Journal of Apicultural Research

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tjar20

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To cite this article: Samuel Perichon, Leonora Adamchuk, Lejla Biber, Janko Božič, Róbert Chlebo, Janja Filipi, Sonja Leidenberger, Georgios Mavrofridis, Erkay Özgör, Cristina Bianca Pocol, Marco Porporato, María Shantal Rodríguez-Flores, Miguel Vilas-Boas & Aleksejs Zacepins (11 Jun 2024): Advice on how to start beekeeping, memories with bees and the uses of honey: results of an online questionnaire with European beekeepers, Journal of Apicultural Research, DOI: 10.1080/00218839.2024.2361965

To link to this article: https://doi.org/10.1080/00218839.2024.2361965

JOURNAL OF APICULTURAL RESEARCH
https://doi.org/10.1080/00218839.2024.2361965

ORIGINAL RESEARCH ARTICLE

Advice on how to start beekeeping, memories with bees and the uses of honey: results of an online questionnaire with European beekeepers

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ABSTRACT

Beekeeping is a demanding activity that requires both particular human qualities from those who practise it and an environment that is favourable to bees. This is why the interviewed beekeepers advise to take time to think before starting to keep the bees, to find a mentor, and to always have the desire to get to know the bees even if this is not enough for success. In Northern and Western Europe, beekeepers consider patience and calmness as essential qualities to be a "*good beekeeper*", while in Southern Europe, passion for bees is the main driver of success. The reasons for abandonment or failure also include human and environmental factors. To better understand the relationship between beekeepers and their bees, interviewees were encouraged to share their best memories. With years of experience, contemplative memories fade into memorable situations in which bee practices are described, and then in turn, they fade into moments of sociability. Honey harvesting plays an important role. Productive considerations are more expressed in Southern Europe, where it is an exceptional harvest that marks on people's minds, more than the first honey harvest. The strong connection to their bees and the territory they live in is also expressed in the choice of their favourite honey. Many beekeepers mentioned the local honey production, which they are proud to produce with their own bees, even though they sometimes became criticized for a too high price for this local product.

ARTICLE HISTORY
Received 9 January 2023
Accepted 21 January 2024

KEYWORDS
Apis mellifera; beekeeping; perception; online questionnaire; Europe

Introduction

Beekeeping is part of the world's cultural heritage (Crane, 1999). The keeping of bees (*Apis mellifera*) has gone on for at least 4,500 years. The oldest evidence of this activity is an Egyptian bas-relief showing a man who harvests honey and seals their harvest in containers for storage (Kuény, 1950). In Europe, people used a long time hives made of straw, wicker, cork, sometimes clay, and more commonly tree trunks (Crane, 1999; Gupta et al., 2014). In some regions, traditional practices associated with these hives are still in place (Dupleix et al., 2020; Lehébel-Péron et al., 2016). Traditional beekeeping in trunks in Poland and Belarus has been included by UNESCO as part of the world's intangible cultural heritage (UNESCO, 2020). Two years later, "Beekeeping in Slovenia as a way of life" was also inscribed (UNESCO, 2022). Since the list was created in March 2008, these are the first two official recognitions of beekeeping heritage in the world. Beekeeping is a singular activity in many ways. It is distinguished from the breeding of other animals by constraints associated with the biology of the bee, the impact on the production of natural hazards, in particular weather, to the technicality involved, and the social representations around this insect and those that raise them (Lemelin, 2011; Tunget & Clark,

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Supplemental data for this article can be accessed online at https://doi.org/10.1080/00218839.2024.2361965.

1993). European honey bees are not aggressive, but they may be potentially dangerous, especially because of allergies (Carli et al., 2022; Oldroyd, 2012; Stanhope et al., 2017). Each year around the world, about 400 people die from honey bee stings (European honey bees or other like Africanized bees) compared to fewer than 100 shark bites. The most common animals responsible for human death are farm animals (horses, cattle) ahead of insects (bees, wasps, hornets) and dogs (Forrester et al., 2018). Fortunately, in almost all cases with *A. mellifera*, the amount of venom injected is not fatal, although the stings can be painful and cause localised skin reactions. The properties of bee venom (de Graaf et al., 2021; Lin & Hsieh, 2020; Zahran et al., 2021) have been recognized for the treatment in oncology, neurology (multiple sclerosis), infectious diseases or allergology (asthma). However, bees are mainly hunted and domesticated for the honey that they store in combs and wax that they make to build them (Crane, 1999). Honey, pollen and royal jelly also have recognized medicinal properties that can vary between plants that have been foraged by bees (Farooqui & Farooqui, 2012; Kuropatnicki et al., 2018; Siedentopp, 2009). In addition, the diversity of honeys results in an incredible range of colours, tastes, textures and smells that express a diversity of natural or semi-natural environments where bees live (Persano Oddo & Piro, 2004).

In Europe, 48 honeys benefit from Geographical indications[1] include Protected Designation of Origin (PDO), or Protected Geographical Indication (PGI). The latest honey to be registered is a Greek honey under the name "*Meli Kissouri*" (published on 11/12/23). The authenticity of honey is linked to the peculiarity of the geographical place in which it is produced: natural elements and human factors are all taken into consideration (Drivelos et al., 2021). These certifications allow local beekeepers to guarantee consumers the exceptional quality of their product and its authenticity (Pocol et al., 2017). Certification is all the more important when you consider that honey is the third most counterfeited product in the world. Recent customs controls at the EU's external borders and at honey import warehouses have highlighted the scale of the problem: Of the honey samples collected, 20% were not true honey or were not compliant with EU standards (European Commission, 2022). The annual consumption of honey is around 0.7 kg/inhabitant, which represents more than 300,000 tonnes of honey consumed each year, the equivalent of 20 to 25% of world consumption (European Commission, 2022). Every year, honey production in the European Union (250,000 tonnes) is not enough to meet demand. Therefore, about 200,000 tonnes of additional honey, 40% of which comes from China, is imported. Beekeepers deplore this situation, especially since the beekeeping sector is facing a number of problems (Gray et al., 2023; Moritz & Erler, 2016; Parveen et al., 2022). There's a lot of nostalgia. They speak of a bygone era when *Varroa destructor*, Asian hornets, pesticides, global warming, etc. have not yet weakened bee colonies and the amount of honey produced was high (Perichon et al., 2024; Vercelli et al., 2021). Despite the decline in bee numbers - i.e. the annual loss of colonies with fluctuations from year to year - it is worth mentioning that in some countries the number of beekeepers and colonies is increasing (European Commission, 2022). This current popularity of beekeeping in Europe is reflected by this.

This article follows the first article (Perichon et al., 2024). It also applies to social science. In fact, the results refer to other questions in the survey we closed at the end of May 2022, which means that the respondents and the countries represented are identical. Contrary to the first article, which asked questions about threats to bees, obstacles to the local development of beekeeping and its future, here we focus more on individuality. The results will be presented in two parts. In the first part, we will describe the profile of what respondents consider to be a "*good beekeeper*" and, conversely, how they explain the abandonment or failure of beekeeping. Whatever the context in which this activity is practised, it often combines moments of doubt and even disappointment with great satisfaction. This will be an introduction to the second part, as honey can certainly be a source of unforgettable memories. This part will be dedicated to the beekeepers' favourite honeys, what motivates their choice, and how they use them. Our results were concluded by having the beekeepers respond to a customer who reproached them for the high price of local honeys.

Materials and methods

This article is based on the results of an online questionnaire. The consultation period took place between September 2021 and May 2022 after a trial phase with 117 European beekeepers. The questionnaire in its original form was widely disseminated throughout Europe. Beekeepers responded from the homepages of beekeeping organisations or specialized journals. The URL was also posted on social networks (Facebook, groups and forums) and distributed on professional mailing lists. Not all national, regional or local organisations that were asked to disseminate the questionnaire reacted actively, which may be due to the large number of surveys that beekeepers and their organisations are increasingly requested to fill, including administrative

procedures for the activity. Local beekeepers are more likely to participate in surveys conducted in their local language, not just in English, thus this survey was made available in 18 languages. The questions focused on open-ended responses, multiple choice answers, and evaluations in the form of a matrix[2]. The first eight questions in our questionnaire (Table 1) form the basis of the results presented in this article.

The data processing method was influenced by the type of question asked. The answers given by respondents to the open-ended questions were carefully reviewed and a list of keywords that appeared in the written responses was created. The data was analysed using a list of keywords that was expanded during the processing. Once the data was entered, the often large number of keywords required them to be classified by theme. This stage, which required a lot of work, was completed using LibreOffice 7.0 (calc). The sum of responses for each keyword and theme was computed, and the percentage was determined by the number of validated responses. An identical list of keywords was applied to each country for this purpose. To calculate percentages for the multiple-choice question in each country, the number of respondents who verified their answers was considered. Only results of open-ended or multiple-choice questions from countries that submitted at least 40 responses at the regional level or at least 100 responses at the national level will be included in this article.

Tables and GIS maps were commonly used to format the collected data. QGIS software was utilized for the production of all the maps. There were two types of maps created, one with histograms or circular diagrams and another with a layer of points that corresponded to the respondents' places of residence. After being located on Google Earth, these points were created on the OpenStreetMap layer. Each point that was associated with a respondent's place of residence was given an identifier. The answer to the respondent's questions in the spreadsheet was identified by the same identifier. A table join, which is to associate data from our survey with a point on a map, was possible in this manner. The question about beekeepers' favourite honey, for example, was formalised with maps base on categorised values. In contrast to open-ended or multiple-choice questions, the cartographic formalization will incorporate all the answers given by respondents who have provided their place of residence.

Results

Characterization of sample and beekeeping activity

Sample characterization

A total of 2,111 beekeepers representing 33 European countries participated in the survey (Figure 1). France had the most responses collected ($n = 338$), followed by Greece ($n = 266$) and Ukraine ($n = 258$). The absence of opinions in a region or a country should not be interpreted as a consequence of our refusal to involve beekeepers; simply, no local relay on the spot could be established to support or join our project. At least one of the two thresholds established, either 40 responses at regional or 100 responses at national level, was reached by 13 countries representing the 4 European sub-regions determined on the basis of the United Nations breakdown. In Iceland, we collected 43 responses, which is less than the 100 required, but it represented roughly (or near) 50% of beekeepers on the island who gave their opinions. The reason we included this country in the analysis of results presented in this article is because of this explanation. For Eastern Europe, three countries are involved (Ukraine, Romania, Slovakia); for Northern Europe, four countries (Sweden, Scotland, Ireland, Iceland); for Southern Europe, five countries (Greece, Italy, Spain, Portugal and Northern Cyprus); and for Western Europe, two countries (France, Germany).

Table 1. Questions on the subject of study (online questionnaire).

Multiple choice question

- Question #1: Which of the following motivations best fits your personal situation? I like to watch the bees come and go in front of my hives, it is soothing / I think of my bees as pets / I keep bees because it is a tradition in my family / I like to open my hives and watch my colonies grow / I like the smell of a crowded hive / I like to collect honey / I like to give honey to my relatives / I treat my family and myself with honey / I keep bees to improve the pollination of plants in my garden / I keep bees to sell honey and increase my family's income / I'm a professional beekeeper

Open-ended questions

- Question #2: What is your favourite honey? Please justify your response.
- Question #3: How do you eat/use honey?
- Question #4: How do you respond to those who consider honeys from your region as too expensive?
- Question #5: What are the essential qualities to be a good beekeeper?
- Question #6: What advice would you give to someone who would like to start beekeeping?
- Question #7: How do you explain the fact that some beekeepers have given up or failed?
- Question #8: What is your fondest beekeeping with your hive memory?
- (. . .)

Profile survey questions

- Question #17: How many years have you practiced beekeeping?
- Question #22: How many hive(s) do you own? And what is approximately your honey production per hive and per year?
- Question #23: Please indicate: your municipality and region of residence, your age and your profession

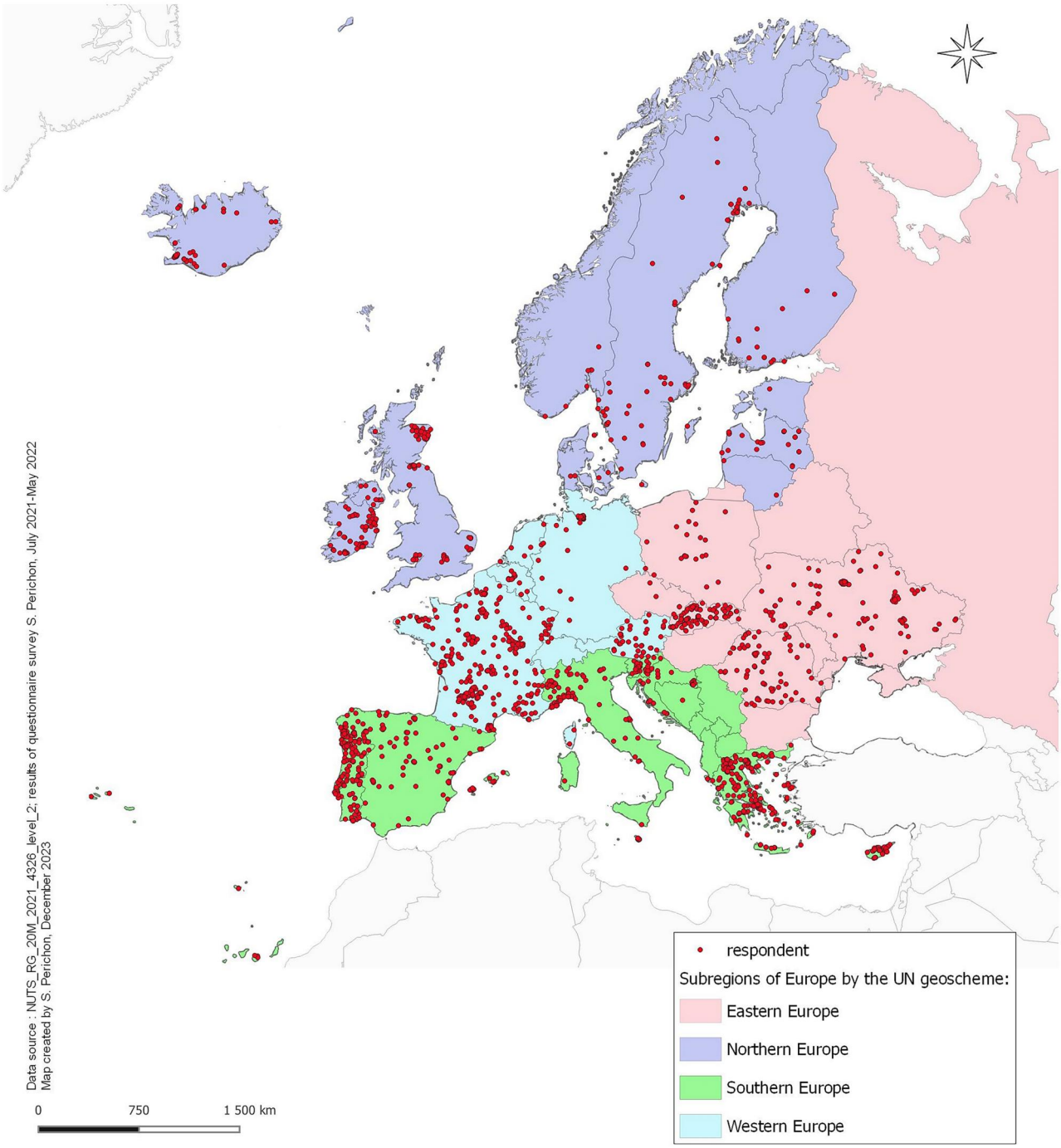

Figure 1. Location of respondents in the Subregions of Europe.

The results will be displayed on a national scale, even if some are representative of a specific region and not necessarily the entire country. This is the case for Germany with the city-state of Hamburg, Italy with the regions of Liguria and Piedmont, and Spain with Galicia. 90% of our sample ($n = 1{,}876$) was made up of responses from these 14 countries.

The average age of beekeepers varies from 42 in Romania (with 23% aged under 30) to 65 in Sweden (Table 2). In the other countries of Northern Europe, the average age is also higher than elsewhere. Pensioners are the largest socio-professional group in 9 out of 14 countries, with over 30% of the sample in France, Italy, Scotland, Ireland, and up to 62% in Sweden. The other socio-professional groups of significant importance correspond to jobs accessible after higher education: jobs as technicians, engineers, teachers and researchers, often in the fields of agriculture, the environment, IT or mechanics. Professional beekeepers[3] are mainly represented in southern European countries: 31% in Spain, 30% in Italy, and 26% in Greece.

Characterization of beekeeping activity

The majority of beekeepers who responded to the questionnaires had at least six years of experience in beekeeping. Table 3 shows that in several countries (Italy, Greece, Ireland), the average number of years

Table 2. Profile of respondents from the main countries of our sample.

Countries	*n*	Main regions	Average age (years old)	Main occupations (%)
Ukraine	258	Kyiv, Poltava, Dniepropetrovs'k	43.5	Engineers (20), teachers (14), technicians (12)
Romania	133	North western	42	Pensioners (15), beekeepers (15), teachers (11)
Slovakia	102	Strené, Západné	49	Pensioners (27), technicians (17), workers (14)
Ireland	72	Southern, Eastern and Middle	57	Pensioners (33), teachers (21), beekeepers (16)
Sweden	71	Norrbotten, Västsverige	65	Pensioners (62), beekeepers (16)
Scotland	69	North Eastern	57	Pensioners (38), engineers (30), researchers (16)
Iceland	42	Reykjavik, Southern	56	Farmers (20), engineers (10), pensioners (10)
Greece	266	Western Macedonia	45	Beekeepers (26), employees (17), farmers (11)
Portugal	160	Northern, Middle	48	Pensioners (12), beekeepers (12), technicians (12)
Spain	166	Galicia	48.5	Beekeepers (31), employees (14), pensioners (9)
Italy	94	Liguria, Piedmont	54	Pensioners (30), beekeepers (30), workers (16)
Northern Cyprus	46	Nicosia, Famagusta	43	Teachers (30), farmers (13), pensioners (12)
France	338	Occitanie, Nouvelle-Aquitaine, Burgundy	56.5	Pensioners (32), teachers (24), beekeepers (10)
Germany	63	City-state of Hamburg	53.2	Engineers (15), pensioners (14), technicians (11)

Table 3. Beekeeping activity of respondents from the main countries of our sample.

Countries	experience (years old)	Honey bee colonies	Yield (kg/hive/year)	Sell honey (% of respondents)
Ukraine	12.6	70	37.8	50%
Romania	11.2	98	33.2	43%
Slovakia	11.6	22	22.9	28%
Ireland	14.3	18	16.3	22%
Sweden	13.6	22	28.1	34%
Scotland	13.3	8.1	15.7	12%
Iceland	7.6	3.2	8.4	19%
Greece	14.1	135	14.4	45%
Portugal	13.1	131	12.1	48%
Spain	13.4	180	15.6	28%
Italy	15.1	88	16.0	16%
Northern Cyprus	11.6	116	18.6	41%
France	11.1	30	15.8	16%
Germany	11.7	19	21.4	15%

of practice is over 14 years. In Italy, 37% of beekeepers have had more than 21 years' experience, 31% in Spain, and 30% in Portugal and Sweden. Beekeeping in Iceland has only existed for twenty years. *A. mellifera* does not occur naturally on this island. The honey bees actually originate from another island, the Finnish island of Åland.[4]

This is why beekeepers in other European countries have more practical experience: 7.6 years on average, compared to a minimum of 11.7 years in France.

The average number of honey bee colonies per respondent varies significantly between countries: from 3.2 colonies in Iceland to 180 colonies in Spain. As in Greece and Romania, the average value in our sample is increased due to the significant number of full-time beekeepers. Other Eastern and Southern European countries, where the average number of honey bee colonies is between 70 and 131, suggest that beekeeping is a second professional activity. In Portugal, 50% of the respondents have over 50 honey bee colonies, it's 56% in Northern Cyprus and 45% in Ukraine. The majority of apiaries in Northern Europe are those with fewer than 10 honey bee colonies. This is true for nearly all Icelandic respondents, over three-quarters of Scots, and two-thirds of Irish and Swedish respondents. For information purposes, as it is very difficult to answer this question precisely, we asked beekeepers to estimate their average annual honey production per hive. The results, which are only based on declarations, reveal obvious differences between Eastern Europe and most other countries. In Ukraine and Romania, the declared honey yield is 37.8 kg per hive and 33.2 kg per hive respectively, compared with 8.4 kg per hive in Iceland, 12.1 kg per hive in Portugal and 14.4 kg per hive in Greece.

The respondents' main motivation is not selling honey (Supplementary Table S1). However, for a significant proportion of them, it is an additional source of income, and for most professionals, it is their main source of income. In Ukraine, Portugal, Greece, Romania and Northern Cyprus, between 40% and 50% of respondents cited financial considerations as one of the reasons for their beekeeping activity. This was also the case for one-third of the respondents in Sweden. The idea of harvesting honey and sharing it with loved ones can serve as a source of motivation. Those with less than 5 years of beekeeping experience are specifically affected by this. The honey harvest is a motivation for 74% of Icelandic respondents to engage in beekeeping, as an example. In this country, as well as elsewhere in Europe, there are two primary motives: "*watching their bees*" and "*opening their hives*".

Beekeeping, a demanding activity that created unforgettable memories

A description of what makes a "good beekeeper" and some advice on how to become one

According to the results of our survey, being a "good beekeeper" requires many qualities. These are linked

to the expected personality traits and beekeeping skills. Many respondents consider passion for honey bees and beekeeping as an essential condition for the practice of beekeeping. "Passion" is defined as a strong attraction to an activity, which we consider important for personal development and in which we invest a lot of time and energy. In 8 of the 14 countries studied, "passion" is either the first or second quality that is most frequently mentioned. All of them are located in Eastern and Southern Europe (Supplementary Table S2). For experienced beekeepers, a "good beekeeper" is also someone who knows the requirements of bees very well and who has sufficient experience in the field. Nearly 60% of beekeepers in Northern Cyprus consider knowledge to be a prerequisite, which is even more advanced than passion. For others, passion and patience it is important to have both passion and patience. Ireland (47%), Scotland (38%), and France (32%) have the highest ranking for patience. In the Northern European countries, patience and calmness are often present in opinions. In Sweden and Ireland, 29% and 27% respectively, consider calmness, while only 5% mention it in Southern European countries.

A "good beekeeper" is distinguished by their rigour (sanitary treatments, monitoring), as well as their availability to deal with swarming, predation, and feeding. In France and Portugal, beekeepers point to observational skills. Again, a close relationship can be established with the monitoring required to operate an apiary to anticipate problems that could weaken or even destroy a colony. A beekeeper should also be someone who does not refuse to engage physically. This ability extends beyond the countries of Northern Europe, and is found in Ukraine, Spain and Romania, mostly among professional or older beekeepers (>21 years of experience). Sharing practices and knowledge with other beekeepers, accepting to be a mentor, or simply of working to promote beekeeping in one's region are very rarely developed in the answers. In view of the structural decrease in the number of beekeepers in most of the regions concerned, this can be surprising, especially since beekeepers are fully aware of the situation, or even deplore it. Only four countries exceed 10% in the sample: Northern Cyprus, Scotland, Slovakia and Ireland. The profile of those interviewed corresponds to that of experienced beekeepers who are involved in beekeeping associations or beginners who probably have a mentor or who seek one for advice.

We then asked beekeepers what advice they would give to anyone interested in starting beekeeping in their region (not to mention a professional or recreational activity). The advice is quite different in terms of the best way to train in beekeeping. According to the respondents, there are many ways to do this: through an introduction offered by a local beekeeping association, an internship with a professional, or coaching with a mentor. In the countries of Northern and Western Europe, attending an apiary school seems very appropriate. It is mentioned by over 40% of beekeepers in France, Sweden, Iceland, Ireland, and Scotland. Professional support (internships, mutual aid, fixed-term contracts) is more likely to be recommended in Southern Europe. In both cases, a chronological logic is often described: firstly you are introduced to beekeeping, then you find a mentor near you, and finally, you buy colonies.

Some respondents cautioned that it is important to think about beekeeping before installing hives in one's garden or engaging in the activity. Beekeeping can indeed be far from the idea that people have of it or that is conveyed by the media. It is also the reason why an initiation year is often necessary to assess the reality of working in an apiary, and to become aware of the constraints throughout the seasons. Romanian and Greek beekeepers are most often advised to take the time to think before getting started (34%). This warning is also issued by 24 to 30% of German, Spanish and Icelandic beekeepers. While the focus is on the conditions of practice, Icelanders talk about carefully considering the location of the future apiary. On the other hand, Ukrainian beekeepers encourage people to take the plunge, rather than wait and learn from their mistakes (27%). Self-education through beekeeping literature and online tutorials is recommended by both them and the respondents in Slovakia.

Reasons for abandonment and failure in beekeeping

The respondents offered more than 30 reasons for abandoning or failing professional or recreational beekeeping. There appear to be three main reasons: lack of knowledge and experience, lack of motivation, and lack of dedication to work, or inability to perform the most demanding tasks due to age or medical conditions (Table 4; Supplementary Table S3). This can be directly attributed to the beekeeper himself. Most other reasons include lack of time, greed, impatience, and social isolation. In Eastern countries, lack of motivation appears to be the main cause of the abandonment and failure of beekeeping. Half of all Ukrainian respondents refer to it, compared to around a third in Romania and Slovakia. In Northern Europe, it is more the difficulty of the tasks and the time spent on the beehives that are mentioned. Social isolation could play a role in Ireland and Scotland. It should be noted that venom allergies are frequently mentioned by Scottish

Table 4. The main reasons for abandonment and failure in beekeeping.

	Knowledge		Motivation		Work		Time		Profit motive		Bee mortality		Cost	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Slovakia	25	27%	28	30%	26	28%	24	26%	**30**	**32%**	8	9%	12	13%
Romania	33	28%	**42**	**35%**	19	16%	15	13%	24	20%	4	3%	29	24%
Ukraine	31	13%	**121**	**50%**	27	11%	8	3%	36	15%	6	2%	19	8%
Iceland	8	20%	9	23%	4	10%	2	5%	2	5%	**11**	**28%**	2	5%
Sweden	**32**	**46%**	16	23%	23	33%	25	36%	4	6%	16	23%	3	4%
Scotland	14	24%	14	24%	**21**	**36%**	16	28%	2	3%	15	26%	10	17%
Ireland	**18**	**26%**	16	24%	16	24%	16	24%	4	6%	12	18%	7	10%
Italy	17	19%	**21**	**24%**	19	21%	15	17%	10	11%	11	12%	19	21%
Spain	**49**	**31%**	16	10%	35	22%	18	11%	11	7%	32	20%	38	24%
Portugal	34	22%	17	11%	16	10%	22	14%	20	13%	25	16%	**48**	**30%**
Greece	60	25%	**84**	**35%**	46	19%	14	6%	60	25%	16	7%	63	26%
N. Cyprus	**19**	**42%**	9	20%	14	31%	6	13%	4	9%	3	7%	6	13%
France	94	31%	37	12%	42	14%	43	14%	17	6%	**110**	**36%**	35	12%
Germany	23	35%	4	6%	**26**	**40%**	18	28%	5	8%	9	14%	11	17%

respondents (17%), which is not commonly reported elsewhere in Europe.

Some beekeepers point to situations made difficult by external factors which may have a direct impact on the level of motivation of beekeepers. They are related: bee mortality, increased operating costs, the vagaries of the weather, disease, environmental degradation, successive poor harvests, bee predators, administrative constraints, hive theft, and unsuitable bee breeds. The main factor behind the abandonment and failure of beekeeping in Iceland and France is bee mortality, while in Portugal and Greece, it is more likely due to financial constraints. The significance given to bee mortality could possibly be attributed to the small size of the apiaries (3.4 bee colonies/respondents). Losing one or more bee colonies in a small apiary can result in the end of activity, particularly if it is hard and expensive to acquire new bee colonies. This could explain why the Scots (who have 8 hives per respondent) also place a significant emphasis on bee mortality. In Iceland, beekeepers specify their answers by highlighting a cause-and-effect relationship between bee mortality and weather hazards (25%) or an inappropriate location for hive installation (23%). The causes of bee mortality are rarely specified in other countries, likely because they were covered elsewhere in our questionnaire. Portugal must be excluded due to the prevalence of exasperation with the damage caused by Asian hornets, which is believed to be a reason for abandoning beekeeping (25%, rank 2). Varroasis is also cited by 23% of respondents (rank 3). In other countries, respondents may have implicitly mentioned the absence of sanitary treatment for Varroa mites when they expressed a "*lack of knowledge*" or "*lack of seriousness*".

Beyond the difficulties, unforgettable memories for beekeepers

Based on the responses, we have identified 7 categories of the best beekeeping memories. Five of these categories are consistently represented in the 14 countries studied. Among these are "hives", "spring", "bee queen", "honey", and "family and friends" (Supplementary Table S4). Eight countries have all the categories present, which include "swarming" and "bee stings". In Iceland, the memory of the installation or opening of the first hive(s) is more important than the memory of a honey harvest, as shown in Figure 2. This may be due to less experience among beekeepers. Most of them started beekeeping less than three years ago, so they haven't gone through as many situations that might be chosen. It should also be borne in mind that the installation of a hive in this country is in general the result of a long wait. In Romania, 19% of beekeepers also consider it their best memory. Two reasons could explain this: the creation of the beehive appears more than elsewhere as the result of a more or less long personal reflection; and the beginning of the activity was sometimes made possible through a relative. The first opening of the hive could also be an unforgettable memory because it has a multi-sensory experience (Table 5).

The memorable nature of this harvest is that it was either the respondent's first or it remains a record of how much honey is produced. In Northern Cyprus and Romania, more than one in three beekeepers mentions honey, particularly in terms of quantity. The first honey harvest is most likely to take place in countries in Northern or Western Europe. When the answer is developed, it is common for the beekeeper to evoke the satisfaction he felt by giving his first pots of honey to people who were important to him. In Greece, Ukraine and Italy, the transportation of beehives to other regions for honey harvesting is sometimes mentioned. More often than in other responses, beekeepers have justified their choice, which allows them to better understand what motivates them. Many things are described at the same time: the camaraderie of hard work on its own; the spirit of adventure and the freedom to access a natural location with a vehicle coupled to a trailer or a truck; a very special relationship with nature also

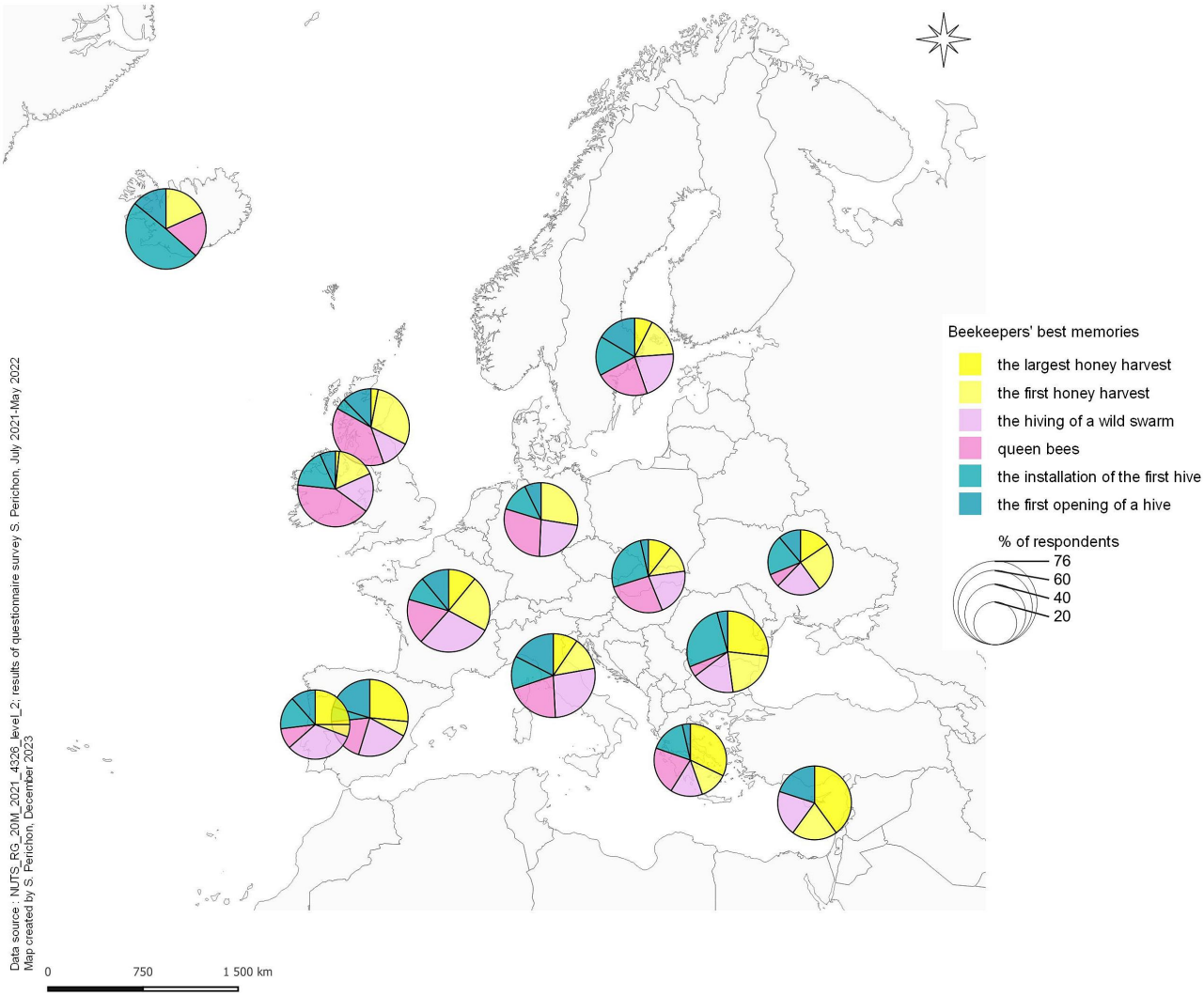

Figure 2. Beekeepers' best memories.

because most of the tasks take place at night and from dawn everything has to be ready for the bees; the hope for another harvest, etc. Some beekeepers who have sedentary beehives remember harvesting monofloral honey in an environment that is not usually conducive to its production.

In France and Ireland, almost 40% of respondents said that they had experienced natural or artificial swarming, and queen rearing or simply watching them on a hive frame. The mention of catching a swarm is made by French (21%), Italian and Portuguese beekeepers (17%). The audience's admiration is more important than catching the swarm itself, which is often a routine activity for beekeepers (Table 5). Queens may fascinate beekeepers as well. They refer to either the discovery of a queen in their first colony (Iceland and Sweden) or to a particular stage of raising queens. The subject is related to the birth of the queen, laying, marking with color pen, transporting in plastic cage, opening nucleus box, graft frame with good cells, singing of queen, and mating flight.

In Southern and Eastern Europe, the most memorable moments of a close relative, such as a father or grandfather who is also a beekeeper, can have a significant role. Over 20% of respondents in Portugal, Spain and Slovakia, mention a family member, and it's close to 30% in Northern Cyprus. The context described is often that of an introduction to beekeeping. Another category that should be given our attention is "bee stings". This risk is an integral part of beekeeping, and despite wearing protective clothing, it is not uncommon to be stung. Beekeepers sometimes make fun of chaotic scenes that always end well (Table 5). This is more common in Ukraine with 10% of beekeepers, somewhat less common in other parts of Eastern and Southern Europe (Slovakia, Northern Cyprus: 6%, Portugal: 5%), but never mentioned in Northern Europe.

Beekeepers' preferences and uses of honey, and the question of the product's price

Beekeepers' favourite honeys

The geographical logic is easier to establish when it comes to preferred honeys although, locally, several types can be produced during the beekeeping

Table 5. A selection of the 30 most beautiful memories from beekeepers.

Category: "Hives"

1) "The first opening of my hive in responsibility during my training, the noise, the vibration, the delicious warm smell, and to see so many bees for the first time, I was as cut off from the world for a moment, I only heard, I only felt, I only saw the hectic life of this hive."; 2) "My best memory is the day I received my own hive. It was the beginning of a beautiful and exciting adventure. I was the only beekeeper in downtown Reykjavik, so every time I saw a bee flying around town, I knew it was from my hive. It gives a good feeling."; 3) "In early spring, while I was feeding bees, a hive got snow and almost froze. I asked my father-in-law. His idea was to take a hot brick and put it in the hive … Miraculously, they recovered!"; 4) "When I took the bees to the countryside for the first time and returned home, I felt like I had left someone far away. I was surprised by this feeling, because bees are not an animal personified, and the feeling inside was exactly like leaving someone I knew."; 5) "One day I decided to buy two queen bees to use for the hives. I bought them from a beekeeper who has more than 40 years of experience in beekeeping. And I told him that I was buying bees from him in order to rest on these hives. So he brought the bees in the morning (just as the sun was coming up). We put them in place. And then something unusual happened. He pulls the absorbent cotton off the hives and runs off like a madman. I stay near these hives and I don't understand why such an experienced beekeeper is so afraid of bees? In fact, these bees stung anything that moved within a radius of 30 metres. Removing the frame with honey was a feat. It later turned out that this beekeeper had decided to get rid of the more rabid bees and had sold them to me. In time, I adapted to their work and they became my favourite queen bees, because they taught me many things, including patience with all kinds of people."

Category: "Honey"

6) "Five or six years ago, on August 15, I went to check out 20 hives to see what their condition was because of the heat, and I was given an unexpected 130 kg of honey."; 7) "My first harvest. Even if it's not so important for me, I admit that drawing my labels (with a friend), putting the honey in jars (recovered from right and left) and offering this little jar filled with 'golden liquid' to all those who supported me was a great moment. Everyone had some: family, friends, colleagues, neighbours … "

Category: "Swarming"

8) "I caught my first swarm with my mentor beekeeper. He was at the top of a ladder and shook the swarm of the branch and into the large cardboard box that I was holding. They landed on my head. I was wearing a bee costume. To my surprise, I found the queen on my arm and the rest was easy. That swarm was my very first bee colony I ever had, and it lasted for 3 years in my hive before I raised new queens from it."; 9) "I was in my apiary in the spring of 2019. I was inspecting the hives when I heard a buzzing sound. I see a swarm of bees coming towards me. I place the frame. I was holding in the hive … Suddenly the swarm of bees turned round me until the first bees began to land on my right shoulder … Slowly they all gathered. At first I was terrified and scared, but after I got over my initial fear and no one stung me, I moved to an empty cell shaking inside. It was a swarm of bees that fit on three frames, very good and productive, which I still have."; 10) "The first time, I picked up a swarm and removed the glove off to see if the bees were as harmless as they say they are under the circumstances. I slipped my hand into the swarm and felt the caress of the soft backs of the glomery bees. I was in my twenties and I don't know if I would do it again now"; 11) "The recovery of a swarm under a parasol in the middle of summer on a crowded beach which was successfully resolved without causing damage to third parties."; 12) "I fell off the ladder with a branch in my hand on which the swarm was sitting."; 13) "When the trap fell from a height of six metres and the bees dispersed, while I was on a tree without a mask."; 14) "It was in June 2016, when in the evening I brought the first swarm caught, and in the morning I decided to examine it early, but I had to rush my pregnant wife of the last month to the hospital. Thank God our son was born. That year, I caught 8 swarms, gathered them and 6 spent the winter."

Category: "Queen bee"

15) "Saving a queen from a hive that had been stolen. All the worker bees and the brood were dead, but I searched through the mass of dead bees and found the queen, she was still alive. I put her in a nuc' with a brood and nurse bees from two other hives. She survived and then gave a very populous hive."; 16) "When I saw my queen for the first time in my second summer of beekeeping, I never saw her the first summer, she was unmarked, but when I saw her for the first time, I felt a particularly strong experience."; 17) "I was waiting for a queen to come back from a drone congregation area and suddenly another queen came on the landing board. It was marked with a number. The bees accepted it and kept it for three years."; 18) "When a queen bee is born in an incubator and you see that the tiny larva you were recently holding on a spatula has grown into something wonderful and amazing."; 19) "When I slept at night with the queen bees bought in cages (they were on my chest all night and tickled me with their paws) - so they wouldn't get cold."

Category: "Family and friends"

20) "When my father, an experienced beekeeper, came to help me with my harvest and was impressed with the behaviour of my bees and their productivity."; 21) "My best memory is of being asked by my grandson to help facilitate an information session in his fifth grade class. We had taken the time a few times before this presentation to visit the apiary, opened a hive and allowed him to comment: the brood, the pollen, the honey reserve, the different bees, etc … …)"; 22) "Hard to say … When I was about 13 years old when I removed a swarm from a tree in the woods and took it with Dad to a hive."; 23) "After working on the hive (after the honey harvest), we sat down and the whole group talked, sang and played heligonica*. Wonderful memories for me."; "Night with my father and brother at the apiary, starry sky and the smell of honey from the hives around.. … "; 24) "As a child I loved my parents' nomadic apiary, spending the night in the steppes and forests, rolling honey in tents for two or three days at a time."; 25) "When I was 5 years old, my grandfather and I studied natural combs for honey plants."; 26) "As a child, when Dad put rye bread with cottage cheese and fresh honey from the hive on the table at lunch."

(*) Slovakian traditional music

Category: "Bee stings"

27) "When I removed the swarm from the spruce tree, six metres away, the protective jacket was pulled up, and I received 30-40 stings in the belly and back, but I did not let go of the bees from my hands … "; 28) "When he brought his first package of bees by bicycle, the apiary grew over the years to more than a hundred hives. And that day I was stung by 7 bees, it was very painful, but I did not give up."; 29) "When a hive opened in my car while I was transporting it we all ran away from the car in different directions."; 30) "The police stopped my car while I was transporting beehives because the turn signal wasn't working. They began pointing a flashlight at the trailer. The bees didn't like it at all. Immediately the police wished us a safe trip and let us go."

season. More than 70 different honeys have been identified, corresponding to monofloral honeys (54), polyfloral honeys of spring, summer or autumn, honeys associated with natural environments such as forest, mountain, permanent meadows, peat bogs, etc., and honeydews (5). On the scale of our sample, monofloral honeys are the ones preferred by beekeepers with 48% of the answers before polyfloral honeys (28%), honeys from natural environments (8%) and "honeydews" (7%). Between the European regions, marked preferences emerge. On the other hand, the analysis according to the profile of the beekeeper did not reveal any clear differences.

Beekeepers in Southern and Eastern Europe, especially Romanian (63%), Ukrainian (59%) and Portuguese (57%) beekeepers prefer monofloral honeys. On a continental scale, the honeys most often cited are heather (11 countries out of 33 represented), lime tree (10), acacia (9), rape (8), chestnut and thyme (7). Not surprisingly, the map of preferences coincides with the distribution area of these plants (Figure 3). In other words, the preferences

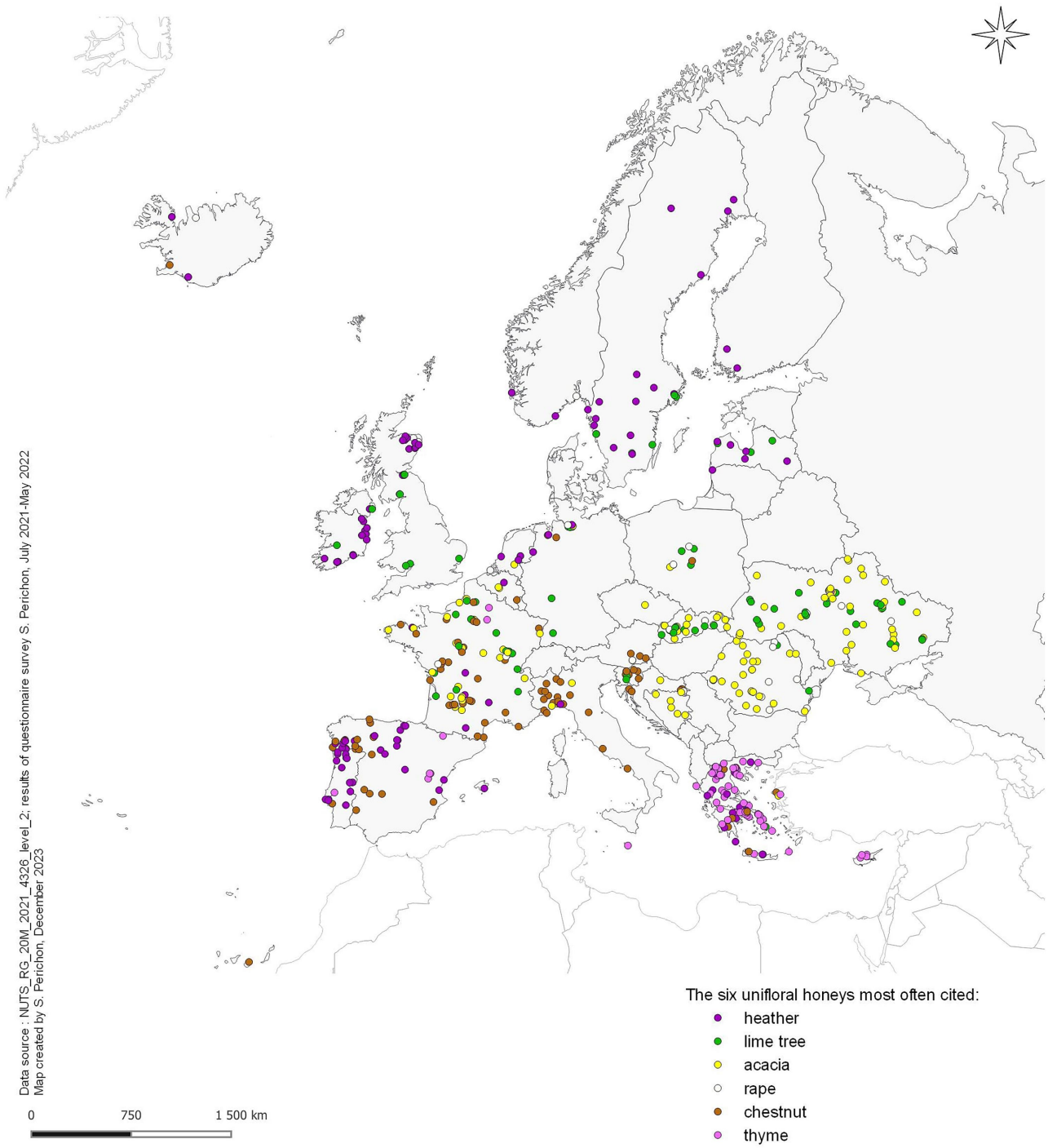

Figure 3. The six unifloral honeys most often cited.

privilege local products and in a more restrictive way the honey or one of the honeys that these beekeepers produce. The heather is preferred in the countries of the North of Europe and in Galicia where the moors are very present in the landscape. Acacia honey is the preferred honey of the Romanian beekeepers (25% in front of the willow 12%) and of the Ukrainians (24% in front of the lime tree 9%). Other preferences seem to be very much linked to regions or countries: honeydew and thyme honey in Greece (32% and 20%), lavender honey in Portugal (29%) or chestnut honey in northern Italy (21%). More surprisingly, in France, all these honeys are quoted without always taking into account the areas of plant distribution on a national scale. Some French beekeepers would thus choose other honeys than those produced in their region? As for the preferences for polyfloral honeys, we find the same logic: the beekeepers concerned generally reside in territories where, with a sedentary apiary, it is difficult or even impossible to make a honeyflow on a flowering. Moreover, these beekeepers sometimes express this preference by default, in particular for "all flowers" honeys coming from agricultural area. This honey comes first in Ireland (37%), Spain (32%), Slovakia (31%), Italy (31%) and France (29%). Other

beekeepers prefer mountain honey (Northern Cyprus), forest honey (Austria), bog and moor honey (Iceland, Scotland, Ireland).

Beekeepers justify their preference on the basis of a sensory evaluation: taste first (63%), sometimes perfume (12%) and colour (9%). Texture can be a decisive element because it determines uses and vice versa. We will come back to this. Three other criteria appear in the answers: the origin of the product, the medicinal properties and the memories (of childhood). The origin of the product concerns the bees or the area of their forage or food supply. The distinction is rich in meaning because it could express an affective link with the insect - the preferred honey is first of all that of its bees whatever the flowers foraged, the texture, the properties, etc. -, or an attachment to a particular product. -, or an attachment to the place of life of the beekeeper. It is in Ireland (27%), Iceland (22%) and Scotland (18%) that the link with the bee would be the strongest. The beekeepers are comparatively older than the average of our sample and they run small apiaries (<10 hives). In Portugal (20%), Sweden (19%) and Spain (18%), the foraging area around their beehives is a secondary motivation, expressed by experienced and rather elderly beekeepers. Finally, Romania (20%) is the only European country that places medicinal properties as a criterion of choice in the same way as the gustatory qualities. These properties are not directed towards specific honeys, all would seem to be concerned. Paradoxically, when these beekeepers are questioned about their uses of honey, few of them mention care, which would suggest the consumption of several honeys.

Honey's various uses for beekeepers

Nearly 80 uses of honey were noted in the questionnaires. For the most part, they belong to the following categories: 1) consumed with a spoon, 2) associated with cereals (fresh bread, toasted bread, porridge, muesli, pancakes, etc.), 3) associated with dairy products (milk, butter, yoghurt, cheese), 4) used as a natural sweetener in water (tea, herbal tea, fresh water), 5) used for healing (coughing, healing, etc.), and 6) used for culinary preparations. As before, regional or national specificities appear in the food habits (Figure 4). For example, honey on bread for breakfast is very common in Scotland (77%), in the Hamburg region, in Slovenia, in Ireland and in Iceland (>50%); honey on porridge (oatmeal porridge) is even the most frequent use of honey among Irish beekeepers (53%) and the second most frequent use among the Scots (41%). The replacement of refined sugar in tea (or herbal teas) with honey is most common in Northern and Eastern Europe, notably in Sweden (64%), Slovakia (58%) and Romania (54%). The use is often associated with the cold months of the year. Ukraine is characterised by the use of honey in fresh water, sometimes with lemon. The acacia honey, more liquid than the others, allows this preparation without difficulty. Besides, in the preferences of Ukrainians, the liquid texture was the second motivation (17%) after the taste qualities. In cooking, honey is used not only as a sweetener, but also as a flavour enhancer. It is in the North of Europe that the use in cooking is the most diversified and the most frequent (49% in Sweden, 41% in Scotland, 36% in Iceland) while it is almost nonexistent in the opinion of the beekeepers of the East. Age does not appear to be a discriminating parameter.

Is the price of local honey too high?

The question of production costs comes up again when we ask beekeepers what they would say if a buyer complained about the price of local honey. Paradoxically, in countries where beekeepers have explained the failure or abandonment of activity because of costs, this criterion is not usually invoked to justify a high price. The price of honey is explained by the high quality of the product (10 countries with a rank of 1, and 4 with a rank of 2), while Icelandic beekeepers point out the rarity of the product. The proportion of beekeepers quoting the higher quality of local honey is high in Ireland (49%), Spain (45%) and Romania (41%). Irish beekeepers (31%) and Italians (26%), Germans and French people (25%) make the link between the price of honey and the amount of labour involved in its production for the beekeepers and their bees. In some cases, the number of kilometres travelled by bees to produce 1 kg of honey or the number of flowers harvested is mentioned. Beekeepers also put the price of their honey into perspective by comparing it with other local products like wine and cheese, or how much a pack of cigarettes cost. Finally, they point out that a pot of honey is not emptied within a day and can also be kept for several years. Other beekeepers regret that consumers ignore the realities of local beekeeping (Spain 23%, Ukraine 18%, Northern Cyprus 17%). When some beekeepers invite them to help them in their apiaries for a few days, or when they offer to look after a few hives, it is also to raise consumer awareness about the personal investment that beekeeping requires. The invitation is mostly from Portuguese (35%), Romanian (15%) and Italian (12%) beekeepers. It might reflect some kind of frustration. If consumers prefer the price to the quality and origin of honey, beekeepers give them the address of a discount supermarket where they can go to buy false honey or honey of doubtful origin: Slovakia 33%, Ireland 21%, Scotland 20%, and Greece 19%. For many beekeepers, especially in

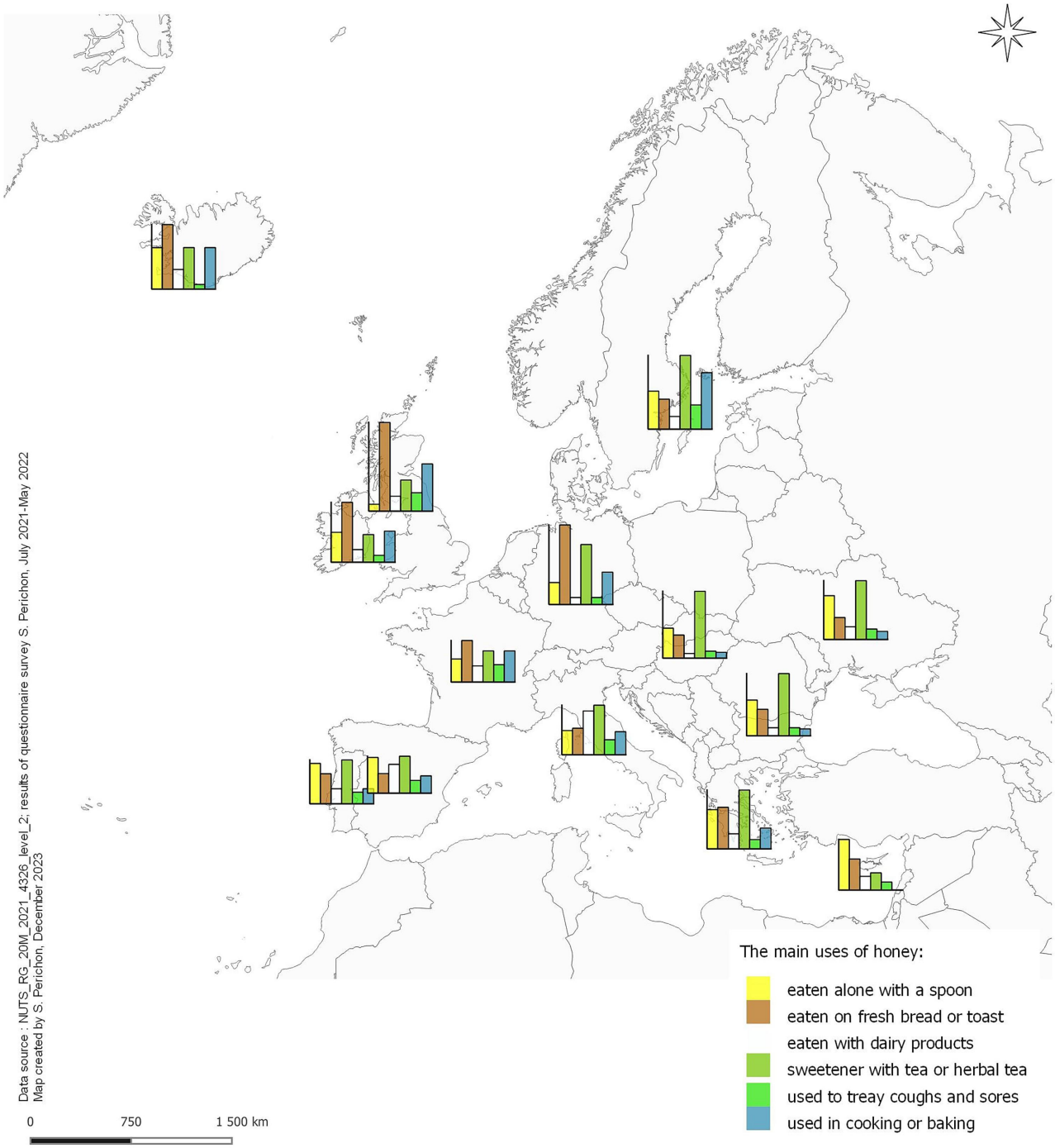

Figure 4. The main uses of honey from beekeepers.

Northern Europe, the mere mention of "*Chinese honey*" suffices to express the worst in beekeeping. In Northern Cyprus, almost 40% of respondents consider that the price of local honey remains much lower than it should be. This opinion is shared by 24% in Greece and 22% in Sweden. Some accuse the state of culpable indifference on the issue of mass imports of honey, while others think that amateur beekeepers tend to break prices.

Discussion

It is often difficult to explain what might lead a beekeeper to give up beekeeping, as the reasons are varied and often personal. Several profiles were described during the survey. First, some think that abandonment has to do with health problems or old age; for others, it is the degradation of the environmental or economic context that causes the discouragement of beekeepers. Bee mortality is accounted for by one of several factors. It's worth noting that certain countries such as Spain have a correlation between mortality rates (Gray et al., 2023) and the importance of this factor as a reason for abandoning or failing in beekeeping. In contrast to previous research (Etxegarai-Legarreta & Sanchez-Famoso, 2022; Fedoriak et al., 2021), respondents seldom bring up bee breeds, diseases, or other matters that

are crucial for successful beekeeping. However, the context in which they live seems to influence their opinion in the same way as age or level of experience. When beekeepers complain about strong and repeated pressure on their bees, they recognize the abandonment because they themselves acknowledge moments of doubt at times. Therefore, they seem to be talking about what might cause them to give up. On the other hand, when the pressure on the bees is perceived as low to moderate, abandonment is interpreted as a lack of motivation, a lack of knowledge, and is stigmatised. This stigma is particularly apparent in the countries of Eastern Europe where beekeepers are often younger but already experienced. Among beekeepers using non-conventional hives (Perichon, 2021), we find a narrative in which failure is due to a state of mind or a level of social behaviour, less often to pressure on the bees. In both cases, a large proportion of beekeepers also consider disappointment with honey production or financial gain as an explanatory factor. Some of the beekeepers, who most often live in Eastern or Southern European countries, are questioning the non-selectivity of the aid granted to the installation, which in their opinion still benefits dishonest professionals. The latter would put an early and voluntary end to their beekeeping activity once they had received the aid. In fact, the negative impact of subsidies on beekeeping is due to the support given to beginners with no experience. They are not always aware of the harm their poor beekeeping practices can cause to many beekeepers around them. Health is often a key issue in opinions, particularly among professional beekeepers in all countries. In their view, the failure or abandonment of beekeeping can also be explained by ideological motives involving practices with heavy consequences: minimal inspection of colonies to the refusal of anti-varroa treatments. However, as Kahane et al. (2022) point out, based on a Q methodology study in Cornwall (UK), whatever the beekeepers' practices, they are all driven by a desire to minimise the stress and suffering of their bees. Being concerned about the welfare of your bees before your self-interest is the philosophy of a 'good beekeeper' according to most of those we interviewed in Europe. The way in which it is expressed may vary, but that is what it is all about. The duality between, on the one hand, the pleasure of observing one's bees in good health, of seeing them multiply, of seeing them foraging on the flowers in one's garden, of harvesting honey; and, on the other hand, the frantic search for a profile at the expense of the bees, remains very present in the answers. It transcends the profiles of beekeepers and European regions, and does not appear to be an exclusive feature of leisure beekeeping (Tubene et al., 2022). Beekeeping, and perhaps even more so in the case of leisure activities, sometimes puts its practitioners to the test. From season to season, emotions can change from great joy to deep discouragement. It may contribute to an idealisation of memory. According to Perichon (2021), experience tends to guide the choices of non-conventional beekeepers. With the number of years of experience, memories focus first on observing situations and then on increasingly technical practices; memories of sociability moments are more common among beekeepers whose beekeeping is a family history, and often also among the oldest or most experienced beekeepers. If this logic can be applied in some countries of Western and Northern Europe, it is nonetheless essential to note a significant difference compared to beekeepers in non-conventional management. The beekeepers we interviewed, particularly in Eastern and Southern Europe, often refer to memories of an exceptional or unexpected honey harvest. Ideological motives also seem to find a strong expression in the context.

In Europe, there have been numerous studies on honey preferences among consumers, but not specifically on beekeepers. A comparison could be instructive for this reason. It's uncommon for our survey respondents to talk about honey they don't produce. They generally favor monofloral honeys such as heather, lime, acacia, rape, chestnut, and thyme honey. From this perspective, beekeepers seem to share consumers' tastes. In Croatia, acacia honey is also preferred to floral and meadow honeys (Brščić et al., 2017); in Romania and Slovakia, acacia and lime honeys are preferred (Horská et al., 2018; Šedík et al., 2022). Beekeepers' preferences are similar to consumers', except for the price, since honey produced in their apiaries is the favorite. If taste, texture, geographical origin, therapeutic properties, etc. are common criteria, the importance attached to each may vary depending on the profile of the beekeeper or the consumer. In Italy, Testa et al. (2019) indicate that the therapeutic properties of honey would be a criterion higher than the price and taste in the purchase act, which would be confirmed by Pocol et al. (2022) for Romania. Another study, also in Romania, but made with a sample of students, would focus on the taste and geographical origin of the product (Šedík et al., 2022). For some consumers, the price of honey remains a decisive criterion when buying (Cosmina et al., 2016; Kličković et al., 2017; Kowalczuk et al., 2017). This does not mean that consumers in Europe are unwilling to pay more for honey of superior quality and authenticity (Ballco et al., 2022; Bissinger et al., 2019; Horská et al., 2018; Kleisiari et al., 2022). According to the beekeepers we interviewed, the price of their honey is linked to

its superior quality and traceability compared to cheap honeys whose origin and composition may be doubtful. In European countries, particularly Greece, beekeepers believe that the price of honey is in fact lower than it should be, taking into account the value of the product and the additional costs of production. As well, in the Balkans, unlike in Western Europe, consumers recognise that local honey is inexpensive (Kleisiari et al., 2022). Buying directly from small producers can save money, as some of the beekeepers we interviewed recommend, and that's what consumers do (Brščić et al., 2017). As they pointed out, meeting a beekeeper is also an opportunity to discover the world of bees through people who have a passion for what they do.

Conclusions

European beekeeping is built on regional traditions that span from ancient practices, such as beekeeping in trunk hives in Poland and Belarus, to the development of a distinct way of life in Slovenia. The tradition of keeping honey bees is being perpetuated by passionate beekeepers throughout Europe. Being passionate means not having to worry about time or energy, and also having the ability to be patient and humble in the face of nature. It appears that the respondents are describing this profile as the "*good beekeeper*". Those who practice beekeeping believe that technical knowledge is necessary for the activity, which can only be acquired through hard work and the support of experienced beekeepers. Local associations play a crucial role in promoting beekeeping, but Internet tutorials should not be overlooked. When respondents associate abandonment or failure with beginning beekeepers, they find that personal motivation, thirst for knowledge, and experience are decisive. Others show more understanding when confronted with external factors that are likely to demoralize them. The question about the best memory is also a valuable source of information. For example, some beekeepers who presented the activity as recreational and disinterested chose their largest honey harvest as their best souvenir.

The organoleptic properties of honey are closely connected to the land foraged by bees and its melliferous flora. For respondents, this product is not only the outcome of insects and beekeepers' efforts. Like other exceptional agricultural products, it has a geographical dimension that is displayed locally through a protected designation. It seems that beekeepers have a strong attachment to the honey produced by their bees, regardless of its quality. In cases where there are multiple harvests throughout the year, they tend to opt for honeys that are recognized as typical of their region. Geography is a key factor in beekeepers' responses to questions about local honey price. Some suggest that individuals who find these honeys too costly use honey from different countries outside the European Union, which are known for adulteration. Thankfully, a growing number of consumers are aware that local honey is produced by beekeepers and bees who work tirelessly to guarantee our well-being.

Acknowledgements

We would like to thank the following organisation for supporting our study by distributing our questionnaire to their members: Irish Beekeepers Association; for the United Kingdom: Edinburgh & Midlothian Beekeepers' Association, Aberdeen & District Beekeepers Association, High Wycombe & District Beekeepers' Association, Shropshire Beekeepers Association, Welsh Beekeepers Association; Icelandic Beekeeping organisation; for Sweden: Nordbi Association Sweden, Biodlarna Sweden; for Spain: Gran Canaria Beekeepers' Association, Eivissa Beekeepers' Association (Balearic Islands); for France: National Federation of Apicultural Technical Groups (FNGTA), National Beekeeping Union (SNA), National Society of Veterinary Technical Groups (SNGTV), National Federation of Beekeeping Development Network (ADA-France), Departmental Beekeeping Unions and Associations of Côte d'Or, Pyrénées-Orientales, Lot, Lot-et-Garonne, Charente, Loir-et-Cher, Aisne, Somme and Côtes-d'Armor; for Belgium: Royal Beekeeping Society of Wavre; for Greece: Bee Club Pellas-Macedonia, Beekeeping Centers of Western Macedonia (Kozani), Piraeus - Cyclades (Piraeus) and North Aegean (Mytilene, Lesbos), Beekeeping Cooperatives of Rethymnon and Andros, and Beekeeping Associations of Kavala, Karditsa and Chania; for Portugal: Foundation for Science and Technology and The National Federation of Portuguese Beekeepers. We thank Egill Rafn Sigurgeirsson for agreeing to translate our questionnaire into Icelandic and for distributing the questions to the Icelandic beekeepers; Jean-Xavier Saint-Guily (Bergerie Nationale de Rambouillet), Robert Svensson (Nordbi Association Sweden) and Hanna Udding (Biodlarna Sweden) for distributing the questionnaire in their networks; Garrett Dempsey for proofreading this article. We would also like to thank all the beekeepers who agreed to answer our questions.

Notes

1. URL: https://ec.europa.eu/agriculture/eambrosia/geographical-indications-register/.
2. URL: https://www.evalandgo.com/form/231600/s/?id=JTk4ciU5OXElOTklQUE%3D&a=JTk2bCU5Mm4lOTYlQTk%3D.
3. We consider "professional beekeeper", those respondents who declared beekeeping as their only professional activity, independent of the number of hives which they manage.
4. As an indication, buying and introducing a colony costs around €600 per unit and €100 for a queen.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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