



## **SWOT/SOR-analysis of healthy and sustainable beekeeping in the EU**

### **Deliverable D4.1**

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**B-GOOD**

**Giving Beekeeping Guidance by cOMputatiOnal-assisted Decision  
making**



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## Preface

WP4 aims to map the business environment and identify key socio-economic components of healthy and sustainable beekeeping in the EU to investigate how stakeholders and beekeepers assess and may overcome the business environment's complexity, and to evaluate production efficiency, (health) management decisions by beekeepers, and their personal, environmental and managerial determinants as the key to identify viable sustainable business models of EU beekeeping.

This deliverable (D4.1) is the first of five deliverables from WP4 'Socio-Economic Drivers'. It describes the methodology, implementation and a first set of results from Task 4.1 'SWOT-analysis and assessment of stakeholder views'. The contents are divided into two main content areas: **SWOT/SOR-analysis** (strengths, weaknesses, opportunities, threats; strategic orientation round) and the **identification of actors and networks**.

The results are based on 41 in-depth interviews and 28 completed SWOT-scoring surveys. As an outcome of the SWOT/SOR-analysis a number of key success factors for policy, strategy and business development of healthy and sustainable beekeeping in the EU are set forth. This deliverable maps in detail the business environment for beekeeping in the EU, its complexity, strengths, weaknesses, opportunities, threats and challenges as identified by actors/stakeholders (note that within this report, the words stakeholders and actors are used interchangeably).

The results from this deliverable will feed into Deliverable 4.2 entitled "Stakeholder views on applied business models and their key descriptors," which will provide a descriptive analysis of stakeholder views on bee colony health, on currently applied and potentially future successful business models for healthy and sustainable beekeeping, and identify their key descriptors in EU beekeeping. In addition to the 41 in-depth interviews and the 28 SWOT-scoring surveys completed thus far, a larger scale survey will be developed in the next phase of Task 4.1, involving 200 EU-stakeholders (covering the full range of stakeholder types with at least 20 surveys completed by representatives from each type) in order to further quantify stakeholders' views and opinions.

## Summary

B-GOOD is a multi-disciplinary project committed to finding solutions to the diverse problems in the beekeeping sector, particularly designing innovative technologies that help keeping healthy colonies and implementing sustainable business strategies.

This report presents the current development of the work package 4, particularly task 4.1. 'analysis and assessment of stakeholders' views' that sought to involve the diversity of stakeholders that characterize the EU beekeeping sector through interviews and a survey with an online questionnaire focused on the SWOT/SOR analysis in order to provide a better understanding of the beekeeping business environment in the EU.

In total 41 stakeholders were interviewed face-to-face or video call, giving specific attention to three focal themes: (i) the identification of actors networks (linking with WP8), as well as the strengths, weaknesses, opportunities and threats (SWOT) facing beekeeping in the EU; (ii) their views and opinions on what characterizes a healthy bee colony (linking with WP1); and (iii) their views on currently applied business models, their key descriptors, and the potential of business model innovation for sustainability in EU beekeeping. The sample of the in-depth interviews covers 10 EU countries and 34 organizations providing an important overview of the complexities of the EU beekeeping sector. The online stakeholder survey completed by

28 participants was conducted to provide a quantification and prioritization of the SWOT components.

The results from this study, SWOT-components of EU beekeeping, have been translated into several key attention points for policy, strategy and business model development. Based on the SWOT analysis from both stakeholder interviews and stakeholder survey, we have outlined five key attention points for 'offensive' policy and strategy development, three key attention points for 'defensive' policy and strategy development, five key attention points for 'clean-up' policy and strategy development, and three key attention points for 'crisis' policy and strategy development.

Network analysis draws attention to the importance of the EU Bee Partnership and its potential as a key network within the EU beekeeping sector, and for knowledge exchange and developments related to honeybee health. The organisations of BeeLife, the Pesticide Action Network, and the European Food Safety Authority were also identified as having dense and far-reaching networks, suggesting that they may also be key players and influencers concerning knowledge exchange about bee health.

The document is organized into four sections: background, materials and methods, results, and conclusions. The first section provides an overview of the scope and the general objectives of this study. Further, the SWOT/SOR and the Actor-Network background are exposed. More specific information is then provided related with materials and methods. The following section gives an overview of the results and finally we present conclusions, highlight next steps and the importance of this task to another B-GOOD work packages.

## **1. Background**

### **1.1 Scope and objectives**

Overall, the objectives for the work programme WP4 can be split into two overarching goals. The first is to identify key socio-economic factors for healthy and sustainable European beekeeping. To address this, we draw from stakeholder's views to perform a mapping of the current EU beekeeping business environment and identify key components of healthy and sustainable beekeeping in the EU using SWOT/SOR analysis in collaboration with stakeholders. Another key objective of the work programme is to create an EU platform to collect and share knowledge between scientists and stakeholders of science and practice related to honeybees, their environment, and agricultural and beekeeping practices, in close cooperation with the EU Bee Partnership. Therefore, the identification of actors and networks within and outside of the EU Bee Partnership is key. We begin with making connections and collaborations with the EU Bee Partnership and subsequently other relevant stakeholders.

This deliverable, being the first of the first task (tasks 4.1) of WP4, seeks to pave the way for the deepening of knowledge about the socio-economic drivers of beekeeping in the EU. The main objective at this stage is to describe the background, methodology, implementation and findings of the SWOT/SOR and Actor-Network analysis including the identification of networks and actors, and key success factors for policy, strategy and business development of healthy and sustainable beekeeping in the EU.

This deliverable provides a mapping of the business environment, its complexity, strengths, weaknesses, opportunities, threats and challenges as identified by stakeholders. To address this, we opt to gather data from in-depth stakeholders interviews and a scoring survey at a multinational level. The stakeholders range from beekeepers and beekeeping associations to extension services and service providers, scientists, NGOs, plant growers and policy makers. This will provide us with an overall view of the EU beekeeping sector as a whole and how it

functions within the EU. The data collected is both qualitative and quantitative in order to have a broad spectrum of possible socio-economic analysis.

## 1.2 SWOT/SOR and the business environment

In order to develop policies and strategies for the EU beekeeping sector, SWOT analysis offers a tool to better understand how strengths can be leveraged to realize new opportunities and understand how weaknesses can slow progress or magnify organizational threats (Fine, 2009). SWOT analysis has been extended beyond companies and organizations to countries and industries, and continues to permeate the academic peer reviewed literature (Helms and Nixon, 2010; Gürel and Tat, 2017). SWOT has been used by businesses to find gaps and matches between their competences and resources and the business environment (Wheelen and Hunger, 1998), and has enabled managers to formulate competitive strategies in line with the requirements of their business environments (Panagiotou, 2003).

The EU beekeeping sector has recently faced specific challenges relating to its business environment. The increased globalisation of honey production, trading and packaging, the drive of international competition, together with the control of diseases and pests has caused many of the problems and difficulties that it faces today (Jones, 2004). Moreover, excessively high losses of managed honey bee colonies as well many wild bee species in the EU have raised concern about bee health amongst stakeholders and the broader public (More, 2018).

Studies have attempted to capture the business environment and develop policies and strategies for EU beekeeping. An extensive study on the demographics of the European apicultural industry was carried out in 2013, which included an analysis of honey production, management styles and bee health (Chauzat et al., 2013). A SWOT analysis of European beekeeping was carried out in 2004 using secondary data, i.e. statistics that were compiled from the European Union (EU), the United Nations Food and Agriculture Organization (FAO), national statistics (Jones 2004). However, a comprehensive SWOT analysing involving the input of a wide diversity of relevant stakeholders through primary data collection has not taken place.

Therefore, the SWOT within B-GOOD involves stakeholders along the pipeline to provide a comprehensive mapping of the complexity of the business environment and the identification of the key attention points (KAPs) for policy and strategy development. While the classical SWOT in itself is able to provide an overview of the business environment, SWOT analysis is not able to quantify the effects of weight and strategic factors on alternatives (Kangas et al., 2003). This criticism claims that SWOT is merely a descriptive list-making instrument lacking the establishment of a hierarchy between, and prioritization of, components.

Several methods to quantify SWOT elements have been developed, such as the Analytic Hierarchy Process (AHP) method proposed by Saaty (1984) that organizes basic rationality by breaking down problems into smaller constituent parts and then uses simple pairwise comparison judgments to develop priorities in each hierarchy. The Strategic Orientation Round (SOR) is a planning instrument that is used to define strategic objectives based on the outcome of the SWOT analysis (Van Wezemaal et al. 2013). The SOR is especially relevant when involving stakeholders since it allows stakeholders to evaluate the relative importance of the SWOT components, and explicitly links diagnosis and assessment to strategic decisions, policy and action planning (Rutsaert et al., 2014).

## 1.3 Actors and networks

Actor involvement can make a worthwhile contribution to the development of policy in the EU (Häring et al., 2009). Research has shown that using multi actor processes in strategic

planning and policy development increases credibility as actors include groups that do not represent the same interests, and it increases the likelihood of the execution of the proposed strategy (Häring et al., 2009; Jamieson and Briggs, 2009; Neef and Neubert, 2011). In fact, the vast majority of environmental management decisions are guided by multiple stakeholder interests (Hajkowicz, 2008). In agricultural research for development, it is recognized that different actor groups can provide various insights about the biophysical, technological and institutional dimensions of problems, challenges, and what innovations are technically feasible, economically viable and social-culturally and politically acceptable (Schut et al., 2016).

Actor engagement approaches involving people representing various interests are widely used and encouraged within environmental and agricultural policy development. Beekeepers operate within a dynamic socio-ecological environment, influenced by and having to respond to many, variable factors that influence the health of their bee colonies and the sustainability of their beekeeping practices. Thus, B-GOOD will integrate the expertise and interests of a wide range of relevant actors to shed light on the context and circumstances (apicultural, environmental and socio-economic) under which the beekeeping sector operates in the EU.

More specifically, engagement of various actors in the B-GOOD project will help to determine crucial objectives (research and bee management), as well as generating creative and innovative solutions to achieve these objectives. In this way, the partnerships and networks will be fully engaged in the co-creation of solutions, strengthened throughout the project's lifespan and, where necessary, new partnerships and networks will be encouraged. Ultimately, the B-GOOD multi-actor approach will include linkages to other European projects and working groups such as the EFSA MUST-B working group and, through these targeting linkages, will facilitate knowledge exchange and policy development through the sharing of simulation tools used for honey bee risk assessment and consideration of multiple stressors.

It was of major importance to identify relevant actors and actor networks during the beginning stages of the project, as provided in this deliverable. Approaches for stakeholder identification can be divided into two major categories. The first approach identifies actors based on importance, whose removal may impede or result in imbalances within the whole system. The second approach identifies actors based on relational closeness, or the average distance between an actor and all the others, and reflects how central actors operate within a network (Yiwei et al. 2006).

We mixed both approaches in our identification of relevant actors. First, we started by utilizing an already established actor network in the EU beekeeping sector, the EU Bee Partnership. Actors belonging to the EU Bee Partnership were selected by the European Food Safety Authority (EFSA) following a call for nominating candidates in each of the following categories: (i) consumer organisations and NGOs; (ii) farmers, primary producers and associations of practitioners; (iii) business, food industry and distributors in relation with food safety, bee health and sustainable pollination; and (iv) academia. These types of actors contribute substantially on an international scale to the EU beekeeping sector such that the removal of one would affect the whole EU beekeeping regulatory environment.

Second, by asking members of the EU Bee Partnership to name other relevant stakeholders and organisations they are in contact with concerning bee health, we use the short relational distance between them to identify other stakeholders who operate within the network. Within actor network theory, each stakeholder can lead to the identification of further stakeholders. For example, stakeholders can refer implicitly or explicitly to other stakeholders when interviewed (Pouloudi, 1998; 2004). By asking stakeholders to name other people or organisations they have been in contact with concerning bee health, mutual connections within the network can be identified. The mutual connections that stakeholders and organisations

have with each other, as well as the connections they have outside of the EU network, can offer valuable insights into relevant partnerships for long-term collaboration.

We expected that organisations belonging to the EU Bee Partnership would have many interactions between each other, will have wide-reaching networks, and be gateways for knowledge exchange about beekeeping related topics. Through social network analysis, we envisaged identifying other organisations or networks that were also well-connected. Since we used snowball sampling, we expected that the networks and connections would partly follow our sampling process. Overall, the actors, organisations and networks presented in this deliverable can be an important starting point for long-term collaboration, good communication, and consolidate consensus or facilitate compromise between stakeholders during and after the B-GOOD project.

#### **1.4 Actor/stakeholder in-depth interviews**

To gather broad stakeholder views on the EU beekeeping sector and the current business environment, it was crucial to involve the diversity of stakeholders that characterize the beekeeping sector in the EU. With this approach we aimed to provide a comprehensive understanding of the complexity of the business environment as well as the identification of the key points for future strategic decisions, plans and policy in the sector at European level. This complexity results from the fact that this sector is made up of actors representing different interests. For this reason, we included in our analysis the multi-actor approach that allowed us to take into account the diversity of actors from different areas of the sector, aiming to integrate their different interests and points of view.

That was the main reason why it was decided to contact a wide range of actors throughout Europe using a twofold strategy. First, we conducted semi-structured face-to-face or video call interviews with a sample of 41 actors/stakeholders, selected not based on statistical representativeness but on sociological representativeness in the sense of including the diversity of actors representing the different organizations operating in the EU beekeeping sector (as they represent different interests, as mentioned above). Second, we opted for an online questionnaire survey whose main objective was to quantify, rank and prioritize the SWOT components identified in the interviews.

The use of interviews to collect data was related to our objective of mapping the diversity of components presented in the speeches to characterize the sector in greater detail and depth. The semi-structured format of the interviews allowed for core questions to be asked, while also allowing flexibility to discuss new topics raised by respondents (Creswell, 2007). In-depth interviews are a widely used method to explore stakeholder's perceptions of environmental and landscape changes (Subirós et al., 2014; Albright and Crow, 2016; Lamarque et al., 2011).

Moreover, recent EU-funded projects conducted by the involved research groups have successfully utilized interviews to gain opinions and concerns of stakeholders in the beginning phases of the research. For example, the FoodRisC project used interviews with stakeholders to conduct SWOT analysis to analyse the potential of social media in risk/benefit communication (Barnett et al., 2011). The ACROPOLIS project performed interviews with stakeholders to understand their attitudes, understanding, perceived challenges and willingness to adopt new advanced models for cumulative and aggregate exposure to pesticides (Verbeke et al., 2015). The PHYTOME project involved stakeholders related to the processed meat sector to probe for interest and challenges in replacing nitrite by phytochemicals in meat products (Hung et al., 2016). The FoodIntegrity project conducted interviews with actors in the food production and supply chain to obtain insight in their interest in information-and-data-sharing related to food authenticity for the prevention and detection of food fraud (Minnens et al., 2019).

In relation to the specificities of the beekeeping sector, as stated above, SWOT analyses have been used in institutional statistical analysis (Chauzat et al., 2013; Jones, 2004) and were also used as research methods in local studies, as for example the SWOT analysis made to understand important factors that influence Romanian (Grigoras 2018) and Bulgarian (Lyubenov, 2018) beekeeping business models. In-depth qualitative interviews have also been used in research as a means to understand risk factors as well as understand stakeholder views and opinions about multiple aspects of the beekeeping sector in several European countries, from Greece to the UK (Louise, 2012; Roy et al., 2019; Maderson and Wynne-Jonnes, 2016; Kouchner et al., 2019). This studies however were typically focused on local or national levels.

In-depth interviews are useful in a variety of ways. By using a semi-structured qualitative approach we were able to have a conversation in which the interviewee identified some of the priorities, letting us know in this way what major points were most relevant to discuss with that particular stakeholder. In this manner we obtained a broad range of information that a survey or a more rigid form of interview would struggle to achieve (LeCompte, 1999).

Using in-depth interviews allowed us to also identify networks and actors in EU beekeeping, to gather stakeholders' views and opinions from several countries and socio-cultural backgrounds on what characterizes and influences bee colony health, as well as views on applied business models, their key descriptors, and what potential exists for further development of sustainable beekeeping practices. It also permitted us to gain a holistic overview into which local studies can also be incorporated and, possibly, even help develop a better understanding as well as being better understood in a European context. This thus creates a solid base on which to develop further analysis to understand the complex business environment and the challenges and advantages the sector is faced with at multiple levels.

## 2. Materials and methods

### 2.1 Study protocol, topic guide and ethics approval

This study builds on data collected through (1) in-depth interviews with actors/stakeholders with different backgrounds involved in the beekeeping sector, and (2) a SWOT-element scoring survey with a subset of those actors/stakeholders. The interview topic guide was developed in collaboration with WP1 and WP8. It was tested with four members of the B-GOOD consortium. After testing, a number of minor changes were made to phrasing and amendment of certain questions.

The interview topic guide (Appendix 1) consisted of four sections. The following types and contents of data/information was collected:

1. SWOT of beekeeping in the EU: views and opinions on internal strengths (S) and weaknesses (W) of the beekeeping sector in the EU in general, in specific countries and regions; views and opinions on external opportunities (O) and threats (T) facing the beekeeping sector in the EU in general, in specific countries and regions;
2. Social networks of actors for transfer of knowledge and information about honey bee health;
3. Bee health: views and opinions on what constitutes and characterises a healthy bee colony; the threats to bee colony health; future perspectives and challenges related to bee colony health;
4. Business models: views and opinions on current and future beekeeping business models; identification and profiling of beekeeping business models; forecast on future business models for healthy and sustainable beekeeping in the EU.

The topic guide and study protocol were presented in MS17 and submitted for ethics approval in December 2019. Ethics approval was obtained on 17 January 2020 from the Ethical Commission of Ghent University's Faculty of Psychology and Educational Sciences (Faculteit Psychologische en Pedagogische Wetenschappen) as was stipulated in "D10.1 H – Requirement no. 1" and "D10.2 POPD – Requirement no. 2". A copy of the ethics approval letter is included as Appendix 2.

## **2.2 Participant recruitment and sampling**

### **A. Recruitment method**

A total of 41 interviews have been completed during the period 24 January – 20 March 2020. Data collection from stakeholders has been done by means of personal (face-to-face or video call) interviews. Actors were identified using a mix of snowball sampling and convenience sampling. Using members of the EU Bee Partnership as a starting sample, we first interviewed these members and then subsequently gathered contacts from them via snowball sampling, a non-probability method of interview sample selection (Johnson, 2014). Snowball sampling is a low cost and relatively efficient method for locating individuals, and it can be deployed to collect data very quickly (Johnson, 2014).

To increase our breadth of actor selection, we also contacted and interviewed 5 European members of the International Honey Commission, who were not snowballed from the EU Bee Partnership, since the International Honey Commission represents a global network on the forefront of honey and bee product science. We also contacted a member of Bayer Agriscience and a member of the Food and Agricultural Organisation of the United Nations (FAO) separately. Overall, we selected 34 respondents belonging to or snowballed from the EU Bee Partnership, and selected another 7 respondents via convenience sampling.

Stakeholders were interviewed by B-GOOD researchers in English or in their native language in case English was not feasible and as far as the linguistic skills of the interviewers enabled us to do so. This applied to a number of French-speaking and Portuguese-speaking stakeholders. Interviews were audio-recorded for transcription.

### **B. Sampling process**

A total of 41 stakeholders involved in the beekeeping sector of the EU were interviewed after being selected through a mix of snowball sampling and convenience sampling. At first a selection of 11 stakeholders was made with the objective of representing several areas of the sector; all of these stakeholders were members of the EU Bee Partnership. The choice of beginning with members of the EU Bee Partnership was made because, as it is a platform for data sharing with a multitude of different actors, it represented a perfect launching platform to extend a network analysis around the EU beekeeping sector. To these 11 we added 14 more so as to reach the desired sample numbers, this time outside the EU Bee Partnership, to gather opinions from different networks inside the sector. The remaining 16 were recruited by snowballing from the first interviewees, who provided us with this information during the interview. This procedure allows expansion of the network from the first core sample. This brought us to a total of 41 interviews.

## **2.3 Transcription and interview data processing**

All interviews have been transcribed using NVivo transcription. Full transcripts of the 41 in-depth (around 550 pages) are available upon request from the authors. Audio-records have been deleted following complete and checked verbatim transcription. Transcripts are stored

in pseudonymised formats. Qualitative analysis was conducted using deductive coding in the software programme NVivo (Saldana, 2015). Section 1 of the interview topic guide, SWOT of beekeeping in the EU, was analysed in detail and SWOT elements derived from the interviews were then used to create the SWOT element scoring survey. Additionally, section 2 of the interview topic guide, responses to actor network questions, were used to provide data for preliminary social network analysis using UCINET 6 for Windows, a software package specifically designed for analysis of social network analysis (Borgatti et al., 2002).

Note that interview data from sections 3 and 4 in the interview topic guide will be used in other B-GOOD activities. Section 3, stakeholder views and opinions on what characterizes a healthy bee colony, will be matched with the hive monitoring approach and the data on the most essential indicators emerging from WP1 and WP2. Section 4, beekeeping business models, will help to validate potential and viable business models for healthy and sustainable EU beekeeping, envisaged for WP4 deliverable 4.5.

## 2.4 Identification of preliminary SWOT-elements

Based on the transcripts of 41 interviews, a list of preliminary SWOT-elements was drafted for the purpose of the SWOT element scoring survey. At the stage of identification of SWOT-elements, we deemed every potential element as equally valid, no matter how many stakeholders may have raised it. The number of transcripts analysed for SWOT elements was limited to 20 because it was clear from the analysis that saturation was reached. This means that no additional new SWOT-elements emerged with additional interviews being analysed for SWOT-elements. This list of preliminary SWOT-elements (prior to the scoring task) is presented in Appendix 4. It includes 24 internal characteristics that can be strengths or weaknesses (or neutral factors), as well as 29 external factors that can be opportunities or threats (or neutral factors) for the beekeeping sector in the EU. Note that final formulations and final classification as Strength, Weakness, Opportunity or Threat will be completed only following the scoring task.

## 2.5 SWOT-element scoring survey

The SWOT-element scoring survey served as a means for interviewees to receive feedback from the research team concerning the identified SWOT-elements, and to select and evaluate the most important SWOT elements. This stage is also referred to as the stage of prioritization. In the B-GOOD SWOT-analysis, it is combined with an additional validation of classification (as S/W or O/T) and consensus check among stakeholders. In order to realize this, a SWOT scoring task questionnaire was developed including the list of preliminary SWOT-elements. This questionnaire enabled stakeholders to evaluate the identified SWOT-elements on a limited set of five questions. The aim was to prioritise SWOT-elements and to check for consensus reached among stakeholders. The SWOT/SOR scoring task questionnaire is presented in Appendix 5.

The pre-test of the SWOT questionnaire was carried out with five members of the B-GOOD consortium in order to verify the functioning of its structure as well as the understanding and formulation of the questions in order to correct any ambiguities. Upon receiving feedback, the following reformulations were introduced:

- 1) A question about 'agreement with the statement' was added in case some respondents would not agree with the statements, which will allow us to see the level of consensus between respondents (See Appendix 5 question 1).
- 2) A statement about COVID-19 was added in the external factors. It was brought to our attention that even though this did not emerge from the interviews, we should not miss

this opportunity to probe for stakeholders' opinions about whether this might have an impact on the EU beekeeping sector (See Appendix 5 statement B29).

- 3) Question 4 in Section A was reformulated from: To what extent do you believe this element constitutes an advantage (in case you believe it is a strength, i.e. an element the beekeeping sector can use or capitalise on when facing opportunities or threats) or a disadvantage (in case you believe it is a weakness, i.e. an element that may cause problems for the beekeeping sector when facing opportunities or threats) for the beekeeping sector in the EU?

To: To what extent do you believe this element constitutes an advantage (i.e. an element the beekeeping sector can use or capitalise on when facing opportunities or threats) or a disadvantage (i.e. an element that may cause problems for the beekeeping sector when facing opportunities or threats) for the beekeeping sector in the EU? Which eliminates the conditional "in case you believe it is a strength/weakness" clause in order to not constrain respondents in their answers (See Appendix 5 question 4).

- 4) The "Not relevant to me" button in questions 1-4 was changed from black to red, in order to better distinguish it from the interval scale.
- 5) Statement 3 in Section A was reformulated from: Honeybees provide multiple ecosystem services. They are a species that is relevant for agriculture and food production as well as for the environment and biodiversity.

To: Honeybees provide multiple ecosystem services. They are relevant for agriculture and food production as well as for the environment and biodiversity. Because honeybees are not a species (See Appendix 5 statement A3).

- 6) Statement 23 in Section B was reformulated from: While the EU beekeeping sector has become stronger in Brussels, Brussels has become increasingly weak. The EU is ineffective at enforcing what the EU beekeeping sector has proposed.

To: While the EU beekeeping sector has become stronger within the EU, the EU administration and services have become increasingly weak. The EU is ineffective at enforcing what the EU beekeeping sector has proposed. Because it was unclear what was meant by "Brussels?" (See Appendix 5 statement B23).

The SWOT/SOR scoring task questionnaire was launched on 31 March 2020 as a personalised invitation to each of the 41 stakeholders who took part in the in-depth interviews, both as feedback to them concerning the insights obtained and with the request to evaluate the SWOT-elements.

A reminder e-mail was sent on 6 April 2020 to actors/stakeholders who had not yet started or completed the survey. From 14 April 2020 onwards, stakeholders who had not yet completed the survey or who had not yet reacted to the invitation (positive or negative) were reminded personally by phone. Following these reminders, a total of 28 completed surveys (well above the envisaged target of 25) was reached on 30 April 2020, which meant the successful end of data collection. Data have been analysed quantitatively using univariate descriptive statistics in SPSSv26 (IBM Corp. 2019).

### 3. Results

#### 3.1 Sociographic Characterization of Participants

##### 3.1.1 Actor/stakeholder interview sample

Of the 41 interviews gathered, the vast majority of our respondents are male (31), have children (36) and are married (29) (see Table 1). Only 10 women were interviewed, which can be explained by the fact that the beekeeping sector is male-dominated. We had 3 female respondents in our initial 11 interviews from which we snowballed; the selection of

respondents was made on the basis of their role in the beekeeping sector and not on gender, which gives us a more proximate representation of the demographics of the sector.

**Table 1.** Sample distribution by Gender, Marital Status and Children.

Gender	Marital Status	Has children	Has no children	Missing value	Total
Female	Married	7	0	0	7
	Not Married	1	1	0	2
	Missing Value	0	1	0	1
	Total	8	2	0	10
Male	Married	22	0	0	22
	Not Married	4	1	1	6
	Missing Value	2	0	1	3
	Total	28	1	2	31
Total	Married	29	0	0	29
	Not Married	5	2	1	8
	Missing Value	2	1	1	4
	Total	36	3	2	41

In total we have 6 missing values that refer to: in two cases, information on whether or not our respondents have children is missing (2 men); in four cases we lack information about marital status (1 woman and 3 men).

Our sample has an average age of 52,4 years old with a standard deviation of 10,5. The ages varied between 34 and 79 years old, of which 5 were between 30-39; 13 were between 40-49 years old; 11 were between 50-59; 8 were between 60-69; and 3 were between 70-79. The high average age can be explained by the level of representatives of each organization that already had a career related to the sector.

All the respondents lived and worked in Europe and, with one exception, all were of European nationalities. The 10 nationalities represented in the sample are, by alphabetical order: Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Portugal, Slovenia and the United Kingdom.

We can observe that the majority of respondents are from Western Europe with France, Germany and Belgium being the best represented. This is probably due to a high number of respondents having functions at an EU level and thus being centred around the EU institutions. Despite this, in our sample we have representatives from many European regions, which undoubtedly allows us to have access to the variety and regional specificities that characterizes the beekeeping sector.

The principal functions of each stakeholder were taken from their own job description during the interview and categorized as follows: professions concerned with the development of the sector or its support (veterinary services, education platforms, service providers) were categorized as 'extension services' and 'service providers'. Professions concerned with scientific research as their primary function were categorized as 'scientists'. Professions indirectly connected to beekeeping with primary functions in agricultural sector industries, associations etc., were categorized as 'plant growers'. Professions connected to beekeeper organizations, either as administration or functional staff, were categorized as 'beekeeper/beekeeper association'. Professions in product quality testing and control laboratories were categorized as 'inspectors'. Professions connected to policy making, policy evaluation and related issues were categorized as 'policy makers'. Active members of Non-Governmental Organizations were categorized as 'NGO'.

From this categorization we obtained an equilibrated variety of functions: 9 in the Scientist category; 7 in Extension services and service providers; 5 representing the category Beekeeper/Beekeeper Association; 5 in the Inspector category, mainly composed of beekeeping product quality inspectors and pesticide impact evaluators; 5 in the NGO category; 5 representing the Plant Grower category and 5 in the Policy Maker category. To categorize each principal function, we used the job description provided in the interview in conjunction with the function of the organization they represented.

In Table 2 we can observe the job description summarized from the interview and the respective categorization. Please note that all respondents represented multiple functions and could fit in several categorizations (e.g. NGO may be a service provider as well as a scientist a scientist may also be involved in quality inspection, thus inspector; active in training of beekeepers, thus extension service provider; while being a beekeeper and active member of a beekeepers association).

**Table 2.** Category, profession description and interview code number respectively.

Profession description	Organization	Interview code
<b>Beekeeper/Beekeeper Association</b>		
Beekeeper advisor	Danish Beekeeper Association	38
Beekeeper, bee research lab	Carreck Consultancy Ltd.	35
Management position in the UK NFU	UK National Farmers Union	03_1_1
Queen breeding, selection and genetics	Slovenian Beekeepers Association	40
Representative of European beekeepers	European Beekeepers Association	1
<b>Extension services and service provider</b>		
Beekeeper training, extension services	Landesbetrieb Landwirtschaft Hessen	05_2
Biodiversity and bee health	Vétérinaire conseil du PSE	07_2_3
Training in veterinary medicine	BEEVET	07_1
Veterinarian and a honeybee pathologist expert	Istituto Zooprofilattico Sperimentale	05_1
Veterinarian, specialized on bees	GTV Apiculture	07_2
Veterinary for food-producing animals	Clinique vétérinaire des Mazets	07_2_1
Veterinary medicine for bees	OMAA	07_2_1
<b>Inspector</b>		
Bee protection, impact of viruses on bees	Austrian Agency for Health and Food Safety	41
Honey quality and residue testing	International Honey Commission	25
Pesticide risk assessment	Corteva Agriscience	03_3
Quality control of bee products	International Honey Commission	22
Scientist, screening for antibiotics in food	International Honey Commission	42
<b>NGO</b>		
Beekeeper advisor	Réseau biodiversité pour les abeilles	03_3_1
Reducing pollution and improving biodiversity	BeeOdiversity	07_3
Protecting pollinators from pesticides	Pesticide Action Network	09
Registration of veterinary medicine for bees	Association of Veterinary Consultants	07
Scientist and extension service provider	BeeLife	06
<b>Plant Grower</b>		
Bee health, breeding Varroa-resistant bees	Bayer Agriscience	12
Bio protection and sustainable agriculture	International Biocontrol Manufacturers Association	10
Pesticide risk assessment	European Crop Protection Association	03
Representing interest of farmers	UK National Farmers Union	03_1
The link between agriculture and bee health	International Confederation of European Beet Growers	04
<b>Policy Maker</b>		
Regulations related to veterinary products	ANSES	11_2
Investigate and support the beekeeping sector	International Honey Commission	31
Research to protect bee health- risks assessment	European Food Safety Authority	11
Veterinarian, value chains of the livestock sector	FAO	43
Veterinary issues for animal health and welfare	The Directorate-General for Health and Food Safety	06_1
<b>Scientist</b>		
Bee pathogens and pesticides	Julius-Kühn-Institut Germany	03_3_2
Characterisation of bee products	International Honey Commission	24
Ecotoxicologist, impact of chemical stressors	Wageningen Environmental Research	32
Honey bee diseases and pesticides	ANSES	11_1
Landscape modelling for honeybee foraging	Wageningen Environmental Research	33
Research in honey bee product residues	Benaki Phytopathological Institute	34
Research on environmental stressors	Apimondia	05
Research on honeybee health	Wageningen Plant Research	36
Research on neurobiology, Varroa, pesticides	French National Center for Scientific Research	11_3

### 3.1.2 Actor/stakeholder SWOT scoring sample

We asked all 41 interviewees to fill out the online survey for the SOR quantification of the SWOT components. Of the 41 contacted, 25 responded, and 3 more respondents were added using convenience sampling.

These 28 respondents have characteristics very similar to those interviewed in the first phase, but in general terms we have: 20 males and 8 females, ages between 34 and 79 years old.

The professions of the 28 respondents fit in the previously mentioned categories in the following manner: 5 in the Scientist category; 5 in Extension services and service provider, 4 in the beekeeper/beekeeper association category; 4 in Inspector; 4 in Plant Grower; 4 in Policy Maker and 2 in the NGO category. This provided a variety of different views and opinions during the scoring and maintained the level of categorical diversity of the in-depth interviews.

There was a clear drop of participants categorized in the NGO category. All the other categories have similar numbers of respondents, providing a diverse and balanced sample.

Almost all countries represented in the first interview phase are present in this online survey phase, with the only exception of the loss of Denmark and the addition of Finland instead. As before, the greater number of respondents live and work in Belgium, France and Germany.

## 3.2 SWOT/SOR-analysis

### 3.2.1 Identified internal and external factors: preliminary set of SWOT-elements

Internal and external factors that characterize beekeeping in the EU were identified from transcripts of 41 stakeholder interviews (see Table 3).

**Table 3:** Preliminary list of SWOT- elements with abbreviated names (for the full descriptions, we refer to Appendix 4). Note: frequently used abbreviations are BKG=beekeeping; BKR=beekeeper(s); CC=climate change; ENV=environment; Q=quality.

	Internal factors	External factors
1	BKG IMAGE	PUBLIC AWARE ENV BEES
2	BKR NR	CC GEOSHIFT BKG
3	BEES MULTISERV	CC IRREG WEATHER
4	BKG UNIQUE BRU	CONS WTP HONEY
5	HONEY IMAGE	BKP LS PROD RULES
6	BKG PRACT VARY	BKR FARM INTEREST
7	BKG COMM DIV	HEALTH PLANS BEES
8	BKG DATA AGGR	PUBLIC AWARE IMPACT CC
9	BKG MANY ASS	DIGIT TECH BKG
10	BKR FREEDOM	ADV ASSESS ANAL TECH
11	BKR VIEWS	ADV VET MED
12	BKR SEDENTARY	OPEN MARKETS
13	BKR LACK EDU	ADULTERATION
14	BKR SCI DIFF	DOM AGRIC MODEL
15	BKR AGEING	ENV CONTAM
16	YOUNG BKR VIEWS	BKG LITTLE SUPPORT
17	BKR CLOSED MIND	SCI RES BEES
18	BKG BUSY LS	BKR COLONY LOSS

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19	BKR DIGIT TECHN	DIGT PRESSURE LOC
20	VET MED AVAIL	BEES PEST DEBATE
21	HIGH Q RES	ENV DEGRAD
22	HIGH Q EQUIP	NEW BEE PESTS
23	BKR ACTIVE ASS	EU ADMIN INEFF
24	BKR LOW MRKTG	ALT CHEM PEST
25		EU IMPORT HONEY
26		HONEY LABELS
27		BKR ALT TREATM
28		BEE BREED GEN RES
29		COVID19

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Firstly, a total of 24 internal factors that characterize beekeeping in the EU were identified, as seen in Table 3. These internal factors are listed in Appendix 4 where they are numbered (1-24) as they emerged from the analysis of the interviews for the scoring task. Importantly, internal factors are characteristics that the sector itself can influence, modify, change, improve or manage.

Thematic analysis of the 24 internal factors, which can be strengths or weaknesses or neutral factors, revealed a meaningful classification according to 4 groups:

1. Factors that characterize **beekeepers**

Stakeholders noted that beekeepers are numerous (2)<sup>1</sup>, constitute a diverse group (7) whose beekeeping-related data are nevertheless aggregated (8); who have a lot of freedom in their actions (10), and strong personal views (11). Meanwhile, they are also characterized as being mainly an ageing group (15), though with a younger generation that might have different views (16). Beekeepers are also seen as being closed-minded (17), lacking education (13), digital (19) and marketing skills (24). The majority of the internal characteristics thus pertain to the main actors within the sector, namely the beekeepers themselves. This group of factors herewith mainly represents views on the human resources as internal characteristics of the beekeeping sector in the EU.

2. Factors that characterize the **act of beekeeping**

Stakeholders characterize beekeeping in the EU as a highly varied practice (6), which is mainly sedentary (12) and with access to high quality equipment and materials (22). It is also noted that the act of beekeeping may not match well with contemporary busy lifestyles (18). This group of factors refers to internal characteristics in the sense of both **physical resources** and **activities or processes**.

3. Factors that characterize the **beekeeping sector**

A third set of characteristics relates to the internal organization of the beekeeping sector. The sector is characterized as occupying a unique position within the policy domain (4), counting many well-organized associations (23), but being hardly unified (9).

4. Factors that characterize the interaction of **beekeeping with its environment**

Several identified internal characteristics relate to how beekeepers or the beekeeping sector interact with their 'suppliers' (e.g. scientists who supply them with knowledge and training; pharmaceutical companies who provide them with veterinary medicine) and 'customers' (e.g. honey consumers; the broader public). While specific trends and developments at the levels of these suppliers or customers pertain to the external

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<sup>1</sup> The numbers between brackets refer to the numbering of the internal factors as listed in Appendix 4.

environment, the interaction of the sector with them is within the control of the sector and therefore considered internal. Specifically, beekeeping is seen as having a positive image among the broader public (1). In a similar vein, honey is seen as having a positive image among consumers (5). The beekeeping sector receives high quality research (21), but at the same time faces difficulties when interacting with scientists (14). Pharmaceutical companies are supplying the beekeeping sector with potential solutions to control pests, but access to these products is not equal across the EU (20). Finally, honeybees provide multiple ecosystem services (3).

Whether or not these internal characteristics constitute strengths or weaknesses, which ones are the most important to capitalize on or to deal with, and how strong the consensus on this is, was determined through the scoring task. Interestingly, as compared to groups of factors commonly encountered as internal characteristics in organizational or business-related SWOT-analyses, no specific group or elements dealing with financial resources or past experiences emerged from the stakeholder interviews. This indicates that such issues might not be at stake; not be top of the mind when discussing the beekeeping sector in the EU; or be considered as neutral factors rather than as particular strengths or weaknesses.

Second, a total of **29 external factors** were identified in the overall (operational, business, and natural) environment with a potential impact on beekeeping in the EU, as seen in Table 3. These external factors are also listed in Appendix 4 where they are numbered (1-29) as they emerged from the analysis of the interviews for the scoring task. Importantly, external factors relate to trends, tendencies or developments that the sector itself cannot influence directly, modify, change or manage. Instead, the beekeeping sector may have to act upon these trends, tendencies or developments in the sense of making use of opportunities or coping with threats. Hence, proper (re)action may be required from the beekeeping sector when facing these issues.

Thematic analysis of the 29 external factors, which can be opportunities or threats or neutral factors, reveals a meaningful classification into five groups described by the type of environment they pertain to:

### **1. Technological environment**

The technological environment in which beekeeping occurs is characterized by developments with respect to digitalization and automated hive monitoring (9), advancements in risk assessment and analysis technologies (10), veterinary medicine (11), alternatives to chemical pesticides (24), honeybee health plans (7), and honeybee breeding and genetic research (28), supported by increasing financial support (17). Meanwhile, stakeholders flag the idea that digitalization allows for data sharing with the risk of increasing 'forage pressure' for bees on specific locations (19) and that more and more beekeepers explore alternative bee treatments (27).

### **2. Natural environment**

Changes in the natural environment are multiple. Climate change is believed to lead to geographical shifts in beekeeping and honey production (2) and to bring more irregular, unpredictable and severe weather events (3). Environmental degradation (21), the multitude of environmental contaminants (15) and emerging pests or predators (22) impose challenges on bee-friendly environments. Finally, the emergence of COVID-19 may change the future economy and way of living (29), with a potential impact on beekeeping in the EU as well.

### **3. Political and legal environment**

The position of beekeeping relative to other agricultural and livestock production sectors has been discussed. Beekeeping is believed to be less supported (financially,

with extension services, etc.) than other agricultural sectors (16). Meanwhile, full recognition as a livestock production sector may come with stricter rules and more regulation (5). Honeybees are believed to be (politically) used to influence the pesticide debate, yielding less focus on other important issues such as landscape diversity (20). The EU administration is believed to be ineffective at enforcing what the EU beekeeping sector proposes (23). An example and one that was more generally commented on was , honey labelling (some misleading) (26).

#### **4. Economic environment**

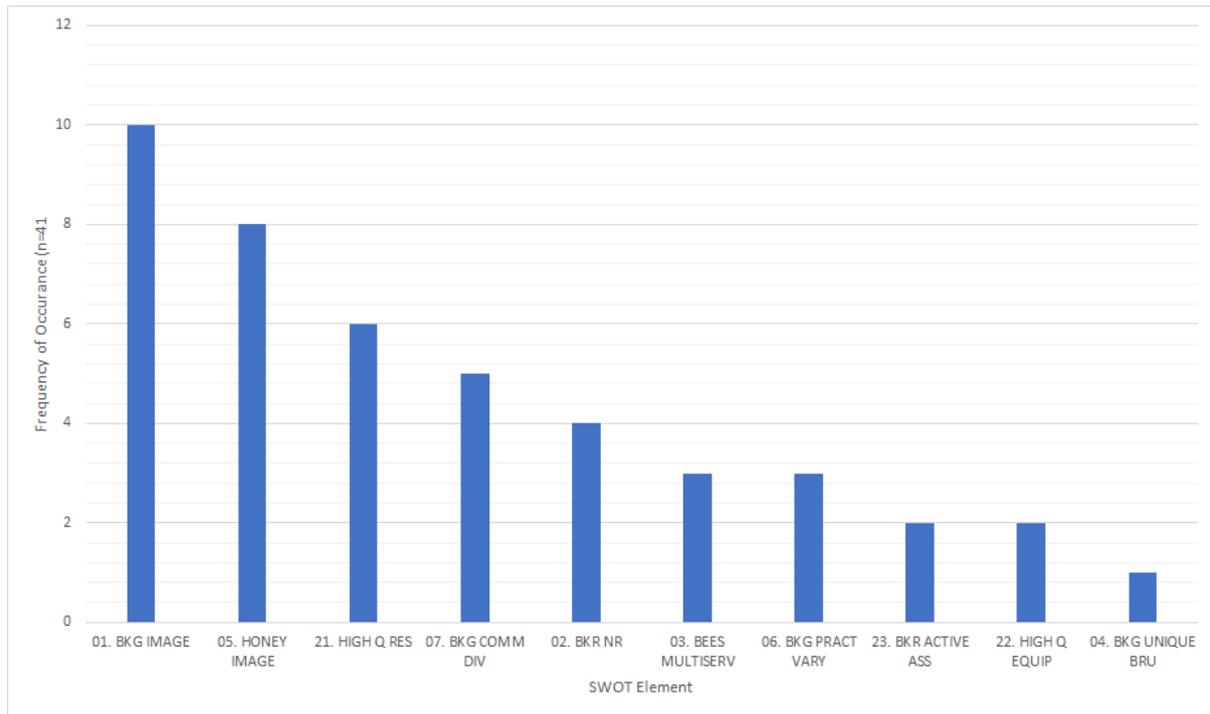
Identified developments and trends in the economic environment relate to international trade, and to the roles of farmers and consumers as other relevant economic actors. International trade of apiary products is very liberal and EU markets are open to cheap imports (12), in particular honey (25), while adulteration of apiary products is quite common (13). While the dominant 'intensive' agricultural model is believed to lead to depletion of habitat and resources for honeybees (14), initiatives emerge where farmers and beekeepers discover common interests and join forces (6). Last but not least, consumers increasingly value natural high-quality products such as local honey (4), which also translates in willingness-to-pay (e.g. a fair price for local honey).

#### **5. Sociocultural environment**

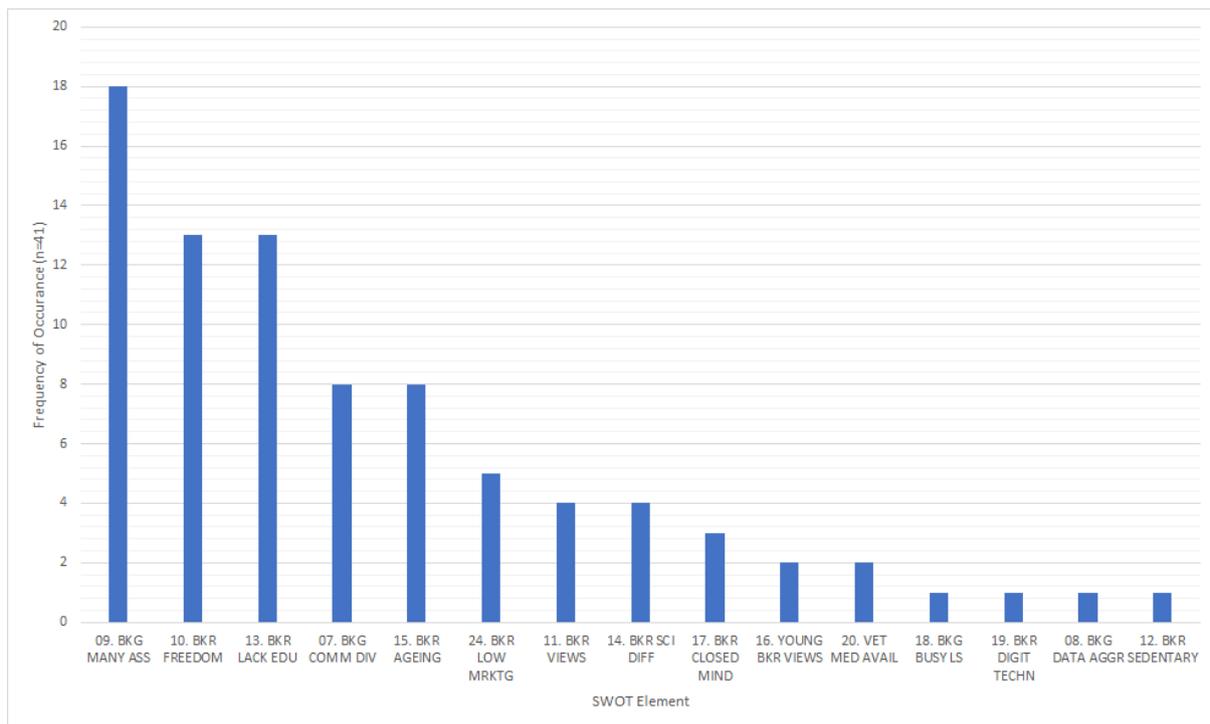
The sociocultural environment is characterized by an increasing awareness about climate change (8) as well as issues such as biodiversity, pesticides and environmental degradation (1) and their adverse impact on honeybees. Meanwhile, beekeepers are increasingly blamed (by society) for contributing as well to colony loss as a result of their management practices (18).

Whether or not these external trends and developments constitute opportunities or threats, which ones are the most important to benefit from or to deal with, and how strong the consensus on this is, will be determined through the scoring task.

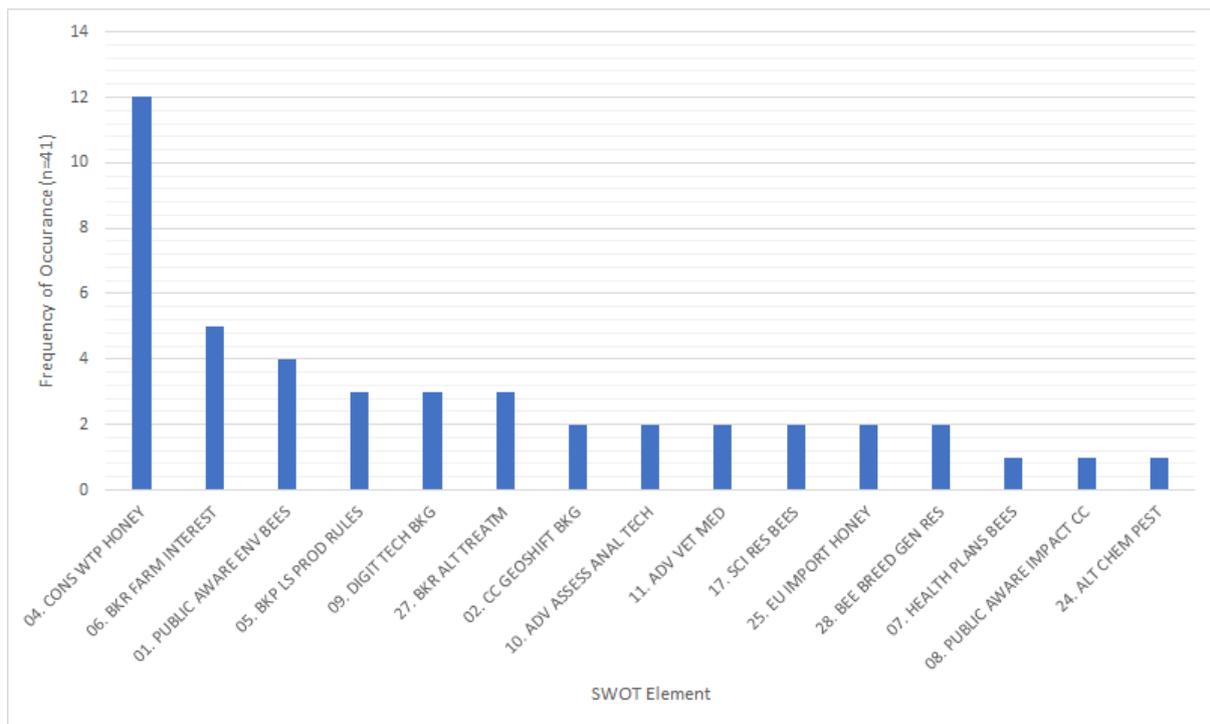
Although we treated every potential element as equally valid for the survey no matter how many stakeholders may have raised it, some relevant insight may be derived from the frequency that each SWOT element was mentioned during interviews. Figures 1-4 below show the frequency that each SWOT element occurred in the 41 interviews, and also if these elements are either strengths or weaknesses, opportunities or threats, as classified by interview respondents.



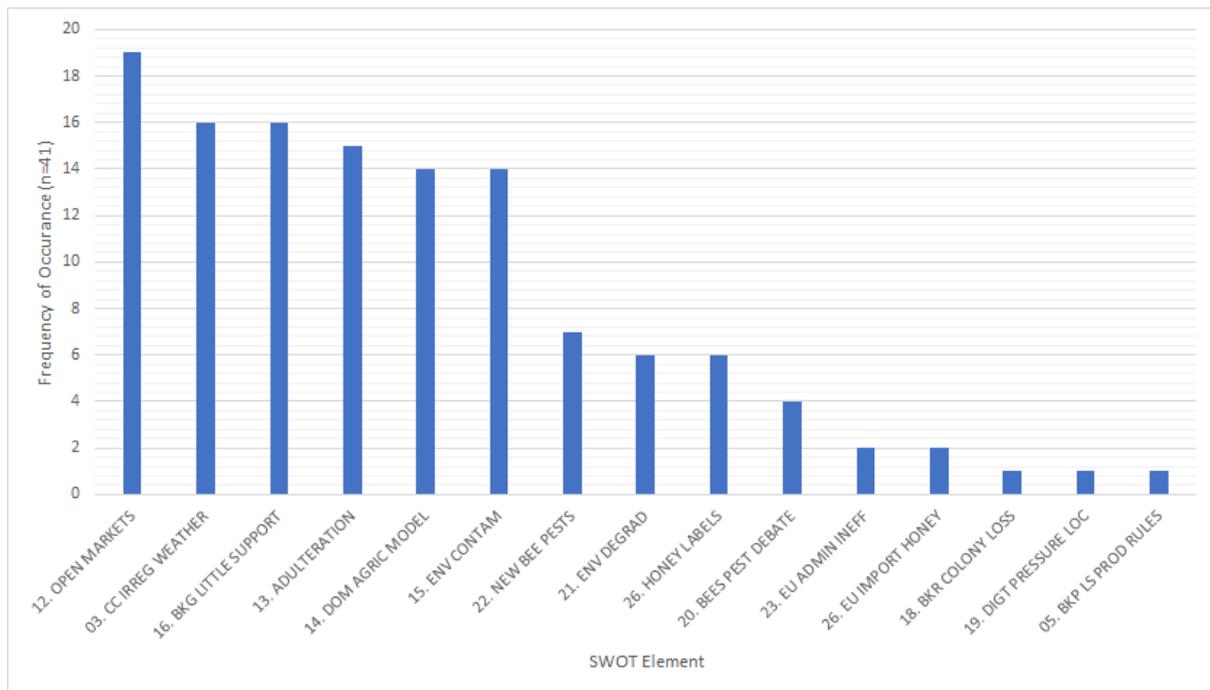
**Figure 1:** Occurrence of Strengths throughout 41 interviews



**Figure 2:** Occurrence of Weaknesses throughout 41 interviews



**Figure 3:** Occurrence of Opportunities throughout 41 interviews



**Figure 4:** Occurrence of Threats throughout 41 interviews

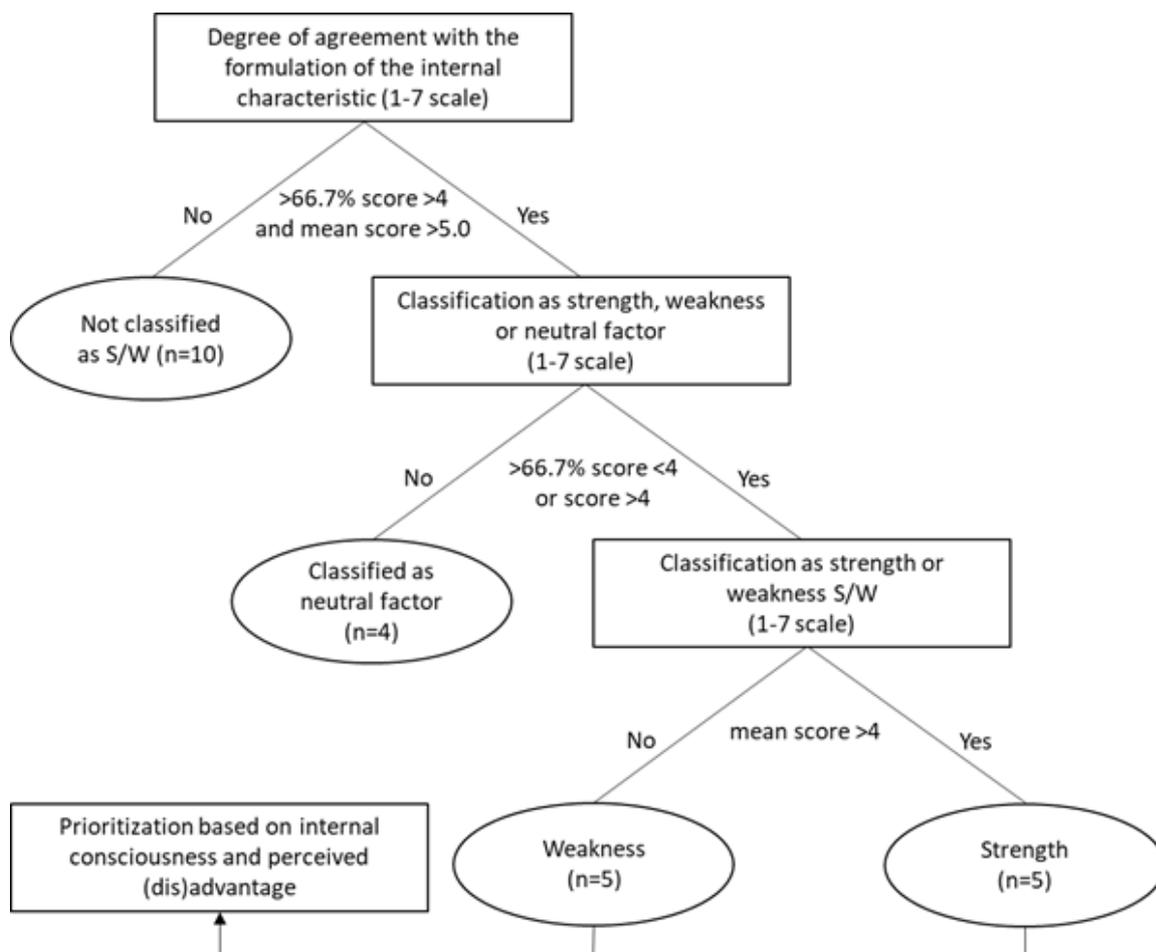
### 3.2.2 SWOT-element scoring: final set of SWOT-elements

#### A. Scoring survey analysis of internal characteristics

An analysis of the scoring survey data for the 24 identified internal characteristics has been performed in four steps using the classification tree procedure presented in Figure 5.

First, the degree of agreement or disagreement among stakeholders about the presented statements (of SWOT-elements) has been assessed. Only elements with a substantial degree of agreement (i.e., with more than two thirds of the stakeholders who agree and where the mean agreement score is higher than 5.0 on the 7-point scale) are taken to the second step.

Second, stakeholders' evaluations of the agreed-upon elements as neutral factors (step 2), weaknesses or strengths (step 3) have been assessed. An element has been classified as a weakness or as a strength if more than two thirds of the stakeholders scored the element as such, i.e. a score of 1-3 for weaknesses and 5-7 for strengths, respectively. With respect to mean score on the 7-point scale, this comes down to classifying an element as a weakness or a strength if the mean score is lower than 3.0 or higher than 5.0, respectively. Only elements classified as non-neutral factors are taken to the fourth step, which is prioritization.



**Figure 5.** Classification tree for the 24 identified internal characteristics based on degree of agreement with its formulation and score as weakness or strength, note: 'n' value (in brackets) refers to the number of classified characteristics.

The degree of agreement that was reached among participating stakeholders concerning the internal characteristics of the beekeeping sector in the EU is presented in Table 4. For 14 out of the 24 identified internal characteristics of the beekeeping sector in the EU, agreement (as defined above) was reached by more than two thirds of the participants. These 14 statements all received a mean agreement score of 5 or more on the 7-point scale and will be further taken into account for being classified as a strength, weakness, or neutral factor, and for being prioritized (except for neutral factors).

The other 10 statements received lower agreement scores, either because of a substantial share of stakeholders who disagreed or provided neutral scores, or because they received a high share of aggregated disagreement and neutral scores. The 14 agreed-upon elements that emerged from the survey generally had a high frequency of occurrence in the interviews, which shows a degree of congruence between interview and survey data. However, 2 of the 14 agreed-upon elements had a very low frequency of occurrence in the interviews (i.e. were only mentioned by 1 stakeholder).

- 4 Element 08: *Most data on beekeeping are merged or aggregated across many types of beekeepers in terms of size, management styles and objectives. This creates bias and makes it difficult to compare approaches*, was only mentioned by 1 stakeholder during interviews. One stakeholder commented on this element in the survey in disagreement, saying that in fact there are projects in which separate data are collected, which may explain why it was not mentioned by many stakeholders during interviews (all survey comments can be seen in Appendix 6).
- 5 Element 18: *Beekeeping requires a lot of attention and proper management during specific periods, which may not match with contemporary and busy lifestyles*, was only mentioned by 1 stakeholder during interviews. One stakeholder commented on this element in the survey in disagreement, saying that it cannot be assumed that both hobby beekeepers and professional beekeepers have similar lifestyles, which may explain why it was not mentioned by many stakeholders during interviews.

The ten statements that received lower agreement scores generally had a low frequency of occurrence in the interviews, which shows a degree of congruence between interview and survey data. However, one of these ten elements had a very high frequency of occurrence in the interviews (i.e. it was mentioned by 10 stakeholders or more):

- 1) Element 13: *Beekeepers in the EU lack education, training and knowledge to properly manage their hives*, was mentioned by 13 stakeholders during interviews. One stakeholder commented on this element in the survey in disagreement, arguing that there are indeed training programs for beekeepers. This ambiguity might explain the disagreement between survey respondents.

The overview of the classification of the 14 agreed-upon internal characteristics as strength, weakness or neutral factor is presented in Table 5. Note that only the classification scores from individual stakeholders who did not disagree with the statement and who did not mark the statement as 'not relevant to me' are taken into account. As a result, the valid sample size on which the further analysis is based is 28 (the original sample size) or lower (minimum 22).

Five internal characteristics were classified by at least two thirds of the participating stakeholders as a strength; another five as a weakness; and four as a neutral factor. Remaining items with a mean score below and above 4 are considered weaknesses and strengths, respectively. Strengths received a mean score of 5.96 or higher on the 7-point scales, whereas weaknesses received a mean score of 2.04 or lower. These numbers indicate a good degree of consensus with respect to the classification of these items. The data allow

us to proceed with our analysis of the identified strengths 01, 03, 05, 21 and 22 and weaknesses 08, 09, 11, 20 and 24.

The resulting weaknesses and strengths have been prioritized based on stakeholders' assessments in terms of internal consciousness (i.e. how well the EU beekeeping sector is believed to be aware or conscious about an internal characteristic) and perceived (dis)advantage (i.e. to what extent an external characteristic may constitute a disadvantage or an advantage for the EU beekeeping sector facing its operating environment). Mean scores are reported in Table 6 and plotted in Figure 6 on both dimensions to visualize and facilitate interpretation of these elements relative to each other.

Looking at Figure 6, there are no elements positioned in the bottom left quadrant, meaning there are no elements that may constitute an important disadvantage with low internal consciousness. This is positive news for the EU beekeeping sector. The eventual emergence of internal characteristics in this quadrant (typically weaknesses) would have been problematic and would have demanded immediate prioritisation for remediation.

The internal consciousness of both strengths and weaknesses is generally good; both strengths and weaknesses rank quite similar in terms of internal consciousness. The internal consciousness might be improved for S21, W08 and W24. The EU beekeeping sector should be made more aware of the fact that there is a lot of high-quality research being done on honeybees and beekeeping (S21). This strength can only be capitalized on in terms of benefiting from opportunities or coping with threats if the sector is sufficiently internally aware or conscious of it.

Additionally, the fact that most data on beekeeping are merged or aggregated across different types of beekeepers in terms of size, degree of professionalism, management styles and objectives, which creates bias and difficulties in comparing approaches (W08), is a major weakness that may not be sufficiently recognised and understood within the beekeeping sector. Also on this element, internal consciousness should be raised. The same goes for the observation that most beekeepers have low marketing skills and little expertise to develop or create positive images for apiary products (W24).

As seen in Figure 6, the main strengths to capitalize on are S03 and S01, i.e. the high relevance of honeybees for agriculture, food production, the environment and biodiversity, and the favourable image of beekeeping among the broader public. The EU beekeeping sector is recommended to make greater use of these strengths, which can be especially relevant while interacting with other stakeholders (e.g. agriculture, agribusiness, science, policy, non-governmental organizations) and the broader public.

As seen in Figure 6, the main weaknesses are W11 and W09, i.e. beekeepers possess strong views and possibly show resistance to change or to accept regulation, controls or rules, and the fact that the beekeeping sector is not unified and has many associations that do not sufficiently collaborate with each other. Efforts to smoothen or get rid of these weaknesses, which concern personal attitudes of individual beekeepers and internal organizational aspects of the sector and its associations, are recommended.

**Table 4.** Stakeholders' (dis)agreement with the 24 identified internal characteristics of the beekeeping sector in the EU (n=28)

Internal characteristic	% disagree (scores 1-3)	% neutral (score 4)	% agree (scores 5-7)	Mean	S.D.
01 Beekeeping has a favourable image among the broader public	0.0	3.6	96.4	6.25	0.65
02 Numerous beekeepers, geographical spread, which gives them political weight	14.3	17.8	67.9	4.93	1.44
03 Honeybees provide multiple ecosystem services for agric, food, env, biodiversity	0.0	0.0	100.0	6.54	0.64
04 Beekeeping is unique as an economic interest group, neither NGO nor agriculture	17.9	53.6	28.6	4.14	1.24
05 Locally produced honey has favourable image, high and premium quality, good price	7.1	10.7	82.1	5.61	1.32
06 Beekeeping practices vary greatly, in terms of styles, subspecies, materials, equipment	0.0	0.0	100.0	6.36	0.78
07 Beekeeping community is very diverse, hobby vs professional, different motivations	0.0	0.0	100.0	6.46	0.64
08 Data on beekeeping are merged across types, styles, objectives, which causes bias	14.3	10.7	75.0	5.14	1.41
09 Beekeeping sector is not unified, many associations that do not collaborate	7.1	3.6	89.3	5.79	1.34
10 Beekeepers have a lot of freedom in their management practices	0.0	3.6	96.4	5.93	0.77
11 Beekeepers have their own strong views and are resistant to follow rules	14.3	3.6	82.1	5.43	1.50
12 Most beekeepers are sedentary; their hives face consistently the same exposure	21.4	39.3	39.3	4.18	1.44
13 Beekeepers lack education, training, knowledge to properly manage their hives	21.4	17.9	60.7	4.68	1.36
14 Interaction between beekeepers and scientists is difficult, different language, lack of trust	35.7	3.6	60.7	4.25	1.78
15 Beekeepers are an ageing population group	28.6	14.3	57.1	4.64	1.47
16 Younger beekeepers are less production and more environmentally oriented	17.9	21.4	60.7	4.79	1.20
17 Beekeepers tend to be closed-minded and are not keen on collaborating and sharing	32.1	17.9	50.0	4.07	1.46
18 Beekeeping may not fit with contemporary and busy lifestyles	7.1	7.1	85.7	5.29	1.33
19 Beekeepers lack knowledge of digital technologies and how these can benefit them	17.9	17.9	64.3	4.79	1.43
20 Availability of registered veterinary products is low and unequal across EU	7.1	14.3	78.6	5.50	1.29
21 There is a lot of high-quality research on honeybees and beekeeping	0.0	7.1	92.9	5.79	0.88
22 Beekeepers have access to high quality equipment and facilities	17.9	10.7	71.4	5.07	1.51
23 Beekeepers are active in associations that are internally well organized	32.1	17.9	50.0	4.21	1.71
24 Beekeepers have low marketing skills and expertise to create positive image	3.6	14.3	82.1	5.11	0.79

**Table 5.** Stakeholders' evaluation of agreed-upon internal characteristics of the beekeeping sector in the EU as weakness, neutral factor or strength (n=22-28 since only evaluations of individual stakeholders who did not disagree (difference in scores < 3) with the statement, and who did not mark the statement as 'not relevant to me' are taken into account)

Internal characteristic	% weakness (scores 1-3)	% neutral (score 4)	% strength (scores 5-7)	Mean	S.D.	S/W
01 Beekeeping has a favourable image among the broader public	3.6	3.6	92.8	6.21	1.13	S
03 Honeybees provide multiple ecosystem services for agric, food, env, biodiversity	0.0	3.6	96.4	6.46	0.84	S
05 Locally produced honey has favourable image, high and premium quality, good price	4.0	8.0	88.0	5.96	1.17	S
06 Beekeeping practices vary greatly, styles, subspecies, materials, equipment	21.4	39.3	39.3	4.11	1.03	N
07 Beekeeping community is very diverse, hobby vs professional, different motivations	32.1	25.0	42.9	4.32	1.63	N
08 Data on beekeeping are merged across types, styles, objectives, which causes bias	86.4	4.5	9.1	2.55	1.26	W
09 Beekeeping sector is not unified, many associations that do not collaborate	92.3	7.7	0.0	2.04	0.77	W
10 Beekeepers have a lot of freedom in their management practices	57.1	21.4	21.4	3.32	1.57	N
11 Beekeepers have their own strong views and are resistant to follow rules	87.5	8.3	4.2	2.08	1.14	W
18 Beekeeping may not fit with contemporary and busy lifestyles	69.2	26.9	3.8	3.04	0.87	N
20 Availability of registered veterinary products is low and unequal across EU	83.3	12.5	4.2	2.46	1.25	W
21 There is a lot of high-quality research on honeybees and beekeeping	3.6	3.6	92.8	6.18	1.02	S
22 Beekeepers have access to high quality equipment and facilities	0.0	9.1	90.9	6.00	1.02	S
24 Beekeepers have low marketing skills and expertise to create positive image	96.0	4.0	0.0	2.52	0.71	W

**Table 6.** Stakeholders' prioritization of strengths and weaknesses of the beekeeping sector in the EU, mean scores (S.D.) for internal consciousness and perceived (dis)advantage (n=22-28 since only evaluations of individual stakeholders who did not disagree (difference in scores < 3) with the statement, and who did not mark the statement as 'not relevant to me' are taken into account)

Internal characteristic	Internal consciousness		Perceived (dis)advantage	
	Mean	S.D.	Mean	S.D.
<b>STRENGTHS</b>				
01 Beekeeping has a favourable image among the broader public	5.89	1.34	6.07	1.09
03 Honeybees provide multiple ecosystem services for agric, food, env, biodiversity	6.07	1.05	6.36	0.83
05 Locally produced honey has favourable image, high and premium quality, good price	5.72	1.24	6.00	1.12
21 There is a lot of high-quality research on honeybees and beekeeping	4.82	1.25	5.86	1.04
22 Beekeepers have access to high quality equipment and facilities	5.27	0.99	5.59	0.96
<b>WEAKNESSES</b>				
08 Data on beekeeping are merged across types, styles, objectives, which causes bias	4.55	1.44	2.59	1.05
09 Beekeeping sector is not unified, many associations that do not collaborate	5.08	1.26	2.48	1.36
11 Beekeepers have their own strong views and are resistant to follow rules	5.08	1.38	2.08	1.10
20 Availability of registered veterinary products is low and unequal across EU	5.63	1.17	2.52	1.28
24 Beekeepers have low marketing skills and expertise to create positive image	4.48	1.30	3.04	1.24



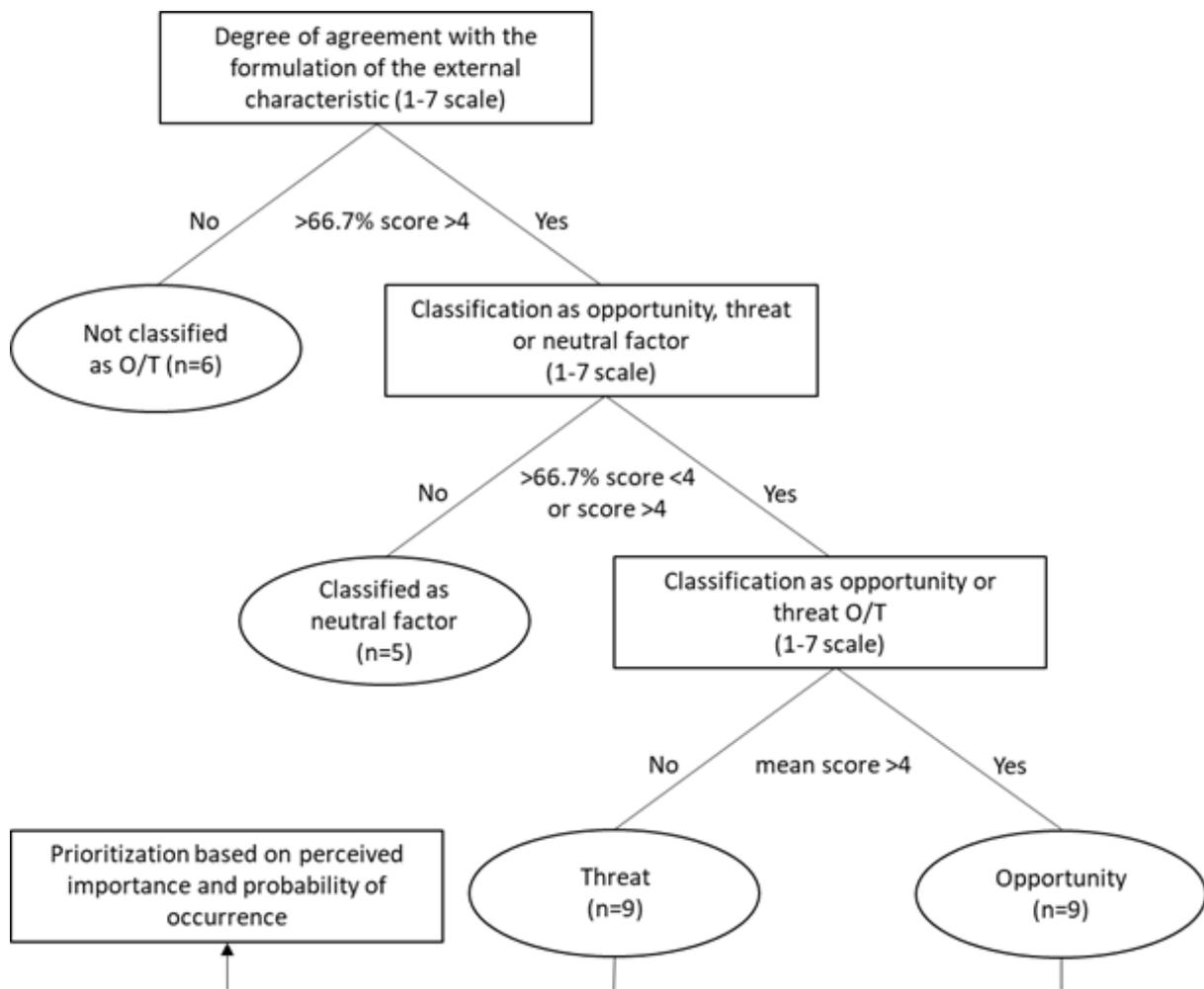
**Figure 6.** Plot of strengths and weaknesses of the EU beekeeping sector according to stakeholders' assessments of internal consciousness (left plot 1-7 scale; right plot enlarged, 3-7 scale for better visualization) and perceived (dis)advantage (1-7 scale); mean scores as reported in Table 6 (n=22-28)

## B. Scoring survey analysis of external characteristics

The analysis of the scoring survey data for the 29 identified external characteristics has been performed in four steps using the classification tree procedure presented in Figure 7.

First, the degree of agreement or disagreement among stakeholders about the presented statements (of SWOT-elements) has been assessed. Only elements with a substantial degree of agreement (i.e., more than two thirds of the stakeholders agree, thus provided a score 5-7 on the 7-point scale) are taken to the second step.

Second, stakeholders' evaluations of the agreed-upon elements as neutral factors (step 2), threats or opportunities (step 3) have been assessed. An element has been classified as a threat or an opportunity if more than two thirds of the stakeholders scored the element as such. Only those elements are taken to the fourth step, which is prioritization.



**Figure 7.** Classification tree for the 29 identified external characteristics based on degree of agreement with its formulation and score as threat or opportunity, note: 'n' value (in brackets) refers to the number of classified characteristics.

Table 7 provides an overview of the degree of agreement that was reached among participating stakeholders concerning the external characteristics of the beekeeping sector in the EU. For 23 out of the 29 identified external characteristics of the beekeeping sector in the EU, agreement was reached by more than two thirds of the participants. These 23 statements

received a mean agreement score of 5 or more on the 7-point scale and will be further taken into account for being classified as opportunity or threat and for being prioritized.

The other six statements received lower agreement scores, either because of a substantial share of stakeholders who disagreed or provided neutral scores, or because they received a high share of aggregated disagreement and neutral scores. The 23 agreed-upon elements that emerged from the survey generally had a high frequency of occurrence in the interviews, which shows a degree of congruence between interview and survey data. However, two of the 23 agreed-upon elements had a very low frequency of occurrence in the interviews (i.e. were only mentioned by 1 stakeholder):

- 1) Element 07: *There are initiatives towards the development of health plans for honeybees that will benefit beekeepers in keeping their colonies healthy*, was only mentioned by 1 stakeholder during interviews. Two stakeholders commented on this element in the survey, one emphasising that these health plans are only accepted if they are compensated by subsidies, and the other was confused with the term “health plans.” The fact that this concept has not fully matured in Europe might explain why it was not mentioned by more stakeholders during interviews.
- 2) Element 08: *There is a growing awareness among the broader public about the adverse impacts of climate change, the need to better preserve natural resources, lower environmental contaminants and improve biodiversity*, was only mentioned by 1 stakeholder during interviews. Two stakeholders commented on this element in the survey, one emphasising the need for the public to better understand the difference between biodiversity and bee protection, and the other emphasising the importance of public awareness. Perhaps more stakeholders did not mention the lack of biodiversity awareness during interviews, because many of them did not explicitly make the link between biodiversity and bee protection.

The six statements that received lower agreement scores generally had a low frequency of occurrence in the interviews, which shows a degree of congruence between interview and survey data. However, one of these six elements had a very high frequency of occurrence in the interviews (i.e. were mentioned by ten stakeholders or more):

- 1) Element 16: *As compared to other agricultural activities, the EU beekeeping sector receives little financial support and dedicated extension services*, was mentioned by 16 stakeholders during interviews. Two stakeholders commented on this element in the survey: one in disagreement, saying that there is indeed support for beekeepers, and the other saying that the amount of support varies greatly between member states. This difference in support between member states could explain why it was not fully agreed upon by survey respondents.

Table 8 provides an overview of the classification of the 23 agreed-upon external characteristics as opportunity, threat or neutral factor. Nine external characteristics were classified by at least two thirds of the participating stakeholders as opportunities; also nine as threats; and five as neutral factors. Opportunities received a mean score of 5.75 or higher on the 7-point scales, whereas threats received a mean score of 3.00 or lower. These numbers indicate a good degree of agreement with respect to the classification of these items. The data herewith suggest to proceed with analysis of the identified opportunities 01, 04, 06, 07, 08, 09, 10, 17 and 28 and threats 02, 03, 12, 13, 14, 15, 22, 25 and 26.

Opportunities and threats have been prioritized based on stakeholders’ assessments in terms of perceived importance (i.e. how important the external factor might be for the EU beekeeping

sector) and perceived probability of occurrence (i.e. to what extent the stakeholders believe this external characteristic may become even more of a reality in the near future than it is already now). Mean scores have been reported in Table 9 and plotted in Figure 8 on both dimensions to visualize and facilitate interpretation of these elements.

As seen in Figure 8, all elements are positioned in the upper right quadrant, which means they are all important and believed to become an even stronger reality in the future as compared to now. This underscores the high relevance of the identified opportunities and threats. The positioning of all elements close to each other means that these external characteristics are all perceived as nearly equally relevant and to be taken equally seriously into account for the future development of the EU beekeeping sector.

The right part of Figure 8 is an enlarged excerpt that shows the differences in positioning between the elements, though they are small in absolute numbers. Generally, threats rank higher (they are all positioned more upper right) compared to opportunities. This is indicative of a somewhat pessimistic view with threats being perceived as more important and more likely to occur than opportunities.

Yet, differences in the means scores between different items are small in absolute numbers. Whereas differences in mean scores between threats, as well as differences between opportunities, are not statistically significant (all  $p > 0.05$  for pairwise comparisons, the difference between T22 and O28 (as the two extremes) are significant ( $p < 0.001$  for probability of occurrence and  $p = 0.008$  for perceived importance).

As seen in Figure 8, the main threat relates to the emergence of new pests and predators that may affect honey bees. Emerging pests and predators add to the current beekeeping environment in which varroa and Asian hornets have already occupied their space. A key message is to strengthen monitoring and to develop contingency plans to cope with emerging threats.

Threats can generally be classified as threats resulting from climate change (02 and 03), from international trade and trade relations (12, 13, 25 and 26), from newly emerging risks in terms of contaminants, pests or predators (15 and 22), and from the dominant agricultural model (14). The threat related to newly emerging risks partly relates to international trade since it is believed that new pests and predators (will) come with increasing international exchange of goods. Further, threats resulting from climate change interact with the threat from the dominant agricultural model since both sets of external factors exert an impact on the natural habitat of honeybees. With respect to each of these threats, key messages relate to monitoring, coping and acting upon them by making use of the main identified strengths. In case the presence of specific weaknesses prevents coping with specific threats, the strategic consequence might become one of 'crisis'. Whenever feasible, eliminating threats is recommended.

As seen in Figure 8, the most important opportunities for the EU beekeeping sector relate to advancements in risk assessment and analysis technologies for detecting adulteration of apiary products (O10) and increasing financial support for scientific research on honeybees (O17). The EU beekeeping is recommended to embrace these opportunities by using its strengths, and to overcome eventual weaknesses that might prevent benefiting from these opportunities.

Compared to the other identified opportunities, technological developments, including the development of digital beekeeping tools with the potential to improve hive management (O9), is perceived as somewhat less important and somewhat less probable to really break through (though differences in mean scores are not statistically significant). This suggests that further efforts are still needed to convince the EU beekeeping sector of the potential of this technological revolution. Alternatively, it may also suggest that the technology is not yet

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perceived to be ready, or that the 'market' in terms of the current beekeeper population is not yet ready to adopt it.

Five out of the nine identified opportunities relate to science and technology factors with a potential impact on the EU beekeeping sector: advancements in risk assessment and analysis technologies, digitization, financial support for scientific research, and honeybee breeding and genetic research with the potential for developing resilience against diseases, and initiatives towards the development of health plans for honeybees that may benefit beekeepers in keeping their colonies healthy. Science and technology developments herewith emerge as major factors for the EU beekeeping sector to capitalize on. Policies that foster the adoption of scientific insight and new technologies in beekeeping management and practices are therefore recommended.

Additionally, two opportunities are concerned with public awareness, i.e. social factors; first, growing awareness about issues such as biodiversity, pesticides and the environment in which honeybees play an important role, and second, growing awareness about the adverse impacts of climate change, the need to better preserve natural resources, lower environmental contaminants and improve biodiversity. Close interaction with the broader public on these issues and the role of honeybees in this development are recommended.

An economic opportunity pertains to the fact that consumers are increasingly interested in and willing to pay for healthy, sustainable, natural and locally produced food, which may result in consumer willingness to pay good prices for local honey. Initiatives to support beekeepers in taking advantage of this opportunity are welcomed.

A final opportunity stems from cases or situations where beekeepers and farmers have common interests and are open to collaborate and join forces. The statement referred to agreeing on the timing of pesticide applications as a concrete example that was mentioned during the stakeholder interviews. Efforts to foster interaction between beekeepers' and farmers' associations and actively seek such collaboration is recommendation. Support to individual beekeepers and farmers (e.g. through extension services) in reaching and setting up such mutual agreements is recommended.

**Table 7.** Stakeholders' (dis)agreement with the 29 identified external characteristics of the beekeeping sector in the EU (n=28)

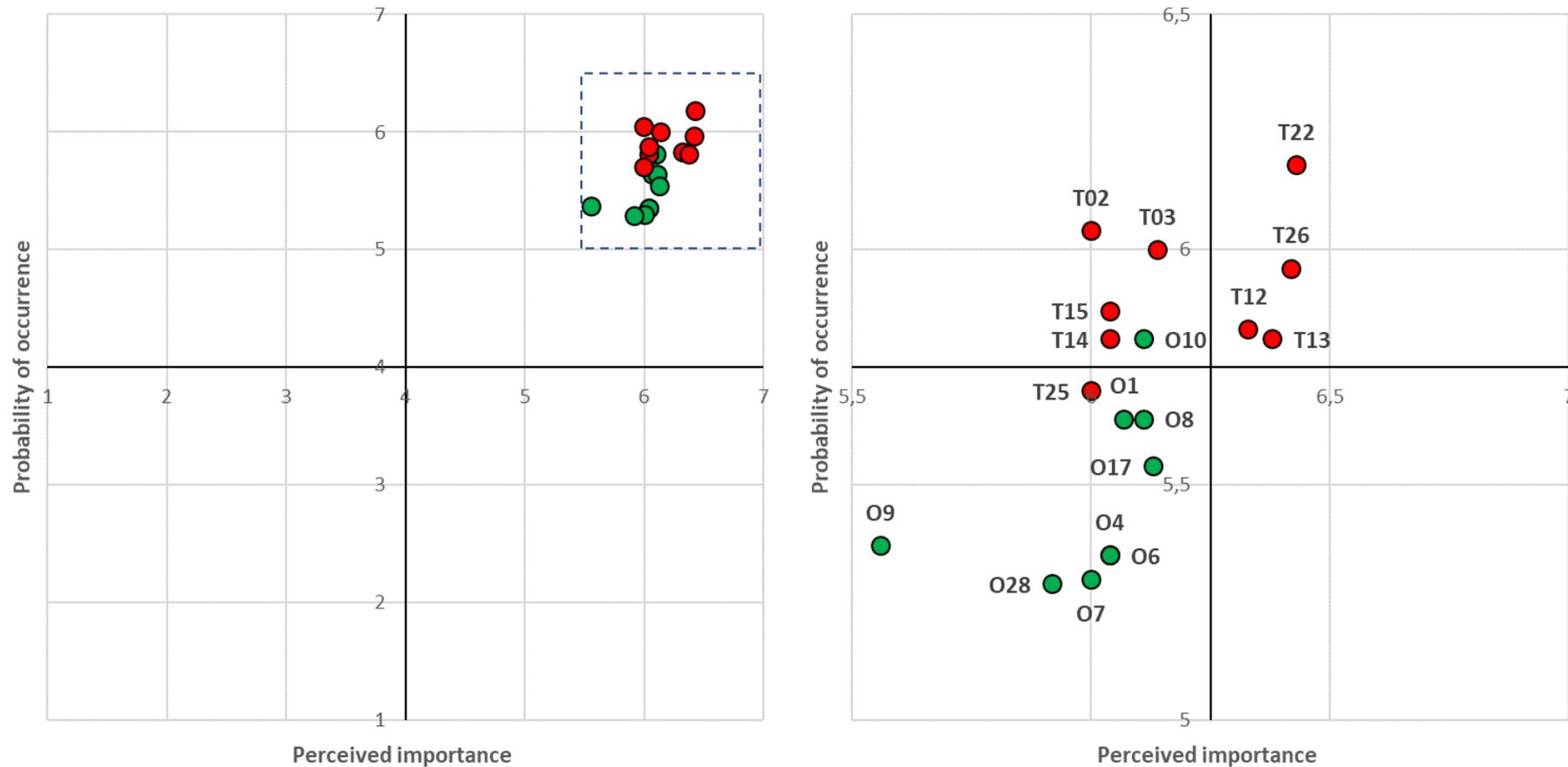
External characteristic	% disagree (scores 1-3)	% neutral (score 4)	% agree (scores 5-7)	Mean	S.D.
01 Broader public aware about biodiversity, pesticides and the environment	0.0	0.0	100.0	5.93	0.66
02 Climate change cause geographical shifts in beekeeping and honey production	3.6	7.1	89.3	6.00	1.02
03 Climate change brings more irregular, more unpredictable weather	0.0	3.6	96.4	6.39	0.74
04 Consumers are interested and willing to pay for local quality honey	7.1	3.6	89.3	5.39	1.13
05 Recognition of beekeeping as livestock production will bring more rules and regulation	14.3	14.3	71.4	5.21	1.55
06 Beekeepers and farmers have common interest and are open to collaborate	17.9	14.3	67.9	4.93	1.39
07 Initiatives towards health plans for bees may benefit beekeepers and their colonies	3.6	10.7	85.7	5.46	1.14
08 Growing public awareness about adverse impact of climate change	0.0	0.0	100.0	6.11	0.63
09 Technological developments, digital beekeeping tools with potential improved hive mgmt	0.0	10.7	89.3	5.75	0.93
10 Advancements in risk assessment and analysis technologies for detecting adulteration	3.6	3.6	92.8	5.96	0.96
11 Advancements in veterinary medicine of easy to use products for beekeepers	25.0	25.0	50.0	4.25	1.51
12 International trade in apiary products is very liberal and EU markets are open	0.0	7.1	92.9	5.96	0.88
13 Adulteration of honey and beeswax put the image of apiary products at risk	7.1	3.6	89.3	5.79	1.10
14 Dominant agricultural model leads to depletion of natural habitat and resources	7.1	10.7	82.1	5.79	1.48
15 Increasing number of environmental contaminants, pesticides being just one of them	17.9	7.1	75.0	5.36	1.57
16 Little financial support and extension services for beekeeping compared to agriculture	21.4	25.0	53.6	4.75	1.67
17 Increasing financial support for scientific research on honeybees	10.7	10.7	78.6	5.14	1.38
18 Beekeepers being blamed for poor management leading to colony losses	25.0	10.7	64.3	4.64	1.22
19 Digitalization and data sharing trigger hive movement and pressure on resources	14.3	39.3	46.4	4.54	1.58
20 Honeybees are used in the pesticide debate without focusing on other problems	7.1	7.1	85.7	5.64	1.42
21 Environmental degradation and loss of bee-friendly environment	10.7	10.7	78.6	5.64	1.45
22 Emergence of new bee pests linked to international trade	0.0	0.0	100.0	6.36	0.73
23 EU administration and services have become increasingly weak and ineffective	28.6	32.1	39.3	4.11	1.29
24 Alternatives to chemical pesticides are increasingly promoted	25.0	17.9	57.1	4.75	1.56
25 The EU is the largest net importer of honey	0.0	32.1	67.9	5.46	1.11
26 Honey labels are misleading; no clear indication of honey origin	7.1	3.6	89.3	6.21	1.29
27 Beekeepers explore alternative honeybee disease treatments	7.1	17.9	75.0	5.07	1.22
28 Honeybee breeding and genetic research entail potential for resilience against diseases	10.7	10.7	79.6	5.39	1.34
29 The COVID-19 pandemic is changing our future economy and way of living	3.6	10.7	85.7	5.61	1.17

**Table 8.** Stakeholders' evaluation of agreed-upon external characteristics of the beekeeping sector in the EU as threat, neutral factor or opportunity (n=23-28 since only evaluations of individual stakeholders who did not disagree (difference in scores < 3) with the statement, and who did not mark the statement as 'not relevant to me' are taken into account)

External characteristic	% threat (scores 1-3)	% neutral (score 4)	% opport. (scores 5-7)	Mean	S.D.	O/T
01 Broader public aware about biodiversity, pesticides and the environment	3.6	3.6	92.8	6.07	1.02	O
02 Climate change cause geographical shifts in beekeeping and honey production	69.3	23.1	3.6	2.85	1.32	T
03 Climate change brings more irregular, more unpredictable weather	92.9	3.6	3.6	1.96	1.00	T
04 Consumers are interested and willing to pay for local quality honey	0.0	3.8	96.2	6.00	0.75	O
05 Recognition of beekeeping as livest. production will bring more rules and regulation	17.4	21.7	60.9	5.04	1.80	N
06 Beekeepers and farmers have common interest and are open to collaborate	8.7	4.3	87.0	5.87	1.33	O
07 Initiatives towards health plans for bees may benefit beekeepers and their colonies	0.0	3.7	96.3	6.07	0.87	O
08 Growing public awareness about adverse impact of climate change	0.0	7.1	92.9	6.14	0.80	O
09 Technological developm., digit. beekeeping tools with potential improved hive mgmt	0.0	11.1	88.9	5.96	0.94	O
10 Advancements in risk assessm and analysis technologies for detecting adulteration	0.0	7.4	92.6	6.07	0.92	O
12 International trade in apiary products is very liberal and EU markets are open	96.3	3.7	0.0	2.00	0.92	T
13 Adulteration of honey and beeswax put the image of apiary products at risk	92.4	3.8	3.8	1.85	1.16	T
14 Dominant agricultural model leads to depletion of natural habitat and resources	76.9	15.4	7.7	2.27	1.54	T
15 Increasing number of environmental contaminants, pesticides being just one	91.3	0.0	8.7	2.30	1.40	T
17 Increasing financial support for scientific research on honeybees	4.2	4.2	91.6	6.25	1.03	O
20 Honeybees are used in the pesticide debate without focusing on other problems	53.8	23.1	23.1	3.46	1.63	N
21 Environmental degradation and loss of bee-friendly environment	64.0	8.0	28.0	3.12	2.13	N
22 Emergence of new bee pests linked to international trade	100.0	0.0	0.0	1.54	0.74	T
25 The EU is the largest net importer of honey	69.6	17.4	13.0	3.00	1.48	T
26 Honey labels are misleading; no clear indication of honey origin	80.8	7.7	11.5	2.04	1.82	T
27 Beekeepers explore alternative honeybee disease treatments	28.0	16.0	56.0	4.80	1.78	N
28 Honeybee breeding and genet. res. entail potential for resilience against diseases	12.5	4.2	83.3	5.75	1.29	O
29 The COVID-19 pandemic is changing our future economy and way of living	24.0	24.0	52.0	4.36	1.52	N

**Table 9.** Stakeholders' prioritization of opportunities and threats of the beekeeping sector in the EU, mean scores (S.D.) for perceived importance and probability of occurrence (n=23-28 since only evaluations of individual stakeholders who did not disagree (difference in scores < 3) with the statement, and who did not mark the statement as 'not relevant to me' are taken into account)

Internal characteristic	Perceived importance		Probability of occurrence	
	Mean	S.D.	Mean	S.D.
<b>OPPORTUNITIES</b>				
01 Broader public aware about biodiversity, pesticides and the environment	6.07	0.81	5.64	0.95
04 Consumers are interested and willing to pay for local quality honey	6.04	0.77	5.35	0.80
06 Beekeepers and farmers have common interest and are open to collaborate	6.04	0.83	5.35	1.30
07 Initiatives towards health plans for bees may benefit beekeepers and their colonies	6.00	0.92	5.30	0.78
08 Growing public awareness about adverse impact of climate change	6.11	0.88	5.64	0.87
09 Technological developm., digit. beekeeping tools with potential improved hive mgmt	5.56	0.93	5.37	1.04
10 Advancements in risk assessm and analysis technologies for detecting adulteration	6.11	0.93	5.81	1.15
17 Increasing financial support for scientific research on honeybees	6.13	0.80	5.54	0.66
28 Honeybee breeding and genet. res. entail potential for resilience against diseases	5.92	0.78	5.29	0.96
<b>THREATS</b>				
02 Climate change cause geographical shifts in beekeeping and honey production	6.00	0.80	6.04	0.72
03 Climate change brings more irregular, more unpredictable weather	6.14	1.00	6.00	1.12
12 International trade in apiary products is very liberal and EU markets are open	6.33	0.68	5.93	0.87
13 Adulteration of honey and beeswax put the image of apiary products at risk	6.38	0.64	5.81	0.85
14 Dominant agricultural model leads to depletion of natural habitat and resources	6.04	1.11	5.81	1.20
15 Increasing number of environmental contaminants, pesticides being just one	6.04	0.93	5.87	0.92
22 Emergence of new bee pests linked to international trade	6.43	0.57	6.18	0.67
25 The EU is the largest net importer of honey	6.00	1.00	5.70	1.02
26 Honey labels are misleading; no clear indication of honey origin	6.42	0.90	5.96	0.94



**Figure 8.** Plot of opportunities and threats for the EU beekeeping sector according to stakeholder’s assessments of perceived importance (left plot 1-7 scale; right plot 5.5-7 scale for better visualization) and probability of occurrence (left plot 1-7 scale; right plot enlarged 5.0-6.5 scale); mean scores as reported in Table 9. Note: O4 and O6 occupy exactly the same position

### 3.2.3 Key Attention Points (KAPs) for policy and strategy development

Matching key internal with key external factors allowed for the identification of key attention points (KAPs) for policy and strategy development for the EU beekeeping sector. The corresponding policy and strategic option where a key strength matches with a key opportunity is 'offensive'; where a key strength matches with a key threat 'defensive'; where a key weakness matches with a key opportunity 'clean-up'; and where a key weakness matches with a key threat 'crisis'.

#### *Matching strengths and opportunities: KAPs for 'offensive' policy and strategy development*

- Using its favourable image among the broader public (S1) and the acknowledged relevance of honeybees as providers of multiple ecosystem services for agriculture, food production, the environment and biodiversity (S3), EU beekeeping should strive to benefit from opportunities provided by the broader public awareness of biodiversity, pesticides and the environment (O1) and the growing public awareness of the adverse impacts of climate change (O8). The EU beekeeping is recommended to communicate about the role and importance of honeybees in agriculture, food production, preservation of the environment and biodiversity, eventually also in relation to climate change. Scientific underpinning stemming from high quality research on honeybees and beekeeping (which has been recognized as another strength of the EU beekeeping sector, i.e. S21) can help strengthening the messages used.
- The EU beekeeping sector should capitalize on the fact that locally produced honey has a favourable image as a high quality and premium product (S5) for which consumers show an interest and are willing to pay premium prices as a healthy, sustainable, natural and locally produced food (O4). This strength should be carefully protected, notably the image of local honey as a healthy, sustainable and natural product. Advancements in product quality assessment and analysis – another important external factor identified as an opportunity(O10) – can help in this respect, e.g. by providing quality control, certification and reassurance.
- The fact that honeybees provide multiple ecosystem services including pollination, which is crucial for agriculture and food production (S3), is an asset that should be used by the EU beekeeping sector when interacting and collaborating with farmers (O6). Efforts to make crops and landscape elements (e.g. trees, hedges) more beneficial for bees can be negotiated by capitalizing on the fact that bees are beneficial for crops.
- The fact that there is a lot of high-quality research being done on honeybees and beekeeping (S21), often involving the EU beekeeping sector, beekeeper's associations or individual beekeepers as stakeholders, allows the sector to take advantage of science-and-technology-related opportunities in the future, e.g. digitization, honeybee breeding and genetic research (O9, O10, O17 and O28).
- Access to high quality equipment and facilities (S22) is an important asset that may put the EU beekeeping sector in pole position to capitalize on opportunities offered by technological developments in terms of digital beekeeping tools, automated hive monitoring, and data sharing (O9).

#### *Matching strengths and threats: KAPs for 'defensive' policy and strategy development*

- The threat resulting from the dominant agricultural model of intensive food production, monocultures and lack of crop diversity that leads to the depletion of habitat and

resources for honeybees (T14) can be combated by the fact that bees provide multiple ecosystem services (S3).

- The favourable image of locally produced honey as a high quality, premium and valuable product (S5) is a key strength for coping with multiple threats in the EU beekeeping environment: open markets and cheap imports (T12), adulteration (T13), the emergence of new bee pests and predators (T22), honey imports (T25), origin-labelling of honey (T26). Efforts towards preserving, strengthening and underscoring this image are needed (e.g. increasing the use of quality labels or geographic indications).
- The fact that there is a lot of high-quality research being done on honeybees and beekeeping (S21), often involving the EU beekeeping sector, beekeeper's associations or individual beekeepers as stakeholders, may contribute to coping with the threat of emerging bee pests and predators (T22).

*Matching weaknesses and opportunities: KAPs for 'clean-up' policy and strategy development*

- The fact that data on beekeeping are merged or aggregated across many types of beekeepers in terms of size, management styles and objectives (W8), and the observation that beekeepers have their own strong views and are resistant to accepting regulation and controls, to interacting with veterinarians, to registering their hives, and to following rules imposed on them (W11), may prevent the EU beekeeping sector to benefit from the opportunity provided by technological developments, e.g. digitization, automated hive monitoring and data sharing (O9). For these technological development to break through and get adopted, actions to clean up or get rid of those weaknesses are needed (e.g. investing in training of the new generation of beekeepers).
- Beekeepers' own strong views and resistance to accepting regulation and controls, to interacting with veterinarians, to registering their hives, and to following rules imposed on them (W11), constitute a crucial weakness as they may prevent the EU beekeeping sector to benefit from multiple opportunities. It may prevent the adoption of health plans designed for honeybees to keep colonies healthy (O7), the adoption of technological developments (O9), or advancements in risk assessment and analysis technologies (O10). This weakness may also prevent the uptake of provided extension services and herewith constitutes a key attention point for remediation.
- The fact that the beekeeping sector is not unified and counts many associations that do not sufficiently collaborate with each other (W9) may prevent the EU beekeeping sector from benefitting from the opportunity to seek common interests, win-win situations and collaborate with farmers (O6). Dealing with this weakness is recommended in order to take advantage of the opportunity to collaborate with the agriculture sector.
- The fact that the availability of registered veterinary products to control varroa is poor and not equal across EU Member States (W20) may prevent the EU beekeeping sector from taking advantage of initiatives towards the development of health plans designed for honeybees to keep colonies healthy (O7). EU policy can play an important role in remedying this weakness.
- The observation that beekeepers may have low marketing skills and little expertise to develop or create positive images for apiary products (W24) prevents the EU beekeeping sector from benefitting from opportunities provided by the growing

consumer interest and willingness to pay for healthy, sustainable, natural and locally produced food (O4) and by the growing public awareness about issues such as biodiversity, pesticides and the environment in which honeybees play an important role (O1) and about climate change (O8). Efforts to make beekeepers more effective merchants for their apiary products and ambassadors for honeybees and beekeeping in relation to the natural environment are recommended.

- It should be noted that each of the five identified weaknesses emerges as relevant in combination with opportunities, i.e. each identified weakness can potentially prevent the EU beekeeping sector in benefitting from one or more opportunities, and therefore each deserves priority for remediation.

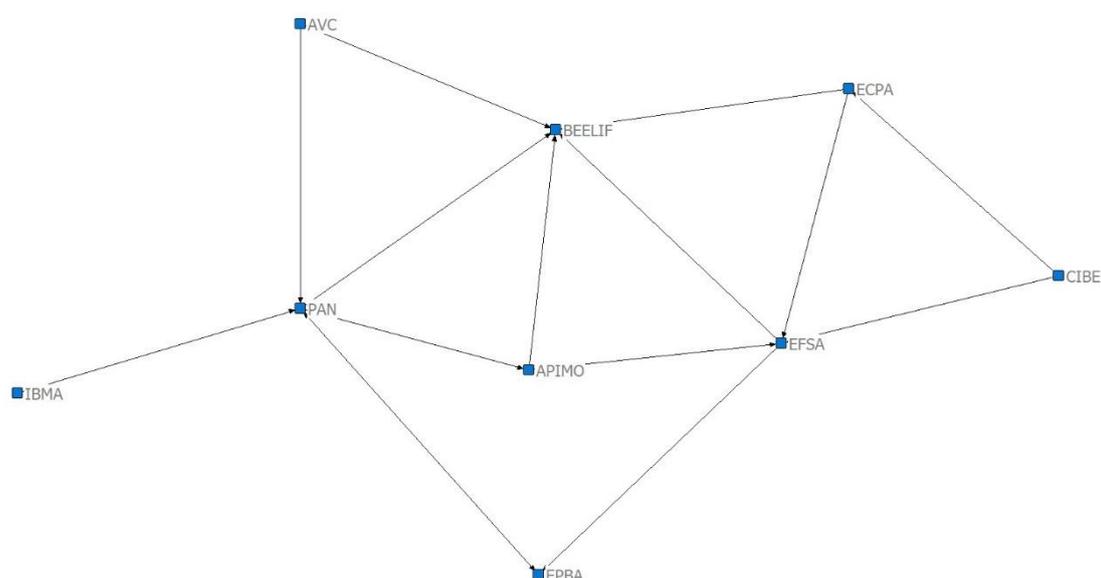
#### *Matching weaknesses and threats: KAPs for 'crisis' policy and strategy development*

- The fact that the beekeeping sector is not unified and counts many associations that do not sufficiently collaborate with each other (W9) may prevent the EU beekeeping sector from coping with multiple threats, e.g. from international trade and open markets (T12), adulteration of apiary products (T13), cheap honey imports (T25), and misleading honey labelling (T26). This weakness of the EU beekeeping sector may mean a weak and inconclusive position in the public debate and towards policy making.
- Beekeepers' own strong views and resistance to accepting regulation and controls, to interacting with veterinarians, to registering their hives, and to following rules imposed to them (W11) constitutes a crucial weakness as it may prevent the EU beekeeping sector from coping with threats related to the adulteration of apiary products (T13) and the emergence of new bee pests and predators (T22). Own strong views and reluctance to accept regulation and controls, or to register honeybee hives, may prevent the adoption of advice, recommendation, technologies and methods to cope with such emerging threats.
- Beekeepers' low marketing skills and limited expertise to develop or create positive images of apiary products (W24) prevents the EU beekeeping sector from coping with cheap imported honey (T25) and current policy with respect to origin-labelling of honey (T26).
- This analysis suggests that there are only a few key attention points that refer to a potential crisis situation. Notwithstanding this small number of crisis-susceptible KAPs, each of them individually deserves particular attention in order to prevent a real crisis situation.

### **3.3 Identification of actors and networks**

Actors and their organisations and area of expertise are clearly defined in section 5.1. Here, we report on our analysis of the social network data gained from interviewed respondents. The focus of this analysis has been to understand the connections and the nature of interactions between respondents and the organizations they represent. We started by analysing relationships within the EU Bee Partnership to assess the connectedness of organizations within this existing network. We then analysed relationships between all interviewed respondents, based on their areas of expertise, to gain an understanding of knowledge exchange networks. Finally, we have mapped all organizations represented by respondents to determine the relationships between these organizations. Note that the social network analysis represented here is not a complete network analysis on the EU beekeeping sector, but rather it represents those which we sampled in the present study.

### 3.3.1 Connections within the EU Bee Partnership



Organization name	Abbreviation
Association of Veterinary Consultants	AVC
European Crop Protection Association	ECPCPA
Pesticide Action Network	PAN
BeeLife	BEELIF
European Professional Beekeepers Association	EPBA
International Confederation of European Beet Growers	CIBE
Apimondia	APIMO
International Biocontrol Manufacturers Association	IBMA
European Food Safety Authority	EFSA

**Figure 9:** Knowledge exchange connections between organizations represented in the EU Bee Partnership. The arrows indicate the direction of the connection e.g. four organizations stated they had a connection with PAN, whereas PAN stated they had a paired connection with two, EPBA and APIMO.

The EU Bee Partnership is a newly formed network which was formally established in 2018. Our analysis is based on existing relationships for exchanging knowledge related to bee health, rather than interactions as part of EU Bee Partnership activities. Nevertheless, our analysis indicates that of the organizations who are members of the EU Bee Partnership, Pesticide Action Network (PAN) and BeeLife (BEELIF) have the most connections, which indicates that they may be exposed to more information and more diverse information concerning bee health. The International Biocontrol Manufacturers Association has the least amount of connections, suggesting that their position within the EU beekeeping sector regarding knowledge exchange about bee health is less central.

The Association of Veterinary Consultants, the European Professional Beekeepers Association and the International Confederation of European Beet Growers all have two connections, suggesting that they have a moderate role in knowledge exchange about bee health. The network mapping of these organizations is only partial but it does suggest that both PAN and BeeLife are active in developing connections and exchanging knowledge with various organizations within the EU beekeeping sector. This is not unsurprising given their aims and positions advocating greater consideration of bee health issues.



It would seem that a number of our interviewees are connected by knowledge exchanges related to the active monitoring and prevention of bee diseases, with a cluster of veterinarian and monitoring organizations, particularly in France (GTVAP, OMAA and SNGTV). In addition, the Food and Agriculture Organization (FAO) and APIMONIDA (APIMO) are also connected within this core subgroup. Outside of this core grouping of organizations there are number of other organizations with circular links but with fewer ties, and these are highlighted as organizations with black nodes (squares). Organizations with red nodes have simple linear ties.

The overall landscape of organizations exchanging technical knowledge related to bee health would appear to be somewhat fragmented with numerous disparate organizations, connecting where there are shared interests. The core subgroup identified in this initial network analysis has highlighted some of the key organizations who can not only provide B-GOOD with expert knowledge but who are also likely to be key for disseminating project outputs and informing policy developments at the European level.

### **3.4 Comments/Limitations**

Feedback from respondents concerning face-to-face or video call interviews was generally quite positive. Many respondents said they enjoyed the conversation and that the questions were well-structured, observant and stimulated reflections. All respondents were receptive to the interview being recorded in accordance with the protection-of-personal-data and privacy provisions agreed with them as submitted to and approved by the ethics committee. The allotted time for interviews was two hours; however, for many respondents this was too much of a commitment and interview times had often to be shortened. There were some cases where sections were not covered as thoroughly as hoped, especially if respondents had a specific time constraint. In a few cases, respondents did not feel it necessary and/or were unwilling to provide their main contacts, which may have limited our ability to gather exhaustive actor networks. In some other cases, respondents indicated to be less knowledgeable or aware of specific domains or issues, which were then accordingly less deeply discussed.

We received some comments on the SWOT/SOR survey from respondents following completion, receiving feedback from six respondents in total. Most feedback centred around the fact that the survey was quite long and, because of this, one respondent indicated to have stopped completing the survey. Participants were not forced to complete the survey in one go but could interrupt their completion and resume later. One respondent reported some ambiguity of the interchangeable use of “statement,” and “element” within the survey. Some questions used the word “statement” in reference to the SWOT element: i.e. ‘To what extent do you agree or disagree with this statement?’, and some questions used the word “element” in reference to the SWOT element: i.e. ‘To what extent do you believe this element is an opportunity or a threat for the beekeeping sector in the EU?’ Although the usage of these words was mixed and linguistically justified in our opinion, we don't believe it impacted the consistency of the scoring by respondents and results from the SWOT/SOR.

## **4. Conclusions**

By using semi-structured interviews allied with SWOT/SOR analysis and a survey approach, we were able to gather an array of relevant information relating to stakeholder views, their connections and the different factors influencing the EU beekeeping sector. This allowed us to understand better the complexities of the business environment.

- 
- Several institutions play important roles in the sector, notably BeeLife, the Pesticide Action Network and the European Food Safety Authority, are deeply connected and have a high degree of centrality.
  - Beekeeper associations and federations have an important role in the development of the sector but, according to the insights provided by stakeholders, appear to be not well coordinated amongst what is a very heterogeneous sector with organizations representing different beekeeping interest (e.g. hobbyist and professional beekeepers). This may prevent the EU beekeeping sector from seeking common interests and collaborating with farmers, as well as prevent collaboration against adulteration of honey products, misleading honey labeling, and international trade. A platform that not only connects scientists and other stakeholders to beekeepers is as important as a platform that coordinates associations in a manner that they work towards common goals.
  - According to our respondents, many beekeepers have their own strong views and resistance to accepting regulation and controls, to interacting with veterinarians, to registering their hives, and to following rules imposed on them. This may prevent the adoption of health plans designed to benefit honeybees and to keep colonies healthy, the adoption of technological developments, uptake of provided extension services, or advancements in risk assessment and analysis technologies.
  - There is an increasing awareness about climate change as well as issues such as biodiversity, pesticides and environmental degradation and their adverse impact on honeybees. Beekeeping can capitalise on a good image in society in general but seems to be blamed to some extent for colony losses due to badly adjusted beekeeping practices. This underscores the need for quality education and training in the beekeeping sector.
  - Particular challenges arise from cheap honey imports, misleading honey labelling, notably with respect to origin, and adulteration of apiary products. The fact that the beekeeping sector is not unified and counts many associations that do not sufficiently collaborate with each other may prevent the EU beekeeping sector from coping with these threats. Advancements in risk assessment and quality analysis may contribute to dealing with these challenges, which may also require economic, political and legislative changes.
  - Consumers may prefer local production and in some cases organic and more natural products, which may benefit local beekeepers. Consumers seem willing to pay to have a higher quality product. However, many beekeepers may have low marketing skills and little expertise to develop or create positive images for apiary products.
  - Climate change is seen as having an impact on biodiversity, foraging potential and blooming periods, requiring adaptation in beekeeping practices. But as many beekeeping practices are based on tradition, and as beekeepers may be resistant to change, this is not always an easy process. We suggest that scientific discourse be adapted to the beekeeper, and that education platforms be aware of the environmental changes from local to global levels.

#### **4.1 Next steps and connections with other WPs**

This report is the result of close cooperation between WP4 and WP8, who will continue collaboration by developing participatory workshops for the co-creation of results and tackling

of real problems and opportunities facing beekeeping in the EU. The identified key attention points for policy and strategy development will be further discussed with actors and beekeepers during future participatory workshops. Specifically, the next step from KAPs to policies, objectives, actions and activities will be discussed in those settings.

Next steps within WP4, Task 4.1, include data collection using a quantitative survey with 200 stakeholders, with the objective of gathering more data on their views and contributing to further development and refinement of our analysis.

Besides the identification and assessment of the SWOT-components of EU beekeeping and its translation into key attention points for strategy and business model development, Task 4.1 will provide insights to WP1 about stakeholders' views on the concept of colony health and the diversity of stressors in beekeeping and also on the diversity of currently applied and potentially future successful business models and their key descriptors.

Our focus is on socio-economic data and the research we have undertaken is closely connected with WP5 data collection efforts, related to ecological-environmental factors and conditions shaping economic efficiency and management decision-making. Our data will be relevant for WP5 to establish the relationship between environmental, biological and management drivers and bee health status. The latter is also a key issue of relevance to WP1.

In the near future, the data relating to stakeholder opinions on bee health will be analysed and shared with both WP1 and WP5 to contribute to a multidisciplinary enriching of the research and further development of the project.

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## 6. Appendices

### 6.1 Appendix 1. Topic guide for actor/stakeholder interviews



Task 4.1.

#### TOPIC GUIDE IN DEPTH INTERVIEWS WITH 40 STAKEHOLDERS

<b>Introduction</b>
<i>Introducing the researchers and explaining the purpose of the interview</i>
<i>Informed consent procedure</i>
<p>- Introduction:</p> <p>Explain the purpose of the interview: investigate the views and opinions of stakeholders about 1) beekeeping in the EU, 2) connections and relationships with other stakeholders, 3) what characterises a healthy bee colony and 4) current and future honey beekeeping models in the EU.</p> <p>Confidentiality is guaranteed: no names of persons, organisations or companies in the report. The conversation is audio-recorded and will be transcribed to facilitate reporting.</p> <p>Reporting: the executive summary of a report based the interviews will be distributed among the participants.</p>

**Interviewer notes:** Prior to conducting this interview the participant should be sent an email with the study information and consent form and read the following.

**Introduction script:**

This interview will take approximately 2 hours to complete. In order to insure that all information will remain confidential, I will not record your name. I will only use a code for this interview when noting your answers.

Your name or any details that might identify you will not be published and transcripts of this call will be securely stored electronically. All personal information you provide will be kept confidential, anonymous and treated according to the EU regulations on personal data ownership.

Just to remind you, your participation is voluntary and you may refuse to participate at any time and do not need to give me a reason. You will not be paid for participating in this study and there will be no cost or risk for you to participate. If you would like a copy of the

summary report for this study please let me know at the end of the interview and I will add your name to a list that I will maintain separately. If you have questions later about this study, please contact me at <insert interviewer phone number>.

Please can you confirm you have received and read the study information sheet and consent form. Consent form sent and received.

Yes

I would like to record this interview. Do you agree to continue and participate in this study and that this interview is recorded?

Yes  No (if no terminate interview)

Do you have any questions about the project, or this conversation before we begin?

*Participant consent needs to be obtained before conducting the interview. Two informed consent forms must be completed. The original is kept by the investigator for a period of 25 years, the copy is given to the participant.*

Interviewee: ..... (name and institution)

Date: .....

**Participant code:** .....

*Interviewer note:* Respondent names should not be recorded here. Please use the spreadsheet provided to record respondent names against the codes provided e.g. T4.1\_1a\_x (predetermined numeric code)

**Stakeholder biographical information**

*Interviewer note: Please insert as much biographical information as possible prior to the interview and confirm with interviewee, as necessary.*

*Suggested script: do you mind if I ask you a few questions about yourself?*

1. Gender

2. Year of birth

3. Nationality

4. Marital status

Single     Married     Divorced     Widowed  ...

5. Do you have children?

6. Place of residence?

7. What is your profession?

8. What is your specialisation within the EU beekeeping sector?

9. How long have you been in this position?

10. What is your organizations interest in the beekeeping sector? What aspects are particularly important to your organization?

## Topic 1: SWOT facing the EU honey beekeeping sector

### *Getting to know stakeholder's views on the EU honey beekeeping sector*

*Suggested script: A first aim of our study is to get a view on the characteristics of the beekeeping sector in the European Union and those of the environment in which this sector operates. This task is also known as SWOT-analysis, which means that we will try to identify strengths, weaknesses, opportunities and threats.*

#### **1 What is an important internal characteristic of the EU honey beekeeping sector?**

*Interviewer note: May need to clarify internal characteristics.*

*Suggestion: By internal factors I mean are factors that the sector itself can change, improve. They constitute strengths, weaknesses, or neutral factors.*

Can you tell me what you think are the main internal characteristics that are of interest / concern for your organization?

*Prompt if interviewee gets stuck: examples: organisation of the sector, quality and experience of beekeepers, quality of extension services, unified vs. dispersed, beekeeping facilities, image and reputation of beekeeping, marketing skills, research and development, profitability...*

**Is this a strength, weakness or neutrality?**

**Why do you believe so ?**

**Can this be generalised across the EU, or is it specific for certain regions, countries, types of beekeepers, ...?**

- What is another important characteristic of the EU honey beekeeping sector?

*Repeat previous ...*

- What is another important characteristic of the EU honey beekeeping sector?

*Repeat previous ...*

*Continue until no additional internal characteristics are mentioned.*

#### **2 What is an external factor that influences the EU honey beekeeping sector?**

*Interviewer note: May need to clarify external characteristics.*

*Suggestion: By external factors I mean facts, trends or evolutions in the business environment that the beekeeping sector experiences, undergoes, notices, ..., and that may require a response, reaction, ... They constitute opportunities, threats or neutral factors.*

Can you tell me what you think are the main external characteristics that are of interest / concern for your organization?

*Prompt if interviewee gets stuck: examples: e.g. economic forces, political forces, social forces, structural forces, natural environment, technological and scientific environment, trends and evolutions among suppliers and customers to/from the beekeeping sector...*

**Is this a opportunity, threat or neutrality?**

**Why do you believe so ?**

**Can this be generalised across the EU, or is it specific for certain regions, countries, types of beekeepers, ...?**

- What is another external factor that influences the EU honey beekeeping sector?

*Repeat previous ...*

- What is another external factor that influences the EU honey beekeeping sector?

*Repeat previous ...*

*Continue until no additional internal characteristics are mentioned.*

## Topic 2: Transfer of knowledge and information about honey bee health

*Gaining insight into the knowledge networks that exist between stakeholders, especially concerning honey bee health.*

*Suggested script: I would now like to talk to you about your connections concerning bee health.*

**1** In the past year, did you turn to anyone for **technical advice** about specific problems relating to honey bee health (such as varroa, pesticides, inadequate nutrition, pathogens, etc.)?

*Interviewer note: technical advice/knowledge here is defined as technical support to solve problems.*

**1a** If so, can you provide names for **all** those you have contacted, and the organization they work for? Probe to list all contacts they can think of

*Interviewer note: Record the order and all names given.*

**1b** For all of the people you just mentioned, can you indicate the four people you have had the most contact with?

We intend to contact these people for an interview. Could you provide their contact details?

*Interviewer note: Record the order, names, and contact details of the three most contacted people and ask following questions for each of these named people. If they can only name one or two, record this.*

Name 1: ..... Email: .....

Name 2: ..... Email: .....

Name 3: ..... Email: .....

Name 4: ..... Email: .....

**1c** How often have you been in contact with (*name*) in the last year? 1= very occasionally (once in last year); 2 = occasionally (every 6 months); 3 = frequent (every month); 4 = very frequent (weekly)

**1d** How did you contact them? 1 = meetings in person; 2 = conference in person; 3 = by email; 4 = by telephone; 5 = other (please note)

**1e** What technical knowledge did you discuss / exchange?

**1f** Concerning technical knowledge about honey bee health, did you give information, receive information, or both?

**1g** For each of these 4 names how influential would you rate them?  
1 = not influential; 2 = somewhat influential; 3 = very influential

**1h** How much do you trust the technical advice you give or receive? 1 = do not trust at all; 2 = somewhat trust; 3 = fully trust

Repeat three times for names 1, 2, 3 and 4

**Topic 3: Healthy bee colony**

*Gaining insight into opinions on what characterises a healthy honey bee colony, a dead honey bee colony, and honey bee health in the future.*

*Suggested script: I would now like to talk to you honey bee health.*

**1** How would you define a healthy honey bee colony?

**2** In your opinion, what are the most relevant characteristics of a healthy honey bee colony? Why?

**3** Why do you think honey bee colonies die? In your opinion, what are the most relevant factors that can make a bee colony sick? Why?

**4** How do you envision honey bee health in the future? Why?

**5** Who do you think should be responsible for honey bee health? Is it mostly the responsibility of individual member states or the European Union? Why?

**6** In your opinion, what are feasible steps to improve honey bee health in the future?

**Topic 4: Current and future beekeeping practices**

*Gaining views on current beekeeping practices and potential for beekeeping practice innovation and sustainability. Mapping of the complexity of the business environment and identification of the key attention points for strategy development.*

*Suggested script: I would now like to talk to you about honey bee keeping practices in Europe.*

**1** Why do you think people keep honey bees?

**2** In your opinion, what are the most common honey beekeeping practice types in Europe?

*Interviewer note: honey beekeeping practices can be range from fully professional to hobbyist, from small to large scale, from rural to urban environments, and from businesses with predominantly economic to integrated social and ecological objectives.*

*Examples of honey beekeeping practices:*

*Sheer enjoyment of keeping bees (amateur beekeepers)*

*Honey production or pollination services (farmer/beekeeper)*

*Earning a living (professional beekeepers)*

*Education and extension purposes*

**3** What are the services honey bees provide? Why are these services of interest to your organization?

**4** In Europe, how do honey bees fit into the supply chain/institutional environment? E.g. are bees part of the livestock sector, agricultural sector, or other sector? How is the institutional environment structured? Where are bees placed in the value chain?

**5** Do you think that the honey beekeeping sector in Europe has changed in the past 10 years? How?

**6** How have policies and regulation changes influenced the honey beekeeping sector? In what ways?

**7** What kind of policies should be developed in order to protect honey bee health in Europe? Do you think this responds also to regional challenges in the beekeeping sector? Why?

**8** Do you think climate change has had an impact on honey beekeeping? How so?

**9** What impact will climate change have in the future?

**10** How has the economy surrounding honey beekeeping changed?

**11** How do you think the economy surrounding beekeeping will change in the future?

## 6.2 Appendix 2: Ethics approval letter

 **FACULTEIT PSYCHOLOGIE EN  
PEDAGOGISCHE WETENSCHAPPEN**

[ETHISCHE COMMISSIE](#)

Wim Verbeke

Griet Roets  
Secretary of the Ethical Commission

E [griet.roets@ugent.be](mailto:griet.roets@ugent.be)  
T 09 264 62 93

DATUM  
17 januari 2020

ONS KENMERK  
2019/122/Wim Verbeke

The Ethical Commission gives approval for the following research project:

**B-GOOD stakeholder interviews on healthy and sustainable beekeeping in the EU (WP4 – Task 4.1 – Study 1)**

Researcher: Wim Verbeke



T. Marchant  
(Voorzitter)



G. Roets  
(Secretaris)

  
**UNIVERSITEIT  
GENT**

### 6.3 Appendix 3. Organisation abbreviations

Organisation name	Acronym
ANSES France	ANSES
Aarhus University	AARHU
Agence Nationale de la Recherche (ANR)	ANR
Agence fédérale pour la sécurité de la chaîne alimentaire	AFSCA
Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail	ANSES
Istituto Zooprofilattico Sperimentale del Lazio e della Toscana M. Aleandri	IZSLT
Apimondia	APIMO
Apis Flora Industrial e Comercial Ltda	APISF
Arista Bee Research	ARISTA
Association of Veterinary Consultants	AVC
Austrian Agency for Health and Food Safety	AGES
Austrian Beekeepers Association	ABA
B-GOOD	B-GOOD
BEEVET	BEEVET
Bayer Agriscience	BAYER
Bee Health 2020 LATAM	BHLAT
BeeLife	BEElif
BeeOdiversity	BEEODI
Bejo Seed Company	BEJO
Benaki Phytopathological Institute	BENAKI
Bundesministerium für Gesundheit	BMG
Carreck Consultancy Ltd	CARREC
Centre apicole de recherche et d'information (CARI)	CARI
Clinique Vétérinaire des Mazets	CVM
Coloss	COLOSS
Copa Cogeca	COPACO
Corteva Agriscience	CORTEV
Council for Agricultural Research and Agricultural Economy Analysis (CREA)	CREA
Danish Beekeepers Association	DABA
Direction départementale de la protection des populations (DDPP)	DDPP
Directorate-General for Agriculture and Rural Development	DG-AG
Directorate-General for Environment	DG-ENVI
The Directorate-General for Health and Food Safety	DG-SANT
Dutch Beekeepers Association	DUBA
Dutch Ministry of Agriculture	MLNV
EU Reference Laboratory	EUREF
Eurofins Scientific	EUROFI
European Agricultural Machinery Industry Association	CEMA
European Professional Beekeepers Association	EPBA
European Commission	EC
European Committee for Standardization (CEN)	CEN
European Cooperation in Science and Technology	COST
European Crop Protection Association	ECPA
European Food Safety Authority	EFSA
FAO	FAO
The French National Center for Scientific Research (CNRS)	CNRS
GAEC Freslon Beekeepers	GAEC
GIE Bretagne	GIEB
GTV Apiculture	GTVAP
German Institute for Standardization (DIN)	DIN
Institut Technique et Scientifique de l'Apiculture et de la Pollinisation (ITSAP)	ITSAP
Institute of Biology, Karl-Franzens-Universität Graz	UNIGRAZ
Institutul de Cercetare Dezvoltare pentru Apicultura	ICDA
International Biocontrol Manufacturers Association	IBMA
International Confederation of European Beet Growers	CIBE
International Honey Commission	IHC
International Organization for Standardization (ISO)	ISO
Julius Kühn-Institut Germany	JKI
Landesbetrieb Landwirtschaft Hessen Germany	LLH
Observatoire des Mortalités et des Affaiblissements de l'Abeille mellifère (OMAA)	OMAA
Oniris Veterinary School	ONIRIS
Pesticide Action Network	PAN
Portugal National Beekeeping Federation (FNAP)	FNAP
PoshBee	POSHBEE
Precision Med Expo & Summit	PRESME
Ruakura Research Centre New Zealand	RUAKU
Réseau biodiversité pour les abeilles	RBA
Slovenian Beekeepers' Association	SBA
Société Nationale des Groupements Techniques Vétérinaires (SNGTV)	SNGTV
Swedish Board of Agriculture	SBA
UK National Farmers Union	NFU

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Union nationale de l'apiculture française	UNAF
Unione Nazionale Associazione Apicoltori Italiani	UNAAPI
University of California San Diego	UC-SAND
Programme sanitaire d'élevage (PSE)	PSE
Wageningen Environmental Research	WER
Wageningen Plant Research	WPR
Wageningen University and Research	WUR
l'Institut national de recherche pour l'agriculture, l'alimentation et l'environnement	INRAE

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## 6.4 Appendix 4. List of identified preliminary SWOT – elements

### Section A: Identified internal factors that can be Strengths or Weaknesses for the EU beekeeping sector:

1. **BKG IMAGE:** Beekeeping has a favourable image among the broader public.
2. **BKR NR:** There are numerous beekeepers all over the EU. Their number and geographical spread give them political weight.
3. **BEES MULTISERV:** Honeybees provide multiple ecosystem services. They are relevant for agriculture and food production as well as for the environment and biodiversity.
4. **BKG UNIQUE BRU:** The beekeeping sector is unique in Brussels as an economic interest group. It is not classified as an NGO or a special interest group, nor is it classified as a formal agricultural sector.
5. **HONEY IMAGE:** Locally produced honey has a good image, is high quality and is viewed as a premium product and the beekeepers can therefore command good prices for it.
6. **BKG PRACT VARY:** Beekeeping practices vary greatly. There are considerable differences in beekeeping styles between individual beekeepers, in subspecies, materials and equipment used, and throughout the EU.
7. **BKG COMM DIV:** The beekeeping community in the EU is very diverse, ranging from hobbyists to professionals, and with a wide range of reasons and motivations for keeping honeybees.
8. **BKG DATA AGGR:** Most data on beekeeping are merged or aggregated across many types of beekeepers in terms of size, management styles and objectives. This creates bias and makes it difficult to compare approaches.
9. **BKG MANY ASS:** The beekeeping sector is not unified and has many associations/clubs that do not sufficiently collaborate with each other.
10. **BKR FREEDOM:** Beekeepers in the EU, especially hobbyists, have a lot of freedom in their management practices. They are free to decide which management practices best fit their activities.
11. **BKR VIEWS:** Beekeepers have their own strong views and are resistant to accepting regulation and controls, to interacting with veterinarians, to registering their hives, to following rules imposed on them.
12. **BKR SEDENTARY:** Most beekeepers in the EU are sedentary and do not move their hives, which means that their hives may be continuously exposed to the same pesticides and environmental contaminants over time.
13. **BKR LACK EDU:** Beekeepers in the EU lack education, training and knowledge to properly manage their hives.
14. **BKR SCI DIFF:** The interaction between beekeepers and scientists is difficult and complicated. They do not speak each other's language and there is a lack of trust.

15. **BKR AGEING:** Beekeepers in the EU are an ageing population group.
16. **YOUNG BKR VIEWS:** Younger generations of beekeepers are less production oriented and have more environmentally oriented views on beekeeping.
17. **BKR CLOSED MIND:** Beekeepers in the EU tend to be closed-minded and are not keen on collaborating with others or sharing experiences.
18. **BKG BUSY LS:** Beekeeping requires a lot of attention and proper management during specific periods, which may not match with contemporary and busy lifestyles.
19. **BKR DIGIT TECHN:** Most beekeepers in the EU lack knowledge of digital technologies and how these can benefit beekeeping.
20. **VET MED AVAIL:** The availability of registered veterinary products to control Varroa is low and is not equal across EU Member States.
21. **HIGH Q RES:** There is a lot of high quality research being done on honeybees and beekeeping at the moment.
22. **HIGH Q EQUIP:** Beekeepers in the EU have access to high quality apiary equipment and facilities.
23. **BKR ACTIVE ASS:** In most EU Member States, beekeepers are active in beekeeping associations, which are internally well organized and managed.
24. **BKR LOW MRKTG:** Most beekeepers have low marketing skills and little expertise to develop or create positive images for apiary products.

**Section B: Identified external factors that can be Opportunities or Threats for the EU beekeeping sector:**

1. **PUBLIC AWARE ENV BEES:** The broader public is increasingly aware about issues such as biodiversity, pesticides and the environment in which honeybees play an important role.
2. **CC GEOSHIFT BKG:** Climate change causes geographical shifts in beekeeping and honey production.
3. **CC IRREG WEATHER:** Climate change brings more irregular, more unpredictable and severe weather events.
4. **CONS WTP HONEY:** Consumers are increasingly interested in and willing to pay for healthy, sustainable, natural and locally produced food. As a result, beekeepers can sell their honey at good prices to local consumers.
5. **BKP LS PROD RULES:** Full recognition of beekeeping as a livestock production sector will bring more rules and regulation to the beekeeping sector.
6. **BKR FARM INTEREST:** Beekeepers and farmers have some common interests and they are open to collaborate and join forces e.g. agreeing on the timing of pesticide applications.

7. **HEALTH PLANS BEES:** There are initiatives towards the development of health plans for honeybees that will benefit beekeepers in keeping their colonies healthy.
8. **PUBLIC AWARE IMPACT CC:** There is a growing awareness among the broader public about the adverse impacts of climate change, the need to better preserve natural resources, lower environmental contaminants and improve biodiversity.
9. **DIGIT TECH BKG:** Technological developments in terms of digital beekeeping tools, automated hive monitoring, along with data sharing provide the potential for improved hive management.
10. **ADV ASSESS ANAL TECH:** Advancements in risk assessment and analysis technologies and methods allow for more robust tests, e.g. to better reflect chemical exposure in honeybees or to detect adulteration and fraud with apiary products.
11. **ADV VET MED:** Advancements in veterinary medicine allow for the development of relatively simple products that are easy for beekeepers to use.
12. **OPEN MARKETS:** International trade of apiculture products is very liberal and EU markets are open to cheap imports.
13. **ADULTERATION:** Cases of adulteration of honey and beeswax have risen in recent years, which has put the image of honey and other apiculture products at risk.
14. **DOM AGRIC MODEL:** The dominant agricultural model of intensive food production, monocultures, and lack of crop diversity leads to the depletion of habitat and resources for honeybees.
15. **ENV CONTAM:** There are an increasing number of contaminants in the environment, pesticides just being one of many.
16. **BKG LITTLE SUPPORT:** As compared to other agricultural activities, the EU beekeeping sector receives little financial support and dedicated extension services.
17. **SCI RES BEES:** There is increasing financial support for scientific research on honeybees.
18. **BKR COLONY LOSS:** Beekeepers are being increasingly blamed for implementing wrong / poor management practices contributing to colony loss.
19. **DIGT PRESSURE LOC:** Digitalization and data sharing trigger movements of hives to locations that emerge as appealing, which increases foraging pressure on that location and disputes between beekeepers.
20. **BEES PEST DEBATE:** Honeybees are used to influence the debate on pesticides, without focusing equally on other important issues such as landscape diversity.
21. **ENV DEGRAD:** Environmental degradation is increasing. It is increasingly challenging to maintain a bee-friendly environment in terms of food quality, resources, abundance.
22. **NEW BEE PESTS:** There has been a rise in new bee pests or predators such as the Asian hornet and the hive beetle that are linked with international trade.

23. **EU ADMIN INEFF:** While the EU beekeeping sector has become stronger within the EU, the EU administration and services have become increasingly weak. The EU is ineffective at enforcing what the EU beekeeping sector has proposed.
24. **ALT CHEM PEST:** There are alternatives to chemical pesticides. Under the EU Green Deal, alternatives to chemical pesticides are being increasingly promoted.
25. **EU IMPORT HONEY:** The EU is the largest net importer of honey.
26. **HONEY LABELS:** Honey labels are misleading. The labels mention “EU/non-EU origin” and give consumers no clear indication of where the honey comes from, nor the percentages of EU and non-EU honey.
27. **BKR ALT TREATM:** More and more beekeepers are exploring alternative bee treatments e.g. more natural (bio-controls) for honeybee disease treatment techniques.
28. **BEE BREED GEN RES:** Honeybee breeding and genetic research can improve the productivity, manageability and health status of colonies. It entails the potential to build resilience against diseases which can decrease reliance on chemical treatment.

Although the following statement did not emerge directly from the interviews, it still has been added to the list of external factors owing to its potential importance also for the beekeeping sector in the EU, and because it was flagged as potentially important by one of the participants to the pre-test:

**COVID19:** The COVID-19 pandemic is changing our future economy and way of living



1	2	3	4	5	6	7	-
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5. Do you have any comments on how this element is formulated? In case the statement is not sufficiently clear or if you disagree with how it is formulated, please indicate how this could be better formulated, or what is missing, etc., according to you?

<i>Free</i>	<i>text</i>	...
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## SECTION B: EXTERNAL FACTORS

1. To what extent do you **agree or disagree** with this statement?

Totally disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Totally agree
1	2	3	4	5	6	7

2. To what extent do you believe this element is **an opportunity or a threat** for the beekeeping sector in the EU?

Definitely a threat	A threat	Somewhat a threat	Neither a threat nor an opportunity	Somewhat an opportunity	An opportunity	Definitely an opportunity	Not relevant for me
1	2	3	4	5	6	7	-

3. To what extent do you believe this element is **important** for the beekeeping sector in the EU (as an opportunity or threat)?

Not at all important	Not important	Somewhat not important	Neither important nor not important	Somewhat important	Important	Totally important	Not relevant for me
1	2	3	4	5	6	7	-

4. How do you evaluate the **probability** that this element (with a potential impact on the beekeeping sector in the EU) will indeed occur (i.e. become a reality more so in the future than it is already now)?

Very low probability	Low probability	Somewhat low probability	Neither low nor high probability	Somewhat high probability	High probability	Very high probability	Not relevant for me
1	2	3	4	5	6	7	-

5. Do you have any comments on how this element is formulated? In case the statement is not sufficiently clear or if you disagree with how it is formulated, please indicate how this could be better formulated, or what is missing, etc., according to you?

<i>Free</i>	<i>text</i>	...
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## SECTION C: Fill-in

1. In case you have missed any **internal** characteristic of the beekeeping sector (i.e. factors that the sector itself can change, improve or manage) in the previous set of questions, please add **your own description** here and evaluate it on the same set of questions.

---

*Free*

*text*

...

2. In case you have missed any **external** characteristic of the beekeeping sector (i.e. trends or evolutions that may require a response or reaction) in the previous set of questions, please add **your own description** here and evaluate it on the same set of questions.

*Free*

*text*

...

*If completed, both statements are followed by the same set of questions (applicable for either internal or external factors) as with the previous statements.*

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## 6.6 Appendix 6. Open comments on SWOT elements in survey

### Internal characteristics

#### 01 bkg image

- 1) We must use more globally also World Bee Day!

#### 02 bkr numerous

- 1) don't understand the statment ie 'political weight'
- 2) I am not sure that beekeepers are necessarily aware of this. Beekeeping associations are, but not necessarily the profession.
- 3) Now we beekeepers ara have very positive attitude in public. We must use this in way to get support from them when we are talking to the politician.
- 4) OK
- 5) This geographical spread is an advantage, as it concerns a lot of countries!!And so can get interest from a lot of decision makes.

#### 03 bees multiservices

- 1) As Long as the public is not Aware that a lot of other bee species are at least of the same importance as honeybees, it will be an Advantage vor the honey bee sector. But the critics are increasing.
- 2) Bee health is a good Indicator of the environment status
- 3) the ecosystem service is pollination

#### 04 bkg unique brussels

- 1) Being member of COPA-COGECA allows the beekeeper associations to have a voice!! There are too much NGOs already with ... no "voice"!!
- 2) i dont know
- 3) Sorry, I don't really understand this element.

#### 05 honey image

- 1) Import from honey should only be allowed when same rules of health safety are satisfied( eg lack of antibiotics!! in honey
- 2) In SLOvenia beekeepers sell 70 % of honey to direct buyers!
- 3) The first part of the sentence is correct, the problem is the lack of recognition by the consumers when they make the decision to buy. There are several situations that the decision is based not on the quality but on the cost, which may greatly influenced by homey importation.

#### 06 bkg practices vary

- 1) Both have a place: hobby beekeeper and "professionals"
- 2) It is caused by the small scale beekeeping, but this could be an Advantage, concerning biodiversity and resilience, compared to the negative example or US-beekeeping Industrie, which is driven by Profit.
- 3) there is not only one "beekeeping"

#### 07 bkg community diverse

- 1) Diversity increases resilience!
- 2) There is place for both!!

#### 08 bkg data aggregated

- 1) Data collection exists see COLOSS and please do not "reinvent the wheel"
- 2) the problematic is the origin of the studies and data collects: beekeepers or scientifics?

#### 09 bkg many associations

- 1) If the sector is aware of weakness, then you can do something to it.

#### 10 bkr freedom

- 1) A beekeeper's hives are part of a national herd, where their bee's and the health of their bees has a direct interaction with a neighbours bees. As such they have a responsibility to engage in accordance with a national program of bee health activity.

**11 bkr strong views**

- 1) A beekeeper is, per nature, individualist and does not like, as mentioned, to listen to others. The issue is also money!! But as new diseases will come up, beekeepers will be forced to be Registered and this will help
- 2) as before there is probably a range of acceptance among beekeepers. But from experience mostly with beekeepers association spoke persons, I met strong opinions and sense of independence, though I am eager to think these spoke persons do not necessarily consult internally not represent all opinions in their own associations.
- 3) this statement is not true of the beekeepers benefits from the rules etc

**12 bkr sedentary**

- 1) I believe the main handicap of beekeeping sedentary is not linked with contamination problems but lower productivity.
- 2) i don't know
- 3) it's more complex, question is badly put i think there a factor of cultural rotation and beekeepers chearch frequently colza, sarrazin tournesol but also neutral ressource (ronces, chataigniers...)
- 4) Migratory beekeeping is also stress for bees. Sedentary beekeeping saves pollination the year round, migratory only seasonal pollination of some valuable crops which pay pollination fees.
- 5) The question is biased by singling out pesticides. Environmental contaminants is sufficient to cover the concept of everything bees can be exposed to.
- 6) This question ignores the cocktail effect, which can happen both by keeping bees in one place with lots of small fields with various pesticide regimes for different crops or by moving bees to several crops with pesticide exposure. Staying in one place does not automatically correlate with high or low pesticide exposure in terms of quantity and diversity. Totally depends on the land use around the site.
- 7) Use of pesticides is only a small issue, compared with much greater issues which have all an impact on bee health!!

**13 bkr lack education**

- 1) After the introduction of Varroa, beekeepers had to get a lot more training than in the past. Bad information propogated online is a bigger problem than no training.
- 2) problematic of the good formation
- 3) There are a lot of Training progammes and Courses.

**14 bkr sci difficult interaction**

- 1) it's a big problem and for the data collect\$!!
- 2) Some scientist are extremely helpful to the beekeeping sector. Others have major conflicts of interest. No a communication problem. It is a problem of several factors leading to a lack of independence of science.
- 3) The first question. Am I thinking the EU beekeeping and beekeepers or in my country? That is different answers. I suppose it was also in EU. In other questions there was specification EU.
- 4) They should speak the same language!!

**15 bkr ageing population**

- 1) if it's true, it's a disadvantage but i don't think
- 2) not sure, many young beekeepers are joining in. issue: lack/loss of knowledge and experience

**16 young bkr views**

- 1) Correctly formulated

**17 bkr closed minded**

- 1) I would think that beekeepers are more inclined to work together than their association representants.
- 2) It depends on Groups and age of beekeepers.
- 3) The expression is not valid for all beekeepers. Part of the beekeepers tend...
- 4) there is an evolution (good evolution: european program...)

**18 busy lifestyles**

- 1) technology can be an opportunity
- 2) We cannot mix the "hobby" beekeeper with the "Professional" one; and in the EU, most are "hobby beekeepers"!!

### 19 bkr lack digit tech knowledge

- 1) Again "hobby beekeeper" vs "professional beekeeper"
- 2) Many Beekeepers are open to digitalisation - especially the younger ones.
- 3) We in Slovenia are using webinars, and this solution appeared to be very useful. Of course this is not possible to teach old beekeepers, for them we still need to publish beekeepers magazines.

### 20 vet med availability low

- 1) i dont know
- 2) I think we do not need more veterinary products but more skills to handle varroa without veterinary products.
- 3) Number of products does not say much about their effectiveness. Very good generic products are not registered, because there is no economic model for providing simple and effective treatments. System is extremely biased towards the financial interests of the pharmaceutical industry and the economic model of the veterinary sector.
- 4) This lack of availability of vMP against varroa is a key issue, partly now overcome by the Cascade system. Other positive sign: more and more vets are interested ( and have been trained in bee health

### 21 high quality research

- 1) Beekeepers often don't use the results of science for their Management in practice. There is a science to Stakeholders gap.
- 2) Researchers need money!! And today, politicians are convinced that they satisfy the people who vote for them!! BUT... research should cover ALL aspects and not only the "political" ones as use of pesticides.
- 3) the key is to convert research outcomes into practical knowledge and tools and services or improve existing ones. Risk of the research is that they are too scattered and the true knowledge gaps are not filled
- 4) The research produced varies enormously in quality, and is relatively biased towards low hanging fruit type topics, which makes it difficult to interpret and benefit of the learning.

### 22 high quality equipment

- 1) but are they able to afford them due to pressure on honey sales/prices? And do they know how to apply them? Are we here talking about professional beekeepers only or also amateur beekeepers?
- 2) there is probably a difference in awareness and equipment between professional beekeepers with international contacts, professional who act locally and amateurs.

### 23 bkr active associations

- 1) i think it's a disadvantage because the objectives of these associations are not always well defined or members are not always competent
- 2) If the associations join their Forces it will be an Advantage.
- 3) speaking for netherlands only, non-member beekeepers miss out

## External characteristics

### 01 public aware env bees

- 1) i am not sure that the broader public is increasingly "aware", it understand the problematic but not the real solutions
- 2) The awareness of the public has risen during the last years, caused by the neonicotinoids discussion. But the question is, if this awareness will end up in Action or real activities to protect bees and foster biodiversity. In this context it has to be questioned, what is meant using the term "biodiversity"? Is it a number of common plant species of selected genetic traits and of low genetic variability, planted by Farmers with seed from abroad, because this is the cheapest? Or does it mean ecosystems, functioning Networks of organisms of great genetic diversity, which can interact and mate unhindered by large plots of the same crop and are not isolated remainings of former large populations of individuals.

- 3) very similar to question before. hard to agree as there are two elements to this statement

## 02 cc geoshift bkg

- 1) As stated in former parts of the questionnaire, everything will Change: Vegetation, nectar and honeydew sources, pests and parasites, etc.
- 2) what is meant with 'shift in beekeeping'?

## 03 cc irreg weather

- 1) Climate Change will Change the Vegetation climate zones, crops to be grown in different countries, and it also will Change the honey flows, both the nectar and the honeydew flow, by changed Vegetation, droughts, floodings. It will also Change the brood rhythm of honey bees in affected Areas and thus give new pests and parasites or viruses the Chance to infest our honeybees (e. g. Tropilaelaps mites will then be able to survive on the European honey bee if there is a continuous brood rearing all year around, which is not the case yet in middle and northern Europe.) Also exotic predators of bees (Asian hornet, Giant Asian hornet) will invade in the EU, or have already arrived in some countries. Also some honey bee species from warmer parts of Asia probably will spread to the southern parts of the EU (e. g. Apis Florea).

## 04 cons wtp honey

- 1) Self-selling the honey is only possible if beekeepers have staff and time for Marketing directly to consumers and if they are not living in remote Areas with low Population.
- 2) the consumer don't want always pay the good price for the good produce, it's the problematic for more and more importation from low cost countries

## 05 bkg ls prod rules

- 1) all the beekeepers are not agree with rules in animal production, beekeeping is the least organized
- 2) It will happen anyway. Professional beekeepers will meet the regulations, hobbyists not fully. If bees are valued as farm animals the Registration of pesticides will have to be changed completely. Because no farmer will allow another farmer to kill 50% of his animals (LD-50).
- 3) That is the way to go!!

## 06 bkr farm interest

- 1) Farmers and beekeepers have to work together!! Such collaborations already exist and are successful, eg in France
- 2) It will depend on the necessity of cross pollination, e.g. orchards, seed with high Need for pollination will mostly have good cooperation of Farmers and beekeepers (purchasing pollination fees that Farmers will pay. In other bee Independent crops (e.g. corn, cereals, potatoes, etc.) or highly self-pollinating varieties (e.g. some sunflower varieties), the Need for bees is much less or None and the Farmers will mainly try to save their Profit and harvest.
- 3) the consumer have an important place in that opportunity

## 07 health plans bees

- 1) As practice Shows at the Moment, such programs are only accepted if they are compensated by subsidies.
- 2) Those health plans are the real future and should be encouraged!!
- 3) what is meant with 'health plans'? knowledge on how to take care of bees is not new but it is improved. Key question is: are we working on the right things? are they being implemented? do they have the result we would like to see? is unintended harm done? which knowledge gaps still exist? A general remark: I see nature-based or natural beekeeping as an important opportunity.

## 08 public aware impact cc

- 1) the general public often confuses biodiversity with bee protection; it needs to understand the basics to better understand the solutions
- 2) The public is an important Stakeholder and consumer and has to some extent influence on the markets by their buying behaviour.

## 09 digit tech bkg

- 1) E.g. electronic remote scale hives are very important for migratory beekeepers to find the right time to move their bees to promising crops.

### 10 adv assess anal tech

- 1) This methods have to be used in practice, otherwise nothing will Change. The Point is, who wants to know too much about ugly Things, this Knowledge could irritate consumers and disturb markets, bring losses to pharmaceutical companies, the agriculture Business, etc.

### 11 adv vet med

- 1) As Long as no resistance against These medicaments occur, everything will be o.k. If there is resistance and no alternative Treatment, the colony losses will increase. There is also the risk of residues in the bee products. Many of this "synthetic" products are not allowed in organic beekeeping, other methods, likg RNAi-bases Treatments against pests and parasites will be rated as GMO-treatmentes. In some EU-memberstates (e.t. Austria), the use of GMO in agriculture is not allowed and it will not be good for the Image of the bee products.
- 2) simple products that are easy for beekeepers to use don't remplace the knowledge...

### 12 open markets

- 1) But similar standards for all products, produced locally or imported
- 2) The Problem is the declaration and labelling, e.g. "mixture of honey from EU and non-EU countries", where no Minimum percentage of the honey from the EU is the prerequisite for such a labelling. The other Problem is honey fraud and adulteration, which is not detected or should not be detected by official authorities to not disturb the international honey trade and honey Business of the large Traders and "Producers" (I think: honey should be harvested from the beehive and not "produced" from unripe nectar or syrup in China or other countries.) Thus cheap Import honey is the ruin for honest professional beekeepers in Europe and worldwide.
- 3) what is meant exactly with 'cheap imports': unreliable honey? too cheap?

### 13 adulteration

- 1) i add the wrong practice of beekeepers
- 2) It is a real fact already and I have some doubtst that EU-authorities really have the will or power to Change that Situation due to free trade Agreements, low Price bee products for EU-consumers, etc.

### 14 dom agric model

- 1) There is place for both systems!!
- 2) I would propose that the issue relies in the land management rather than the intensivity: if intensive means high yields, it does not necessarily exclude pollinator habitat. the alternative is extensive agriculture which means more land towards cultivation and less land set aside.
- 3) This model will not Change!

### 15 env contam

- 1) 'number' = amount of or diversity of?
- 2) as long as not only pesticides are looked for
- 3) Beekeepers also are using chemical Treatments, so they are part of the game.
- 4) Is there ? Looking at the measures put in place over the last 30 years we see a gradual decrease of the number of substances authorised for use in agriculture, general chemicals, medicinal products, plastics, cosmetics, etc. The question would be more precise by stating "increasing number of detection" which is mainly because of the increased level of detection and number of sampling.
- 5) The level of risk has constantly been reduced with the evolution of regulation and risk assessment strategies, over the last 5 decades. I do not see that we can say that more pesticides are present in the environment when the number of active substances in the EU has dropped from ca 1200 in 1991 to 400 today, and where persistent ones have been banned.

### 16 bkg little support

- 1) i don't know
- 2) It depends on the MS how this Money is spent (to beekeepers, to improve product Quality, to increase Extension Service). Some MS spend it mainly to professional beekeepers others to hobyists, others to increase Research on different issues, etc.

- 3) there is many financial support for beekeeping the good question is sometimes for what results?

### 17 sci res bees

- 1) As it happened during the last decade - triggered by high bee and colony losses due to pesticide poisoning from systemic neonicotinoids (seed Dressings, sprays, etc), a lot of scientific Projects covering that issue had been funded. Also many Projects on bee health, biodiversity and identifying and preservation of local bee races. Reasons are: bees are a Symbol for intact nature, they are busy and have a good Reputation, also beekeepers are some sort of exotic subjects. Another practical reason is that we Need bees in many crops to get good harvest only by sufficient pollination or cross pollination.
- 2) needed as new diseases are coming up

### 18 bkr colony loss

- 1) it is above all a lack of training of future beekeepers I think it's an opportunity if there is an awareness for this fact
- 2) question is not clear
- 3) The Statement at the beginning is true and not true, depending on the issue. The best Management will fail if the Environment and farming practices, crops and pesticide use will weaken the bee colonies that they will die in the end.

### 19 digit pressure loc

- 1) Movement of hives is of all times, not due to digitisation. Many elements in the sentence so hard to say agree or disagree
- 2) The battle for the best places for apiaries is already ongoing. It hinders the best use of crops as well as pollination.
- 3) there is also beekeepers who don't want to make displacement (hard work and expensive)

### 20 bees pest debate

- 1) farm model!!
- 2) landscape diversity or landscape degradation? and how is diversity linked to healthy food resources?
- 3) Landscape use by forestry, agriculture, humans have to be questioned and changed to more wilderness and Refuges.
- 4) Politically, "pesticides" are an issue!! And other issues, as important for bee health are left away!!

### 21 env degrad

- 1) Beekeeping are part of the solutions and not a threat
- 2) Places to Keep bees the whole year round in good condition and well supported with Food will become harder to find.
- 3) the environment degradation (i talk loss of food for bees) is as important as(or more than) pesticides in the origin of colony loss

### 22 new bee pests

- 1) Beekeepers are the importers of bees, thus the importers of pests like Varroa mites or foreign bee races.
- 2) do the beekeepers understand the risk?
- 3) linked to climate change in some cases

### 23 eu admin ineff

- 1) As Long as pesticide companies and Farmers can block the implementation of bee protection Goals during the Registration process or as a prerequisite for Registration, the Situation will not Change to the better in the near future. The discussion since many years about better side effect Tests for honey and wild bees is a good example for that negative Impact of such companies on the authorities in the EU and the registration bodies in memberstates. As Long as LD50 values are the main criterium and no other sublethal effects (e.g. impairment of homing behaviour, brood care, Suppression of the bees immune system, reproduction problems, etc.). Food uptake, , which also could be detrimental for colonies, no improvement of the Situation could be expected. The Point is, an "LD50 colony" is a weak, sick colony, which causes a lot of labour and costs to the beekeeper without paying off with honey or

other bee products or pollination fees.

- 2) difficult to agree to sentence with so many elements
- 3) I don't think you can say the EU beekeeping sector proposed anything "united". I've seen various actors asking different things if they represent different types of beekeeping, different member states, or even different regions ! The question could also be on Member States responsibility and avoid targeting only "the EU".
- 4) to propose solutions, they need a good diagnostic the problematic is not only resume to pesticides and their interdiction , yes, it's one of the solutions in france there is interdiction for many pesticides; there is a diminution of colony losses? the problematic is more extend; it's the agricultural model the problem, what is the demand of beekeepers for that?

## 24 alt chem pest

- 1) For me, the green deal seems to be a Tranquilizer pill for the public and to establish an opportunity to give Money to the agrobusiness and related companies. In the end everything will be calculated by the Farmers and they will choose the type of agriculture or crop that will bring a regular income. But they will not do that by their inner Motivation, they will do it for the Money which is given for the green deal. To deliver the Money from Brussels to the Farmers will feed a lot of bureaucracy and the Farmers will get only a minor part of it.
- 2) One should not think that because an alternative is based on natural substances for instance, things will automatically be better for pollinators. Tests and requirements on biopesticides (being microorganisms like viruses or bacteria, extracts or pheromones) can also have sever effects on some species. Adequate testing and monitoring will be essential to avoid any incident. One additional factor to take into account is that a living organisms supposed to fight a pest could be safe for bees, but they will act as a clear vector in disseminating it further which can lead to exposure of sites/populations not expected at first.
- 3) Well controlled/managed use of authorised "pesticides" is the first step

## 25 EU import honey

- 1) But we should impose our health criteria
- 2) I don't know
- 3) Importation means honey adulteration and honey fraud. At the Moment, countermeasures are not effective and to weak.

## 26 honey labels

- 1) covid and local production?
- 2) It is already installed and has to changed completely, if professional beekeepers should be able to make their living in the EU in the future. See my comments some chapters before.
- 3) totally agree that 'EU/non-EU' needs to be forbidden asap and that the source(s) must be mentioend and preferably be proven (there are developments to do this via blockchain).

## 27 bkr alt treatm

- 1) alternative treatment need experience, it's not always the case and there is a big problem with these solutions, much among beginners
- 2) In case of resistant varroa mites or in organic beekeeping this is essential
- 3) Interesting.. ut all that will take time!!
- 4) The current scrutiny with which these products are evaluated does not match that for conventional veterinary products and this can constitute a threat.

## 28 bee breed gen res

- 1) BUT... this will take time!!!
- 2) It will take a Long time and will lead to genetic poorness as it is the case with high Performance crops or animals.

## 29 covid

- 1) A lot of our beekeepers is of high age and therefore at risk to get sick or to die. So we will lose a lot of experienced beekeepers of an age above 65 years.
- 2) How does this relate to beekeepng?
- 3) local production and better

- 4) No particular comments
- 5) Yes, it will have an impact. But hopefully, a scientific based one and not a political oriented one