capture them. Thus, from 2009 to 2015, the project was implemented slowly and steadily. See Figure 1 for an image of the apiary.

Fig. 1: Current image of the apiary.

Source: Viviane Mallmann.

The labor used to process the honey is family-based. Mr. José makes the beehives himself. He shares the secret to working with bees: “Since I was a child, I watched my father and grandmother working with honey, and I was always there helping; I learned to capture swarms from them. But it didn’t stop there. I always thought that one day I would have my own farm and bees. So, when I moved from Paraguay to Brazil in 2004, my wife and I took a complete beekeeping course at SENAI. We learned different ways to handle the bees, which was very helpful. Now, I want to take a course that focuses on working with pollen, royal jelly, and propolis, because I believe that this number of swarms will already yield a good amount of product...” (José Mallmann, 04/06/2015).

A significant advancement observed on the family's property is that, thanks to the bees, the productivity of all crops on the site has increased, including corn, coffee, fruits, pastures, and even sesame production. Mrs. Renata expresses immense satisfaction: “With the bees on the farm, the sesame seed production has doubled. We had tried planting before, but we would only harvest a tiny amount of seeds; it wasn’t even worth the effort. Now, with the little space I plant, I have enough for us to eat all year long, and I've distributed these heirloom seeds to various Brazilian states. I always say, the secret is to have bees on the farm. During the fruit bloom, if you walk through the orchard, you can hear the loud buzz of the bees. Then, the fruit trees become so laden that some branches need to be propped up to prevent breaking from the weight, and others need thinning... When we plant corn, especially in the early morning and late afternoon, there are many bees in the cornfield, and the ears turn out plump afterward...” (Renata Mallmann, 04/06/2015).

According to Sommer (2002), many

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

countries are still unaware of the benefits that bees provide for increasing the production and quality of agricultural products, pastures, and biological balance. Approximately 40% of agricultural production depends on pollination by bees. However, the rational use of these pollinators is quite limited. Extensive crops such as coffee, soybeans, cotton, and fruits often lack a single beehive, which could substantially increase final production. Furthermore, Peruca et al. (2002) emphasize the crucial role of beekeeping in the environment, as bees pollinate both cultivated and native plants, contributing to the balance and conservation of nature. Bees are undoubtedly the most useful insects to humans, providing natural products like wax, royal jelly, pollen, propolis, and bee venom, all used as natural foods or for medicinal, preventive, and curative purposes.

There is a clear need for empirical studies in (semi)natural environments involving different pesticides, pathogens, and insect species. Such studies are essential to understand, in greater depth, the mechanisms and interactions among these elements, particularly concerning their importance for insect fitness and population dynamics (STRAUB et al., 2022).

The following Figure 2 illustrates the effect of pollination on sesame production, cultivated from heirloom seeds acquired at the 2010 Heirloom Seed Fair. This annual event, held in the municipality of Jutí, serves as an important social and scientific gathering, bringing together family farmers from various regions to exchange seeds and experiences. The event aims to promote and conserve the environment while attracting academics and professionals from related fields.

Fig. 2: Pollination.

Source: Viviane Mallmann.

To ensure honey production throughout the year, this family adopts innovative practices by utilizing native plants in the region that produce an abundance of flowers, such as naturally growing herbs. They implement sustainable rotational management without using pesticides and cultivate other fast-growing plants that bloom during times of scarcity. Additionally, during long periods of drought, the bees are fed with their own honey, while always ensuring access to clean water.

Rural entrepreneurs should encourage the planting of plant species with multiple uses, capable of producing nectar, pollen, fruits, seeds, fibers, and high-quality wood with significant economic value. However, many beekeepers worldwide limit themselves to exploiting existing vegetation without contributing to the improvement of honey quality or the biological balance through forest densification. This situation is exacerbated by the scarcity of seeds, seedlings, and cuttings, which hinders the rapid expansion of selected plants that could enrich the bee flora. Raising awareness among farmers, beekeepers, and the government for joint action is the current major challenge (SOMMER, 2002).

Another factor contributing to maintaining high honey production is the location of the apiary, which is situated at the back of the property next to a legal reserve area rich in flowering plants throughout the year. This environment provides a bountiful foraging ground for the bees, resulting in exotic, special, and flavorful honey, as illustrated in Figure 3. Astuti et al. (2024) emphasize the importance of biodiversity in light of the global climate crisis, noting that changes in temperature and precipitation patterns directly affect plant flowering, impacting the availability of resources for bees. In various regions, warmer winters and dry summers have reduced the abundance of pollen from some species, such as eucalyptus, while favoring the emergence of drought-tolerant flowers.

This practice ensures high honey productivity on the property. Currently, each hive produces about fifty kilograms of honey annually, totaling approximately three thousand kilograms per year. This production provides the family with a steady source of income. Honey is sold for between fifteen and twenty reais per kilogram, potentially generating annual revenue of up to forty-five thousand reais. Peruca et al. (2002) emphasizes that beekeeping is an important source of income for small producers, especially for settlers, who often have areas that are well-utilized by the bees. Below, in Figure 4, you can see a honeycomb

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

filled with honey**.**

Fig. 3: Honey.

Source: Viviane Mallmann.

Fig. 4: Here, it is possible to observe the honey harvest, with the honeycomb capped.

Source: Viviane Mallmann.

6. Conclusion:

The organic honey market presents significant potential, but its expansion depends on the collective awareness of farmers regarding the use of pesticides, which have negatively impacted bee populations. The adoption of sustainable agroecological practices, although not yet widely spread in rural areas, is becoming increasingly valued, especially among smallholders like Mr. José and Mrs. Renata from the Alvorecer farm.

Farmers' accounts highlight the importance of practices that promote sustainability and autonomy for families dependent on the land for their livelihoods. These individuals, deeply connected to their environment, resist the environmental degradation caused by greed and the social and economic injustices of capitalism, which often result in soil contamination and the exploitation of rural communities. The Mallmann family is an inspiring example of how agricultural production can align with environmental preservation and autonomy while maintaining their identity and values.

With a clear vision for the future, the Mallmanns are committed to expanding their apiary and adopting new techniques to extract not only honey but also other valuable products that bees provide. Despite facing challenges, such as the pursuit of organic certification—which will require additional time and resources—they continue to strive for healthy and sustainable production. Support from partner organizations will be crucial in making these goals a reality. By promoting sustainable agricultural practices, families can not only secure their livelihoods but also contribute to environmental health and biodiversity, ensuring a positive legacy for future generations.

References:

ALCOFORADO FILHO, F.G. Flora of the caatinga: conservation through beekeeping. In: NATIONAL BOTANY CONGRESS, 48th, 1997, Crato, CE. Abstracts. Fortaleza: BNB, 1997. p. 362.

ALCOFORADO FILHO, F.G. Sustainability of the semi-arid region through beekeeping. In: BRAZILIAN BEEKEEPING CONGRESS, 12th, 1998, Salvador, BA. Abstracts. Salvador: UFBA/SBB, 1998. p. 61.

APIMONDIA. Beekeeping contributes to achieve the Sustainable Development Goals, 2024.

ASTUTI, P. K.; et al. Buzzing with Intelligence: Current Issues in Apiculture and the Role of Artificial Intelligence (AI) to Tackle It. Insects 2024, 15, 418. https://doi.org/10.3390/insects15060418

CRANE, E. Recent research on the world history of beekeeping. Bee World, Bucks, Vol. 80. pp. 174–186. 1999.

DESNEUX, N.; et al. The Sublethal Effects of Pesticides on Beneficial Arthropods. Ann. Rev. of Entomology. Vol. 52. pp. 81-106. 2007.

ISSN: 2966-0599
contato@ouniversoobservavel.com.br
www.ouniversoobservavel.com.br
Periódico Científico Indexado

GONÇALVES, L.S. Consequences of the disappearance (CCD) of bees in the international beekeeping agribusiness and especially in Brazil. Proceedings of the X Meeting on Bees of Ribeirão Preto. p. 24-25. Funpec Editora, 2012.

HENRY, M.; et al. Common Pesticide Decreases Foraging Success and Survival in Honey Bees. Science, 2012.

IBGE, 2024. https://www.ibge.gov.br/explica/producao-agropecuaria/mel-de-abelha/br

LU, C., WARCHOL, K.M., CALLAHAN, R.A. In situ replication of honey bee colony collapse disorder. Bulletin of Insectology, 2012.

PERUCA, R. D.; et al. Project to strengthen beekeeping among family farmers in the state of Mato Grosso do Sul. 13 p. 2002.

PETTIS, J. A retrospective look at factors contributing to colony losses in the U.S. over the years. Abstracts Book of the 42nd International Apicultural Congress. Buenos Aires, Argentina, from 21st to 25th September. p. 153. 2011.

RATIA, G. Bee losses, organic standard and importance of queen rearing. Apimondia Symposium – Puerto Vallarta, Mexico. Oct. 2008.

REIS, V.D.A. dos. Pre-diagnosis of the Apicultural Products Chain in Mato Grosso do Sul. 2003. Available at http://www.cpap.embrapa.br/publicacoes/ficha.php?topicobusca=DOC&titulo=S%E9rie+Documentos.

RITTER, W. Update on Bee Diseases. Abstracts Book of the 42nd International Apicultural Congress. Buenos Aires, Argentina. Abstract. from 21st to 25th September. p. 152. 2011.

SOMMER, P. G. Overview of global beekeeping. In: Brazilian Beekeeping Congress, 14th, 2002, Campo Grande, MS. Proceedings. Campo Grande: CBA: UFMS: FAAMS, 2002. p. 209-213.

SOUZA, D.C. Organic beekeeping: an alternative for exploited areas in the northeastern semi-arid region. In: Brazilian Beekeeping Congress, 14th, 2002, Campo Grande, MS. Proceedings. Campo Grande: CBA: UFMS: FAAMS, 2002. p. 133-135.

STRAUB, L.; et al. Int J Parasitol Parasites Wildl. 2022; 18:232–243. doi: 10.1016/j.ijppaw.2022.06.001.

van ENGELSDORP, D.; MEIXNER, M. D. A historical review of managed honey bee populations in Europe and the United States and the factors that may affect them. Journal of Invertebrate Pathology. Vol. 103 No. Supplement 1. pp. S80–S95. 2010.

VILELA, S.L.O. Development of technologies for the apicultural agribusiness in the northeast. In: Brazilian Beekeeping Congress, 14th, 2002, Campo Grande, MS. Proceedings. Campo Grande: CBA: UFMS: FAAMS, 2002. p. 276-282.

WHITEHORN, P.R.; et al. Neonicotinoid pesticide reduces bumblebee colony growth and queen production. Science. Vol. 336. pp. 351–352. 2012.