AN ANALYSIS OF THE STRUCTURE OF THE BEEKEEPING CHAIN IN THE TERRITORIES OF THE STATE OF RIO GRANDE DO NORTE (RN)

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ABSTRACT

Purpose: The present research aims to analyze the organizational structure of the honey chain in the state of Rio Grande do Norte.

Method/design/approach: Semi-structured interviews were conducted with eight representative subjects from the beekeeping chain in the municipalities of Rio Grande do Norte. A descriptive qualitative approach was adopted to analyze the organizational relationships within the chain.

Results and conclusion: The results highlight challenges in regulating the honey production chain, suggesting improvements in governance through collaborative development of regulations. Additionally, it emphasizes the importance of associations and producer cooperatives in strengthening beekeeping, adding value, and overcoming commercial challenges. Certification was deemed more relevant for the chain links involved in honey processing and distribution.

Research implications: The study reveals that the various actors involved in the honey production chain in Rio Grande do Norte have significant disagreements regarding the interpretation of the legislation governing the production of this product.

Originality/value: The research contributes to understanding the organizational structure of the honey chain in Rio Grande do Norte, providing development strategies in the apiculture sector.

Keywords: Production Chain, Apiculture, Honey, Agribusiness.

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RESUMO

Objetivo: A presente pesquisa tem como objetivo analisar a estrutura organizacional da cadeia do mel no estado do Rio Grande do Norte.

Referencial teórico: O presente estudo se fundamenta no eixo teórico proposto por Khan et al. (2014), o qual argumenta que a apicultura está emergindo como uma atividade fundamental para a diversificação da produção nos pequenos estabelecimentos agrícolas da Região do Semiárido. Esta região enfrenta significativas restrições no que diz respeito aos recursos hídricos disponíveis, o que, por sua vez, limita consideravelmente as opções de produção.

Método: Foram conduzidas entrevistas semiestruturadas com oito sujeitos representativos da cadeia apícola nos municípios do Rio Grande do Norte. A abordagem qualitativa descritiva foi adotada para analisar as relações de organização na cadeia

Resultados e conclusão: Os resultados destacam desafios na regulamentação da cadeia produtiva de mel, sugerindo melhorias na governança através do desenvolvimento colaborativo de regulamentações. Além disso, ressalta-se a importância das associações e cooperativas de produtores no fortalecimento da apicultura, na agregação de valor e na superação de desafios comerciais. A certificação foi considerada mais relevante para os elos da cadeia envolvidos no processamento e distribuição do mel

Implicações da pesquisa: O estudo evidencia que os diversos atores envolvidos na cadeia produtiva do mel no Rio Grande do Norte apresentam discordâncias significativas em relação à interpretação da legislação que rege a produção desse produto.


Palavras-chave: Cadeia Produtiva, Apicultura, Mel, Agronegócio.

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1 INTRODUCTION

In Brazil, beekeeping began to be developed in the nineteenth century by European immigrants who brought the species *Apis mellifera scutellata* and these bees crossed with the passage of time with the native bees and thus emerged the Africanized bees, being those more productive. (Costa, 2021). The management of beekeeping presents itself as a low-cost activity, making possible the maintenance and sustainability of the rural man, providing work and subsistence for the family (Sebrae, 2009).

According to Khan (2014), beekeepers in the Northeast organize themselves into cooperatives/associations to facilitate their marketing and the processing of the product. According to Lengler (2008), this is because the basis of beekeeping/family farming is associativism and cooperativism, which helps producers to sell their product and organize themselves, as well as to gain training to improve their production and set up the honey processing unit. Organization in associations and cooperatives is a way for creators to guide themselves in the search for policies (Oliveira et al., 2016).

The honey production chain in the State of Rio Grande do Norte has been developed in the context of territorial policies, especially through training promoted by the Brazilian Support...
Service to Micro and Small Companies (SEBRAE). The objective of these training courses is to transform local honey producers into beekeepers. As a result, family members have access to credit from the National Program for the Strengthening of Family Agriculture (PRONAF), using these resources to invest in and fund their beekeeping activities. In terms of production base, Rio Grande do Norte has approximately 9,000 trained beekeepers and about 100,000 hives, resulting in an annual production of approximately 2,000 tons of honey (Belchior Filho & Gonçalves, 2015).

In the context of family farming in Rio Grande do Norte, the absence of honey houses and warehouses certified for processing, filling and legalization of products is recurrent, creating barriers in access to markets, regional, national and international (Brazil, 2007). Besides problems linked to the production, organization and insertion in the markets of processed products, causing in the urgency for the emergence of productive strategies that come to contribute with the activity.

It is expected that, with the analysis in order to deepen the knowledge on the governance of the honey chain in the territories of Rio Grande do Norte, it can formulate important conclusions to direct relevant decisions in the field of family farming and that, consequently, it stimulates the development of public policies directed towards the follow-up.

In this context, the question that arises is: considering the productive arrangement (houses and honey stores) in Rio Grande do Norte, how the main forms of governance contribute to the access of public policies to family farming, and what are the limits and challenges for the attainment of the certification of production? Therefore, the present work aims to analyze the organizational structure of the honey chain of Rio Grande do Norte.

2 THEORETICAL FRAME

The theoretical reference will be based on an analysis of the honey chain in Rio Grande do Norte and its organizational and institutional environment, with the objective of exploring the conceptual and theoretical bases that sustain this structure, it becomes possible to identify the main elements and dynamics that shape this specific productive chain.

2.1 The Honey Chain in Rio Grande do Norte

The honey chain in Rio Grande do Norte is made up of small producers and uses the labor force of rural families, in which income flows thrive within the family agriculture. (Brazil, 2007).

The beekeeper and the consumer are the main players in this production web. In Figure 01, the flowchart of the main production activities of honey will be presented, where the beekeeper and the consumer are the protagonists, following a set of consecutive stages of other subjects by the co-adjuvants of this productive chain.
In the honey production chain of Rio Grande do Norte, it maintains a strong link with cooperatives and associations that are very efficient ways to boost apiculture activities to the financial market, satisfying positive results for those involved (Barbosa & Cardoso, 2020). Beekeeping activity in Rio Grande do Norte had its stage of commercial production in the early 1990s, with the cooperation of government bodies that developed projects and programs in the area of beekeeping (Oliveira, 2006).

With the arrival of the 90s, the government launched the program of financing of the bank of the Northeast for the peoples of the countryside, with the support of the National Program for the Strengthening of Family Agriculture (PRONAF) (Vilela, 2002). And at the beginning of the 21st century, there was the joining of forces between the Support Service for Micro and Small Companies of Rio Grande do Norte (Sebrae-RN) and the Brazilian Agricultural Research Corporation (Embrapa), which ended up carrying out a survey of the diagnosis of the honey production chain in Rio Grande do Norte, primary results that were followed up in technological training work for farmers and melons (Revista Sebrae, 2005).

Freitas et al. (2004) state as undisputed dogmas that beekeeping in Rio Grande do Norte is a secondary activity by family farmers, besides providing capital, is a low initial cost labor activity, and low environmental and social impact. The processing and processing of honey play a crucial role in the transformation of the natural raw material, the nectar of flowers, into a high quality and safe end product for consumption.
This process involves a series of stages that aim not only at preserving the satisfactory characteristics of honey, such as taste, color and nutritional properties, but also at eliminating impurities and unwanted microorganisms. From the harvesting of the beehives to the filling of the final product, techniques such as filtration, decanting, pasteurization and proper processing are applied to ensure the purity and integrity of the honey (Souza, 2007).

The handling of honey production is linked to a process of stages that are submitted in nine stages: receiving, selecting and cleaning, de-operculating, centrifuging, filtering, decanting, filling, storing and distribution. (Ananias (2010, p. 27). The execution of these stages is of utmost importance for the good quality of honey taking into account the significant importance of each physical stage, in which the beekeeper must maintain personal hygiene, and the purification of waste and dirt equipment so that contamination of impurities in the honey does not occur (Souza, 2007).

In order for the honey to reach the consumer's shelf, the product is packed in non-toxic plastic buckets or even metallic drums. Some beekeepers sell at fairgrounds, in glass containers, such as cachaça bottles (Khan, et al., 2014). According to Khan, et al. (2014, p. 100) "The distribution of honey after the processing stage takes place through marketing channels aimed at domestic and foreign markets".

In the context of intermediation in the domestic market of the Northeast, this dynamic develops by means of primary agents, such as beekeepers, warehouses, associations or cooperatives. These agents play a vital role in enabling the connection between the different links of the commercial chain: from wholesale factories and markets to retail outlets, including allowing the direct sale of honey to end consumers (as illustrated in Flowchart 1) (Khan, et al., 2014).

A notable focus is on associations and cooperatives which often take responsibility for the processing of honey, eliminating the need for the intermediate warehouse and thus significantly shortening the distribution channel. In addition, the actions of the cooperatives inhibit the shares of the intermediaries since Siqueira et al. (2022, p. 9) state that "the intermediation of the middleman in the sales transactions sacrifices the producers' profits and discourages the activity of the members of the association".

Khan, et al. (2014) mentions that it is a common practice across the Northeast to target honey to the Food Purchase Program (PAA), also known as "Direct Purchase". This program, established by the Ministry of Social Development and Combating Hunger and operated by the National Supply Company (Conab), plays a significant role in directing efforts to strengthen food security and promote the development of the regions. The honey acquired through the PAA is directed to improve school meals of students from public schools, kindergartens, public hospitals, non-governmental organizations (NGOs).

It is also worth mentioning, in the research conducted by Khan et al. (2014), it was found that a significant part of the producers in these states choose to deliver their productions to representatives of private companies, both within their own state and in neighboring states. This behavior has weakened cooperatives and producer associations.

2.2 Organizational and Institutional Environment

The organization of beekeepers in the State of Rio Grande do Norte is structured through cooperatives and associations, as highlighted by Khan et al. (2014). This union and cooperation between beekeepers that follow similar objectives strengthens the sector in the face of the adversities it faces. According to Morais et al. (2022, p. 1) 'cooperatives and associations represent an alternative to market-driven problems'.

In addition, joint collaboration allows them to gain experienced benefits, such as specialized training, technical support and machinery procurement more advantageously (Khan
Cooperatives and associations also play an essential role in seeking credit from financial institutions, facilitating access to financial resources needed to expand and enhance their apiculture activities (Moreira, et al., 2023).

According to Khan et al. (2014, p. 122) ‘specific associations or cooperatives are present in almost all honey producing municipalities’. In addition, through these organizational structures, beekeepers have access to incentive programs aimed at stimulating the sustainable development of beekeeping, providing benefits for both the beekeeping community and the environment. With this well-established cooperation, beekeepers can face challenges more efficiently and exploit opportunities for the continued growth of the state's beekeeping sector (Vilela & Pereira, 2002).

However, for professional training to take place to acquire this training and knowledge of the stages of production of the honey production chain, it is necessary that public bodies encourage with actions and programs directed towards these producers (Khan et al., 2014). Thus, Sebrae operates in Rio Grande do Norte in a way that encourages specialized forms of apiculture management by offering courses and training to fortify the honey chain (Oliveira, 2006).

Crossing all the links of the productive chain, the crucial importance of quality control emerges, an element that conquers increasing prices on the part of consumers. This price is particularly striking for foreign consumers, who are willing not only to buy a product but also to buy it in its inherent quality. In this vein, "A large part of the northeastern apiculture production is destined for exports, but its continuity depends on the northeastern beekeepers meeting the demands of the international market" (Khan et al., 2014, p. 142).

In light of this, Khan et al. (2014) points out that it is the responsibility of the Ministry of Agriculture, Livestock and Supply (Map) to regulate the operations related to agriculture, livestock and supply. Within this scope, the industrial and sanitary surveillance bodies play a crucial role in establishing operational guidelines for the establishments involved in the processing of honey. These establishments are required to adopt quality assurance programs, notably as Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCP). In addition, participation in the National Waste Control Program for Honey (PNCR) is mandatory, reinforcing the importance of food safety and the monitoring of residue levels in the final product.

The legal guidelines on industrial and health surveillance of establishments cover the following key points: ensuring hygiene in the premises; imposing responsibilities on owners, managers and their delegates; carrying out comprehensive inspections and re-inspections on all items, sub-items and raw materials of animal origin throughout the different stages of production and transport; meticulous registration of labels and marks; establishing trust for committed infringements; detailed laboratory estimates; and regulating the traffic of products, by-products and raw materials of animal origin (Khan et al., 2014, p. 142).

As a process, certification seals associated with federal, state and municipal inspections play different roles: the Federal Inspection Service (SIF) certifies companies for interstate and international business operations, enabling their participation in these expanded markets; the State Inspection Service (SIE) enables companies to operate within state boundaries, facilitating their activities in regional trade; and the Municipal Inspection Service (SIM) guarantees permission for companies to market their products exclusively within the boundaries of the municipality, promoting local compliance (Khan et al., 2014).

According to Khan et al. (2014, p. 145) "Despite all this legal apparatus, in the apiculture chain of the Northeast, few apiculture establishments have federal, state or municipal certification". Faced with this reality, the procedure for obtaining organic certification through certification bodies entails a high cost for smaller beekeepers.
3 METHOD

This study fits into the applied research classification (Gerhardt & Silveira, 2009). In terms of approach, it adopts a predominantly qualitative approach. (Silva & Menezes, 2005). When it comes to the general objectives of the research, the descriptive category was chosen as the most suitable and appropriate for the present study. Gil, 2008.

Data collection for this research was carried out through interviews with previously elaborated script (Gil, 2008). Among the different types of interviews, the most suitable for this study was the semi-structured interview. (Marconi and Lakatos, 2003).

The research involved conducting interviews and selecting participants that are part of the honey production chain in Rio Grande do Norte. The social agents selected were mapped in the municipalities of Mossoró - RN, Serra do Mel - RN, Caraúbas - RN, Severino Melo - RN, Apodi - RN, São João do Sabugi - RN, Jucurutu - RN and Alto do Rodrigues - RN.

The study encompasses a diverse sample of participants, comprising different segments of family agriculture linked to beekeeping. The subjects were categorized as producers/beekpeers, owners of honey houses, owners of warehouses and representatives of the certifying bodies (Table 1). This variety of profiles ensures a comprehensive approach to the topic in question.

In view of the concern to ensure the confidentiality of the information and the privacy of the participants in the survey, the choice was made to adopt a system of symbols to represent them. In this sense, the participants were designated by letters and sequential numbers in ascending order, according to the active relationship with the activity of the honey production chain as detailed in Table 1.

<table>
<thead>
<tr>
<th>CODE</th>
<th>GENDER</th>
<th>CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1A</td>
<td>Male</td>
<td>Associate</td>
</tr>
<tr>
<td>E2C</td>
<td>Male</td>
<td>Cooperative</td>
</tr>
<tr>
<td>E3R</td>
<td>Male</td>
<td>Representatives of the certification body (Idiarn)</td>
</tr>
<tr>
<td>E4R</td>
<td>Male</td>
<td>Certification body representatives (MAP)</td>
</tr>
<tr>
<td>E5P</td>
<td>Male</td>
<td>Producer</td>
</tr>
<tr>
<td>E6P</td>
<td>Male</td>
<td>Producer</td>
</tr>
<tr>
<td>E7B</td>
<td>Male</td>
<td>Benefit/Producer</td>
</tr>
<tr>
<td>E8A</td>
<td>Male</td>
<td>Associate/Producer</td>
</tr>
</tbody>
</table>

Source: Authors’ Compilation (2023).

Interviews took place on site (on site) and home office. Subsequently, these interviews were transcribed in order to allow the analysis of the data. The interpretation of the results of this research was conducted by means of the interpretative analysis approach (Triviños, 1987). Thus, the categories and subcategories of analysis were derived from the scientific literatures pertinent to the theme. Table 2 below illustrates the interrelations between the categories and subcategories of analysis, outlining the research dimension:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Category</th>
<th>Subcategory</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance Structures</td>
<td>Organizational and Institutional Environment</td>
<td>Governance and regulation Interviewers</td>
<td>Khan et al. (2014)</td>
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<td></td>
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<td>Producer Organizations</td>
<td>Khan et al. (2014)</td>
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<td></td>
<td></td>
<td>Certification and Quality</td>
<td>Khan et al. (2014)</td>
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Source: Authors’ Compilation (2023).
4 RESULTS AND DISCUSSIONS

This topic is dedicated to elucidating and discussing the results obtained with the social agents that make up this important honey production chain in the state of Rio Grande do Norte. As explained in Table 2, which provides a representative summary of the participants in the research, we highlight the diversity of actors present, each with distinct but equally essential roles for the sector.

4.1 Governance Structures

In this dimension of the Governance Structures in the honey production chain, it plays a key role in ensuring the quality, efficiency and sustainability of this activity. Governance Structures refer to the institutional arrangements and coordination control that guide relations and transactions along the honey production chain. These structures can range from centralized systems, where a single entity has control over all production gains, to decentralized and collaborative systems, in which several independent agents collaborate to achieve common goals.

4.1.1 Organizational and institutional environment

The category called Organizational and Institutional Environment covers the delivery of public and collective goods, the availability of which is influenced by both the state sector and private-interest entities (Khan et al., 2014). This is supported by regulatory bodies, associations, cooperatives and a number of other bodies. According to the testimonials heard during the interviews, this environment plays a fundamental role in the provision of information related to markets, consumption patterns, technological advances and competitive dynamics, thus ensuring a higher level of competitiveness throughout the chain.

In turn, the institutional setting addresses narratives about the legal systems of conflict resolution. This environment not only refers to culture, tradition and customs, but also covers the set of laws covering environmental, labor, tax, and commercial aspects (Khan et al., 2014). In addition, it encompasses regulations and adoption standards adopted by local government and other competing countries and trading partners, creating a complex web of regulations that affect trade dynamics.

4.1.1.1 Governance and regulation

Interviews with social actors in the honey production chain provide insights into governance and regulation related to honey production, highlighting the interaction between enforcement agents and the parties involved in the chain. The sub-category Government and Regulation covers issues of government policies, regulations and laws, as well as their impact on the productive chain.

As discussed by Khan et al. (2014), in light of Brazilian legislation, it encompasses a variety of products coming from plant-based sources, such as honey and animal beeswax, whether or not they have incorporated elements of plant origin, as well as after undergoing preparation, processing, handling, packaging, storage and transport processes, it becomes imperative to impose prior surveillance. Such monitoring shall be aimed at ensuring compliance with industrial and health criteria.

In the E3R interview, the inspector discusses legislation and regulations related to the production and distribution of honey. He mentions that the state of Rio Grande do Norte does not have a specific legislation for the certification of production of animal origin and that it
always refers to federal legislation, like Decree 9013, which was revised in 2020 and brings as conditioning for each one of the establishments. He also mentions that the honey house is a simplified chain from the point of view of mandatory, but that the 2013 decree brings limitations in the case of a honey and apiculture products processing unit:

"(...) there is no need for this type of establishment to have a sanitary record with us, (...), only the place where this material, it will come to be benefited, but then you take the new decree of 2013 and then it will bring the conditioners in the case of a unit processing honey and apiculture products, because this term warehouse it has already fallen into disuse also in this own legislation of the decree 2013, then it is a unit processing honey and apiculture products, the new nomenclature" (E3R).

"The state of Rio Grande do Norte as well as other states, does not have a specific legislation for inspection of animal production, we always report to federal legislation, one of them decree 9013 that was until revised in 2020, it brings the constraints to each of the establishments, it is evident that the level of requirement basically is the same regarding what, what will differentiate will be my production, I will not have to dispose of a large structure if I am going to produce a small quantity of product, then as you say, the honey house today for us, is a simplified chain from the point of view of inspection” (E3R (b)).

The inspector also stresses the importance of health registration of honey and apiculture processing plants. He mentions the importance of knowing the origin of the honey and that, from the moment he registers, it is possible to know where the producers are and to come back with a policy of differentiated attention:

"[...] when I talk about the question of the processing units already registered, those already being at that level are optimal. They maintain this pattern, I mean at the base, from the beginning because like I have a honey being benefited, but I don't know where that honey is coming from. It's different, for example, from the meat chain, I have an animal that is going to be slaughtered in the slaughterhouse there in Mossoró, this animal only comes in with GTA (Animal Traffic Guide) containing all the information, if there is any problem I already know where to look. I have the registration here, I have the geo-referencing of this property and I arrive quickly. Now, if you have a problem like this in the honey chain, unfortunately there is no way we can get there faster” (E3R).

"From the moment that we register, we started to know where they are and we could go back there with a policy of paying attention to these different people. Because, for example, I received information from these dying offspring in the region of São Paulo, I received it from third parties. But in our system, I did not find any bee breeders in the municipality, as I will know and as the state will arrive to determine a possible focus of a disease, I have to know where the thing is happening, it is primary” (E3R).

Finally, the E3R subject says that there has been a recent advance in the legislation, which is the law of meliponas, which brings conditioning factors for the production of meliponids:

"We have had a great advance recently, I think you should know this, I don't know if it's on your agenda, but if there's any progress and if you don't have it added, which is the part of the meliponias the law that has just come out recently, our decree that was fantastic, was drawn up 200 hands, it was IDIARN, the people from UFERSA, it was EMATER, SEBRAE and the main spring that I say, was the people from the associations. We heard who's on the tip, they brought us his needs, we need it to be like this, if it's not possible let's make it a little bit more possible, they're already putting here decree 30860, it's coming out of the "oven" now" (E3R).
However, Vilela e Pereira (2002, p. 102) in his Study of the Honey Production Chain in the State of Rio Grande do Norte, mentions that "The Health Inspection, under the responsibility of the Ministry of Agriculture, Livestock and Supply (MAPA), is still not exercised with as much rigor as in some other states".

In the report by the E2C subject, he highlights that there are public policies that are active in the honey production chain, but mentions that there have been difficulties and cuts in resources over the years, which has led to a decrease in the activity in certain policies. He specifically mentions the lack of purchase of honey in schools:

"Yes, right, we have very active public policies right, for example now in this pandemic, for honey even a little (...) there was a cut of resources right, bad will also from the manager unfortunately, and unfortunately today there is no honey in schools for example, right, it would be fantastic. It would be something that would help a lot right in the chain" (E2C).

According to Khan et al. (2014), it is still a common practice across the Northeast to target honey to the Food Purchase Program (PAA). In this sense, the author mentions that "The participation of beekeepers, particularly small producers in this program, offers an opportunity to expand the honey market, in addition to ensuring regular income measurement" (Khan et al., 2014, p. 103).

In the E8A speech, the subject highlights the importance of seeking markets beyond the government in the honey production chain. He mentions the school lunch law (PL 8319/2017), which is to buy honey, but which the government does not want to buy because it considers honey expensive. He also mentions that the city hall had bought honey in the past, but that now the structure is underused because the municipality does not buy: "Here it has a capacity for 10,000 kilos, for us to produce 10,000 kilos in the year and the municipality cannot buy, the municipality cannot buy... Underutilized Framework" (E8A).

"When the process started, which had government purchases, which the city hall bought, which was sold honey, everybody grabbed it. Now, the moment it is, that there is the one you have to produce, that there I was going through in every meeting I talked to him, at the time it was the president: 'Look, we have to see that we not only have the government as the buyer. We have to go into private as well'. Whoever did this in there, didn't just wait for the government, went to the private sector, which has, the honey is for sale. The certified honey you put there. It just happened in this pandemic that we didn't have honey, it was the people calling. I don't have it because how do I do it? The honey I sell I make all the notes of my sale" (E8A).

The analysis of the interviews suggests that, in spite of the existence of public policies related to the production of honey, such as the creation of a national policy to encourage the production of honey, there are still challenges and difficulties faced by the social agents of the productive chain. Faced with this situation, Khan et al. (2014, p. 103) notes that "The channel alternatives involving the distribution of production to the foreign market are much smaller. The links basically consist of the beekeeper, warehouse, associations ...".

4.1.1.2 Producer organizations

In interviews with social actors in the honey production chain, the subcategory Producer Organizations emerges as a study element of associations and cooperatives of honey producers. Producer associations and cooperatives play a key role in the development of beekeeping, adding value to honey and overcoming trade challenges.

The subject's E2C report points to the evolution of organizations over time. It begins with the creation of the Farmers' Association, which later specializes in beekeeping and
becomes the Apodiense Beekeeping Association, which later gives rise to Coopapi. These organizations arise as a response to the need for organization and coordination of beekeeping activities in the community. The evolutionary trajectory shows the maturing of organizational structures to meet the specificities of the honey production chain:

"Later, in 1991, the Farmers' Association was founded here in the community, a work that was already more advanced, more directed towards production. That's why cashew nuts are stronger, and that's why the first work was done on beekeeping, still in a rustic way, using boxes; if this work was done here in the community, in 1991, right? In 1995, five years later, the Apodiense Beekeeping Association was founded, from where Coopapi was born. The Apodiense Beekeeping Association has already been oriented to the specific organization of beekeeping, where they were worked, the first beehives arrived here in the region, where the first beekeepers survived and from there a more targeted chain has started to work. The Association has brought good fruit, it exists to this day, and from that came some difficulties, like acceptance, right? A lot was produced, but it was very difficult to market" (E2C).

For Khan et al. (2014, p. 121) "The idea that inspires the creation of associations persists throughout history since antiquity and seeks the satisfaction of common interests". Already in the speech of the subject E8A, presents a concrete example of organization and cooperation in the creation of the honeyhouse, which now belongs to the Association.

The initiative began with the mobilization of an agent from the Bank of the Northeast, who offered a course in beekeeping: "The honeyhouse is from the Association. Here was a project that started from a mobilization. Here we had a sequence. First came an agent from the Bank of the Northeast of the municipality of São Rafael, then had a course of only 18 hours only for apiculture" (E8A). This experience illustrates how training and engagement with financial and support institutions can be catalysts for the development of producer organizations and for the improvement of beekeeping-related practices and infrastructure.

In the E1A interview, the subject highlights the progress of the association by managing to bring together the interested associates and get a project to create a headquarters of its own with complete machinery for processing the honey. He mentions that they are awaiting sanitary registration in order to be able to sell the honey in other states:

"Except that now, after a long time, we have managed to bring together the associates who still had an interest, who still fulfilled the honey, and we are prevented from moving the association forward. We have now received a project, worth almost one million reais, to create our own headquarters, we had only one house of honey and today we have our own headquarters, it is a processing house, of honey, with the complete machinery, with office, car for transporting the honey, we are now waiting only the SIF, that is to be able to sell the honey in other states" (E1A).

Khan et al. (2014, p. 122) ‘The characteristics of the activity induce beekeepers to work in a group, because as small producers are concerned, only the association makes it possible to build honeyhouses and purchase a truck to transport the hives’.

For the E7B subject, the role of the association is to add value to the product of honey. Through the association, beekeepers come together to determine the amount of honey available and market it, aiming to add value to the product. The more honey they have together, the higher the value obtained:

"The association's role today has always been, right, to add value to the product of honey, we got together, the beekeepers get together, and when it's going to sell the honey, the association says on average how many drums we have or bucket, it's going to depend on each beekeeper and we're going to say, ready, today (inaudible), then another beekeeper is going to say when it has, and we're going to market the honey,"
right, to add value, because the more honey we have here together, we get an extra amount“ (E7B).

Subject E8A reports his experience in associativism. Where participation in the activities of the association led to the engagement in territorial meetings and the training offered by SEBRAE:

"When I went into beekeeping, I've only got until sixth grade, you know? When I went into the beekeeping sector, which I went into associativism, then I started to get involved, I started to get involved in a way that the vacations at the place were getting like this... and I got involved. Then you begin to participate, through the association, in the meetings of the territory. Then comes a moment that SEBRAE began to score people to do a training for rural development agent” (E8A).

This narration illustrates how involvement in producer organizations can offer training and development opportunities, confident for the personal and professional growth of beekeepers.

Thus, the E3R subject highlights the importance of technical guidance for the success of cooperatives and associations of honey producers. The enforcement officer E3R emphasizes that often the lack of technical guidance is a significant obstacle. Although some organizations have financial resources, they are often poorly employed in the absence of consultancy or adopted partnerships:

"It's often the lack of technical guidance, the biggest sin in the face of every framework, it's the lack of technical guidance, because sometimes you see a cooperative or association with a little financial resource, but you would give it to build or enter that unit of it, but then what you do, do not seek a technical accessory or partnership that can help in this and use all that feature of the format that they think will be good, that will meet the needs, when it comes to register the guy says that has no more resources, when it seeks a technical accessory you also evidence that in fact was misapplied that resource at that moment there, so I think it was lacking primary and greater of all technical guidance’ (E3R).

It is possible to identify in the speech of the E3R subject that technical guidance is a crucial factor for the success of honey producer organizations. According to Khan et al. (2014, p. 139) ‘Without technical assistance, the level of technology is admittedly low, with direct effects on product quality’.

4.1.1.3 Certification and quality

The sub-category Certification and Quality covers the evaluation of the certification and quality assurance systems applied to honey, as well as their influence on production practices and consumer confidence. Based on the interviews conducted, the analysis of the data reveals crucial information on how the certification process and quality assurance affect the honey production chain. Khan et al. (2014, p. 142) ‘Quality assurance systems developed by countries belonging to the global honey market are in fact a mechanism for protecting local producers’. Subject E3R provides relevant information on the certification process in the honey production chain of the state of Rio Grande do Norte. The inspector mentions that there are 8 certified honey houses, but there was a recent casualty due to the death of the owner of the honey, which led to a discontinuation of activities by the associated members: "We have 8 honey houses, which remain certified, we had the casualty now recently that it was of the honey Meneses that the owner died and those who stayed in the activity opted not to follow and then we had this casualty (E3R)”. This highlights the importance of continuity and effective
management to maintain product certification and quality, as the change in operations can have a direct impact on compliance with certification standards.

The E3R also highlights the description of the certification process, offering a detailed overview of how producers/beekeepers in Rio Grande do Norte seek certification and how this certification is obtained. Subject E3R also reports the need to adapt production structures to meet the standards of honey and beekeeping products processing, highlighting the commitment to quality and food safety:

So how does certification work (...). The producer or the association or the cooperative comes to the IDIARN to present us, the first question is: "I want to register my establishment", so we ask if you already have a built structure that wants to be adapted for a unit processing honey and apiculture products or not. If everything is OK, you receive the registration of that unit and we leave for the registration of the products, you or the lady will work with what? Sache of 10, 15 or 20mg, anyway. You will register your product with labeling, that this labeling will be all analyzed by us, being all right, that label will also be registered and during all this process you will have to present the part of documentation (then I can pass to you the checklist that we have requested here". (E3R).

Certification ensures that honey and apiculture products meet certain quality and safety standards, which can increase consumer confidence. According to Khan et al. (2014), a certification plays a key role in the formal recognition Conformity Assessment, by means of a certificate issued, attesting and proclaiming that a particular product, service, individual or system is in full compliance with the legal provisions, technical requirements, or even with the standards carefully stipulated and required.

Inspectors E4R and E3R mention the role of state and federal inspectorates in regulating the marketing of products. The state inspection seal allows marketing within the state's boundaries, while the SISBI (Brazilian System of Inspection of Products of Animal Origin), created by the Ministry of Agriculture, is necessary to expand marketing to other states and regions of the country.

"The state inspection, in turn, follows the same logic, if I have a state inspection service, if my establishment receives the state inspection seal, I can market my product and its derivatives up to the limit of the state border, it's not that, but I would like to sell out of my state, I want to put it in the municipality of the state of Paraíba, Ceará, who knows Brasília, and then for that you will need a certification from SISBI, which was a great blessing created by the Ministry of Agriculture, to meet the people who have the pretension of sending their product to the limits of the country, because before that, you only had one thing called SIF and that It's expensive, it's costly, it's difficult, it's the one that the cooperative that sent you here joined, and it was so difficult to maintain, because this is something for really big people, it's high values that are spent to get and to maintain the same way, answering your question, why Roberto does not have this opportunity, through the SIF, federal inspection service, probably not and why not people, it's well done to explain, why if I want to have a SIF stamp, I have to meet all the international standards of quality and that are not few, the more I just want to send to Argentina, all right, but to you send to Argentina you have to have the SIF and if you want to have the SIF, you have to meet the rules of Kazakhstan, here in Africa ..." (E4R).

"Come on, there actually is Federal Law No. 789 of 1989 that creates the three instances of commercialization of products of animal origin. The first that is the initial, which is the SIM (Municipal Inspection Service) is for those products produced are marketed at municipal level, for example, Mossoró has the SIM, which registers the establishment and allows you to market within Mossoró, if you want to market to any state, already have to call the SIE (State Inspection Service) that in case is the IDIARN the body that regulates it and if you want to do all this there before the
Country, there would be the SIFI, only that since March last year we already have here, we have received the ministry the seal of the SISBI (Brazilian System of Inspection of products of animal origin), then That state that is adhered to SISBI, the establishments that have registration with it, they can market their products for all Brazil, except export. So if a honeyhouse has registration with the IDIARN, for example, a honeyhouse in canafistla, which has registration with us, she wants to give an entry in the SISBI to market for all Brazil, can she? Of course we will, then we will do a new inspection and there are some modifications that they will have to make, but far inferior to what the map requires and we certify with headquarters or SISMI for this establishment, put the SISMI stamp on your label and sell honey to all of Brazil without any problem, without having to refer to the Ministry of Agriculture, right?” (E3R).

In the E3R report, the subject interviewed presents a clear overview of the inspection bodies that regulate the marketing of products of animal origin, including honey. The SIM (Municipal Inspection Service) allows for marketing at municipal level, the SIE (State Inspection Service) covers state marketing, and the SISBI (Brazilian System of Inspection of Products of Animal Origin) allows for national marketing, excluding export.

This information provides a more comprehensive overview of the different certification and inspection instances in the honey production chain of Rio Grande do Norte. Each instance has its own requirements and limitations, and the choice of which certification to pursue depends on the producer's marketing objectives. It is important to consider costs, quality standards and market opportunities when deciding on the appropriate certification for each case.

In an interview the E3R subject points out that the state of Rio Grande do Norte, like many other states, does not have specific legislation for the inspection of products of animal origin. Instead, they are based on federal legislation, such as Decree 9013, which lays down guidelines for establishments in this sector. These federal laws define the conditions and requirements for the various types of establishments, taking into account the production quantity and other specific factors:

"The state of Rio Grande do Norte as well as other states, does not have a specific legislation for inspection of animal production, we always report to federal legislation, one of them decree 9013 that was until revised in 2020, it brings the conditioners to each of the establishments, it is evident that the level of requirement basically is the same regarding what, what will differentiate my production, I will not have to have a large structure if I am going to produce a small quantity of product, so as you say, each of the honey today for us, is a simplified chain from the point of view of inspection” (E2C (b)).

This approach can be beneficial to local producers, especially those who have limited resources to meet complex certification and inspection requirements. However, E2C mentions that the struggle to obtain the SIF (Federal Inspection Seal) was a major challenge for the marketing of honey within the current legislation. However, after many years of struggle, the Mel Potiguar brand was founded and modernized, getting to know the market better and participating in family farming fairs throughout the country:

"We began to fight for the SIF, the Federal Inspection Seal, right? In fact, so that we can be within the current legislation, within the legislation that markets honey. So, there were a lot of challenges over the years, we came to market a lot of honey by participating in all the fairs, practically, that existed at that time. We participate in all the existing family farming fairs, Brasilia, Rio de Janeiro, São Paulo. From then on, we modernized, we got to know the market more, we founded a brand, the Mel Potiguar brand, which still exists today" (E2C).
The E1A report reveals an important distinction in the approach to certification in the honey production chain in the state of Rio Grande do Norte:

"In the case of certification, for us, it's only for those who are going to fill it in, benefit it and sell it to a supermarket in our region. Certification for the middleman, he does not want, it is not necessary, anyone can sell to the middleman, even that person I told, who takes the honey and squeezes in his hand" (E1A).

Khan et al. (2014, p. 146), the beekeepers point out that "while being aware of the need for this certification, they try to circumvent this situation by distributing their production only to the municipal market, through direct sale to the consumer [...]". The practice of selling honey to middlemen without the need for certification may be a reflection of the different requirements and expectations of these middlemen compared to end retailers such as supermarkets. Considering the limited resources to which farmers are subject to the capital investment in the certification process can be considered as a risk factor in this sense, the study by Duarte et al (2023, p. 15) showed that the management of family farming "is low willing to take this risk".

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<td>Governance Structures</td>
<td>Organizational and Institutional Environment</td>
<td>Governance and regulation</td>
<td>In the subcategory analysis, interviews testify to challenges in regulating the honey production chain, including dependence on federal legislation and the need to improve traceability. And the recent change in regulatory terminology and the collaborative development of specific regulations for meliponas indicate positive progress in the governance of the honey production chain in the state.</td>
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<td>Producer Organizations</td>
<td>The analysis of the sub-category ‘Producer Organizations’ in the interviews shows the importance of associations and cooperatives of honey producers in the development of beekeeping, adding value to honey and overcoming trade challenges. The role of engagement with support institutions, the need for technical guidance and the evolution of organizational structures are essential aspects that emerge from interviews with the social agents of the honey production chain.</td>
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<td>Certification and Quality</td>
<td>The interviewees' reports in this subcategory describe that certification is directed mainly at producers who package, benefit and sell their products, especially to supermarkets in the region. This suggests that certification is more relevant for chain links that are directly involved in the processing, packaging and final distribution of honey.</td>
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Source: Authors' Compilation (2023).

5 FINAL CONSIDERATIONS

Based on the analysis of data on the Honey Production Chain and its different dimensions, it can be concluded that the beekeeping activity presents an interlinked complexity, influenced by climatic, technological, commercial, economic and social factors. The production of honey demands not only technical knowledge, but also an integrated approach that takes into account the particularities of each stage of the chain.
The size of the Governance Structures reveals advances in the regulation of the honey production chain, with recent changes in regulatory terminology and the development of specific regulations. Producer organizations, such as associations and cooperatives, play a vital role in the development of beekeeping, adding value to honey and facing commercial challenges through engagement and technical guidance. Certification and quality are most relevant to the chain links directly involved in the final processing and distribution of honey, indicating a search for improved standards and quality assurance.

In short, the analysis of the data points to the need for a holistic approach in the Honey Production Chain, considering not only the technical aspects, but also the economic, commercial and regulatory aspects. The adoption of sustainable technologies, the strengthening of producer organizations and the search for innovative marketing strategies are fundamental for the continuous and successful development of this sector.

One suggestion that points to possible future work includes: a) deepening the analysis of the perception of honey producers about economic activity and the obstacles that permeate it; b) thoroughly investigating the role played by associations and cooperatives of honey producers in fostering the development of apiculture and in overcoming commercial challenges; c) carrying out a comprehensive analysis on the adoption of technologies among honey producers, assessing their substantial impacts on operational efficiency and sustainability intrinsic to beekeeping.

REFERENCES


An Analysis of the Structure of the Beekeeping Chain in the Territories of the State of Rio Grande do Norte (RN)


