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RESEARCH ARTICLE

REVISED Apiculture sector policies - positive and negative elements to support healthy market conditions

[version 2; peer review: 2 approved, 1 approved with reservations]

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Abstract

Background

The apiculture sector is facing severe challenges, and the honey market health is generally low. Whereas some countries have a positive honey trade balance, the self-sufficiency with honey in the EU is a low as 63% and there are suspicion of fraud with cheap honey imports, deteriorating the business economy like a vicious circle. Given that policies typically aim to regulate markets either directly or indirectly, it was found pertinent to identify examples of policies that are perceived as either being beneficial or deteriorating for a thriving apiculture sector, for the purpose of establishing a basis for sharing these examples via policy recommendations.

Method

An international, web-based survey using open-ended questions was designed to gather opinions on policies perceived as positively or negatively influencing the health of the honey market. The questionnaire allowed respondents to list up to three examples each of positive and negative policies. Members of the COST Action 22105 BeSafeBeeHoney project, were encouraged to assist in gathering responses.

Results

Seventeen responses containing 74 policy examples were collected from 13 countries: Albania, Bulgaria, Bosnia and Herzegovina, Croatia, Denmark, Germany, Kosovo, Italy, Serbia, Spain, Slovakia, Türkiye, and

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the United Kingdom. The provided policy examples were compiled and organised in a spreadsheet for further grouping and sorting using various criteria. The 13 countries were categorised into three groups based on positive, slightly negative, or negative honey trade balances.

Conclusions

Qualitative analyses for patterns in responses reflected a general perception of three decisive policy areas, namely i) subsidisation, ii) product classification and labelling, and iii) regulations governing pesticides and veterinary medicine. Both positive and deteriorating policy examples were given for these issues. However, our research highlights fundamental challenges within the sector resulting from irregular market mechanisms, with indications that the predominant market actors operate largely beyond public oversight, contributing to concerns about effective regulation and control.

Keywords
Apiculture, policies, market health, honey

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REVISED **Amendments from Version 1**

We have revised the manuscript as follows:

-Better explaining the aims of the BeSafeBeeHoney project and the role of the research in relation to that, including the intention to use the research findings as background material for later formulation of policy recommendations.

-A new paragraph has been added to highlight the originality and contribution of the study, explaining how it complements existing apiculture policy research.

-The analysis of honey production, consumption statistics, and self-sufficiency etc. of the countries represented by the responses now appears in a dedicated section. It is emphasised that quantification alone is used to describe the responses. This modification enhances the manuscript's flow and more accurately reflects that the study is grounded in the compilation of policy perceptions, based on responses to open-ended questions. The revised manuscript now more accurately reflects the social science nature of the study.

-The stated objective is reformulated to clearly emphasise that the study does not aim to performing statistical analyses but instead has focus on gathering and analysing perceptions within a social science framework, where responses are expected to vary widely and are valued for their qualitative insight.

-The methodology section has been expanded to explain the rationale for using open-ended questions, underlining that this approach is well-suited for capturing policy perceptions.

-Since the initial submission, one additional survey response was received and the manuscript as well as the associated background data have been updated accordingly.

-To improve transparency and credibility, we have added further detail in the results section, for example by specifying the number of policy examples provided for the identified key themes.

-The discussion is now in a separate section and expanded to include recommended directions for future research to strengthen the conceptual coherence and academic value of the manuscript.

Any further responses from the reviewers can be found at the end of the article

Background

Honeybees are essential pollinators, with about 75% of major crops relying on pollination, which boosts global crop production by approximately 9%[1]. The demand for beehive products, especially honey, is increasing across Europe. This trend is largely attributable to the presence of bioactive compounds and the associated health benefits found in many of these products, including notable anti-inflammatory, antioxidant, and antimicrobial properties.

However, the apiculture sector within the European Union is currently facing several significant challenges. The total number of beehives declined by 1.2% from 2022 to 2023, primarily due to a reduction in the number of professional producers managing more than 150 hives. Between 2018 and 2022, the average market price for honey decreased from €6.42 to €6.25 per kilogram, largely attributed to increased competition from imported honey of questionable quality[2]. Notably, this decline occurred during a period marked by a general 42% increase in overall food prices[3]. Imported honey averages just €1.89 per kilogram, and with imports accounting for approximately 37% of EU consumption, the region remains significantly short of self-sufficiency[2]. Nearly 76% of honey imports originate from Ukraine and China[2].

Concerns about the quality of imported honey are linked to widespread allegations of fraud, particularly adulteration, often involving the blending of honey with inexpensive syrups, which is facilitated by natural variance in honey's constituents under the EU Honey Directive[4]. It is estimated that up to 10% of internationally traded honey is adulterated, with rates potentially reaching 30% for imports from certain countries, including China[5,6]. The European agriculture umbrella organisation COPA-COGECA, which also represents beekeeping associations, has described the state of the honey market as alarming[7].

A healthy market is typically defined by the degree of self-sufficiency (the size of the production in relation to the size of the consumption), which is closely related to and often being used as a synonym for the trade balance (exports minus imports), as well as a profitable and stable production economy where sales prices exceed production costs and the price volatility is minimal[3]. Both the degree of self-sufficiency and the trade balance serve as key indicators of the health of the honey market and, consequently, the thriving of the apiculture sector. Export and import figures are typically sourced from official trade statistics and are therefore considered more reliable than production and consumption data, meaning trade-balances considered more reliable indicators than self-sufficiencies.

Behind the general honey market situation in the EU, there are wide variations between countries. For instance, whereas EU's average self-sufficiency with honey as aforementioned is as low as 63% (100% minus imports of 37%), a few EU countries like Romania, Czechia, Portugal and Hungary are more than self-sufficient[8]. The differences in countries honey trade balances may be attributed to the size of the honey production, including availability of floral resources[9] and other factors, as well as the honey consumption, that depends on culinary traditions and many other factors.

However, the trade balance, including the size of the honey production is also expected to be affected by apiculture sector related policies, since in their essence, policies are made for regulation of markets, directly or indirectly. A clear link between policies and markets is not least the case for the European Union, which is concerned about the functioning of the internal market - see for instance Bahr (2024)[10]. Policies that directly influence markets comprise, for instance, trade agreements, subsidy programmes and competition policy. Examples of indirect policies are regulations on feedstuffs, wages, energy, fertilisers, climate and environment.

Direct EU regulation of the honey market happens via the Honey Directive[4], latest amended in 2024 by the so-called Breakfast Directive[11], which among other includes a definition of honey and requirements to its labelling. EU has enabled support to the beekeeping sector via the Common Agricultural

Policy (CAP) since 1997, whereas it has been mandatory for Member States to prioritise financial support to the sector since 2023[12]. Typically, EU Member States as well as countries outside the EU, have a beekeeping law or a similar regulation, which has the role of recognising the sector and set some basic frames for its activities. However, regulation of the apiculture sector, including harmonising national policies with EU directives in EU Member States is implemented differently into national policy frameworks. For EU it is given the aforementioned market challenges clear, that the policy framework is not fully effective in supporting the apiculture sector in all Member States.

The BeSafeBeeHoney[13,14] project is a COST Action supported by the COST Association - European Cooperation in Science and Technology, that receives financial support from the European Union. The project focuses on improving the safety, quality, and sustainability of beekeeping and bee products in Europe. It operates through international collaboration among researchers and various beekeeping stakeholders to improve the European honey sector, focusing on nutrition, health, abiotic and biotic stressors, and pollination within agrarian ecosystems. In addition, an important and transversal objective of the project is to develop and disseminate recommendations for policies and practices that are beneficial for the apiculture sector, and vice-versa work for removal of policies that impairs the sector.

On this background, the objective of this research is to collect examples among BeSafeBeeHoney partner countries of policies that are perceived as beneficial or deteriorating for a thriving apiculture sector. The wider purpose is to establish a basis for development of BeSafeBeeHoney policy recommendations, and thus work for a wider implementation of beneficial apiculture sector policies, and vice-versa discontinuation of detrimental policies. The research builds on the assumption that the wider aim of apiculture sector policies is to support healthy markets, and that honey trade balances is the best indicator for that, wherefore collected policy examples are compared to the market health of the associated countries, notwithstanding that several other factors also affect market health.

The current research aims at contributing to existing research of apiculture sector policies, and it fills a gap by collecting and analysing perceptions on current policies that are perceived as either beneficial or deteriorating for the honey market, for the purpose of a more disseminated use of beneficial, and discontinuation of deteriorating apiculture sector policies. For instance, Maderson (2023)[15] analysed obstacles and opportunities for co-production of agricultural policy with beekeepers, but did not focus on specific policy issues. Bertoni *et al.* (2025)[16] analysed 29 variables, considered drivers for the performance of beekeeping activities across the environmental, social, and economic dimensions, thus contributing to the understanding of factors of importance for beekeepers' optimisation of their honey production, however, without clearly relating the findings to current apiculture sector policies in a wider geographical context. Delso *et al.* (2019)[17] explains how EU's (then planned) Common Agricultural Policy (CAP) for 2021–27 can support the apiculture sector, and the work can be interpreted as a guidance to the BeeLife network for ways to impose their influence on the (then future) national CAP strategic plans via policy processes to ensure these are being formulated to give the best direct and indirect support to the sector, whereas the current research aims at assessing more widely the already implemented policies that are perceived as either beneficial or detrimental. Bixby *et al.* (2023)[18] analysed factors of importance for optimising honey production and its profitability, including loss factors, and while this gives some insight into ways for improving honey self-sufficiencies, the research does not relate to specific polices. Bruneau *et al.* (2024)[19] are analysing the honey market, among others, on basis of Eurostat and Faostat data, mentioning challenges that include fraud, and provide some policy recommendations that represent the authors' perspectives, being employers or members of BeeLife, while the current research more widely collects and analyses perceptions about already implemented policies.

Method for collection of perceptions

Opinions about examples of promoting or deteriorating policies were collected via an online survey questionnaire. In addition, an interview was made in one case.

The online survey was performed using Google Forms[20]. The survey questionnaire[21] comprised an introduction, where the purpose was explained, it was reminded what the meaning of policies are, and reference were made to prevailing GDPR rules[22] and possibilities for clarifications. The introduction part made it possible to leave the name, e-mail address and organisational affiliation of the respondent, and it included the only obligatory field of the entire questionnaire, namely the country of the respondent. Following that, there were three similar sections with entirely open-ended questions, where respondents could write freely about a policy considered beneficial for the apiculture sector, and three sections, where respondents could indicate policies considered detrimental to the sector. It was possible, on a voluntary basis to provide details, such as to indicate the type of the policy, provide a link to the specific policy, provide a reference to the policy (law number or alike), indicate the geographical scope, and indicate the impact of the policy, impact groups being aligned with the themes of the BeSafeBeeHoney work groups.

The survey was exploratory, encouraging participation from individuals that willingly would express their opinion about beekeeping policies, including beekeepers and their associations, using the BeSafeBeeHoney network for promoting the survey. The responses were not intended to be statistically generalisable, but rather for obtaining insight into examples of apiculture sector related policies across diverse national contexts inside and outside EU, that were perceived as notably beneficial or deteriorating for a thriving apiculture sector.

The use of open-ended questions was well considered and takes basis in the situation that honey policies are structured widely different in national policy frameworks, and that it adds further to the complexity that BeSafeBeeHoney members represents both EU and non-EU member countries. Given this context, using questionnaires with closed-ending questions, largely giving

respondents the possibility to answer "Yes" or "No" to a defined set of questions, would have meant an inherent risk for not having included questions on issues that in a given country would be considered of being among the most supportive or the most detrimental for the apiculture sector. The use of open-ended questions is a well proven social science method, especially for the aims of exploring issues related to perceptions[23], and is a well-suited methodology in the case of co-creation purposes.

The decision to use open-ended questions is entirely in line with the objective and means that responses must be given a qualitative analysis for identification of patterns in respondents' perceptions. Open-ended questions are not likely to yield responses using similar formulations, and cannot be analysed statistically. Each expressed perception is unique and has a value in itself.

Using Google Forms meant that the respondent could have an automated language translation of the survey, most accessible in case it was accessed in a Chrome browser. Using Google Forms also meant that management of the survey was facilitated by functions to register and edit survey questions, receive email notifications every time a response was collected, view responses in a compiled format as well as individually, and download responses in comma separated file (.csv) format for further analysis.

The survey was launched at the first BeSafeBeeHoney Conference, held in Larissa in Greece in the days 28–29 May 2024, where it was promoted in connection to the conference session on policies, and via a poster. A QR code was displayed on the poster and in a PowerPoint for the introduction to the WG5 session of the Conference, to ensure easy access to the survey questionnaire. In addition, the survey was promoted via a Newsletter, send to more than 130 Work Group 5 members on 8 July and again on 13 September 2024. Additionally, the policy survey was promoted through the project webpage[14] and the project newsletter, The BeeLetter, in June 2024.

Any numerical summaries and country groupings are provided solely to describe the dataset and should not be interpreted as evidence of causal or statistical relationships.

Description of collected policy examples

16 responses were collected, representing 12 European countries, and an interview-based response was additionally collected in one country.

One response from Poland was empty, probably due to some technical issue, whereas four countries (Serbia, Bosnia & Herzegovina, Croatia and Türkiye) each provided two responses. Thus, 74 policy examples were provided by 17 respondents from 13 countries[1]. The responded policy examples are organised in a spreadsheet[21] to ease analysing. Table 1 shows, how the provided policy examples are distributed over issues and perceived as having positive or negative impact on honey market health.

Table 1. Survey responses, distributed over issues and perceived as having positive of negative impact on honey market health.

Issue	Number of responses		
	Promotional policies	Deteriorating policies	Total
Abiotic stressors	4	8	12
Biotic stressors	3	2	5
Disease	8	1	9
Nutrition	7	7	14
Production systems & economy	26	8	34
In total	48	26	74

The responses represent countries with a total of approximately 230,000 tonnes of annual honey production, whereof 83,500 tonnes in EU Member States, based on Faostat data[24]. For comparison, the total EU honey production was 286,000 tonnes in 2022[2].

Table 1 shows that 34 of 74, or around 46% of expressed perceptions relates to the issue of production systems and economy, which compared to issues on abiotic and biotic stressors, disease and nutrition are seen as having the highest importance for a thriving apiculture sector. It can also be concluded that each respondent (excluding Poland) on average provided 4.4 examples of promotional or deteriorating policies, and that 48 of 74, or almost two thirds of the provided policy examples were perceived as having positive impact for the apiculture sector.

Table 2 presents honey trade balances for countries represented among the survey responses.

As a side effect on the attempt to describe the survey dataset by statistics on the represented countries, there were discovered some discrepancies. Variations between the reported trade balances, whether derived from Eurostat or Faostat data, suggest that official statistics on the honey market may not be entirely consistent. Also, some deviation to honey statistics provided by World Integrated Trade Solutions are observed[25]. Another indication for this is that Denmark in accordance with information provided by the Danish Beekeeper Association's website[26] produces 3–5,000 tonnes of honey annually, which is two to three times higher than indicated by the Faostat-based figures behind Figure 1.

Imprecise statistics regarding honey may result from the fact that a significant portion is produced by hobbyists and sold informally outside of regulated market channels. According to

[1] *Kosovo is counted as a country in this respect, but neither Eurostat nor Faostat provides honey statistics for Kosovo.*

Table 2. Honey trade balance in 2023 for selected countries, based on Faostat data on export and import as well as population[24,27] and compared with Eurostat based data for EU Member States[28]. Countries are sorted descending after the Faostat-based trade balance. No statistics exists for Kosovo.

	Faostat-based data				Eurostat data
	Exports, tonnes	Imports, tonnes	Population, 1,000	Per capita trade balance, kg	Per capita trade balance, kg
Bulgaria	10,991	3,226	6,796	1.14	-0.19
Serbia	1,510	377	6,773	0.17	
Türkiye	9,316	15	87,271	0.11	
Slovakia	1,803	1,762	5,518	0.01	-0.17
Albania	4	51	2,402	-0.02	
Spain	27,811	31,383	47,912	-0.07	-0.18
Bosnia and Herzegovina	7	469	3,185	-0.15	
Denmark	2,349	4,186	5,948	-0.31	-0.28
Italy	5,730	24,361	59,499	-0.31	-0.08
Croatia	733	2,776	3,896	-0.52	-0.19
Germany	18,574	64,769	84,548	-0.55	-0.43
UK	2,274	50,927	68,683	-0.71	

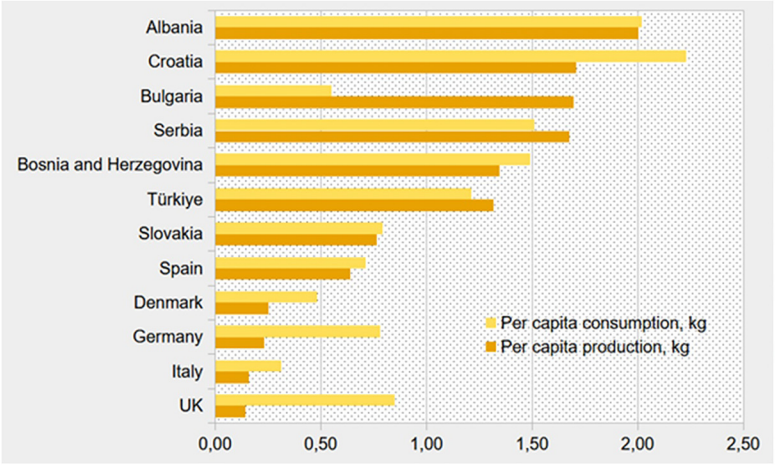

Figure 1. Per capita annual production (dark orange) and consumption (light orange) (kg) of honey in selected BeSafeBeeHoney countries (Based on data of Faostat, 2023[24,27], production figures for Italy based on Faostat data for 2022[24,27]).

information provided by the Danish Beekeepers Association[26], approximately 55% of the honey production is attributed to hobby beekeeping, and similar trends are likely present in other countries. Such circumstances can significantly impede the effectiveness of standard market mechanisms and may create opportunities conductive to unlawful activities.

These contrasts are already indicated in Table 2, and further illustrated by Figure 1, showing significant differences in consumption and production of honey in countries behind the responses.

Figure 1 presents a general pattern, though with some exceptions, where countries with high honey production also tend to have higher consumption. A comparison of Table 2 and Figure 1 indicates furthermore a possible relationship between a high honey production and a positive trade balance, as seen in Bulgaria and Serbia. Conversely, countries with lower

honey production, such as Germany, Italy, and the UK, are among those with the most negative trade balances.

On basis of Table 2, we can divide countries in 3 groups dependent on their annual trade balance per capita according to Faostat:

1. Positive per capita trade balance: Bulgaria, Serbia, Türkiye and Slovakia
2. Slightly negative trade balance, between 0 and -0.5 kg honey per capita per year: Albania, Spain, Bosnia and Herzegovina, Denmark and Italy
3. Negative trade balance, under -0.5 kg honey per capita per year: Croatia, Germany and UK

The countries are shown in Figure 2, using the above definition of positive, slightly negative or negative honey trade balance.

Table 3 shows how 39 out of 74 national policy examples divides on promotional and deteriorating examples for the three trade balance groups of countries, whereas 35 policy examples were related to EU or other international policies.

Qualitative analysis of responses

Since policy examples were collected using open-ended questions, there are no identical responses, but there are responses that relate to the same issues and some general patterns in responses are identified:

- **Abiotic stressors**

  Abiotic stressors, including pesticides and veterinary medicine was among the policy areas that respondents saw as most decisive for a thriving apiculture sector. The issue was exemplified in five deteriorating policies, including an example from UK, where pesticides that were prohibited when UK was EU member, now are allowed again (e.g. neonicotinoids), and an example from Serbia that mentions non-restricted use and sale of antibiotics. Four beneficial policy examples were given, including one that relate to EU regulations that reduce the use of pesticides to a minimum, and one dealing with a Codex for Bee Products in Türkiye that reduce the risk for chemicals to enter honey and other bee products.

  In line with this, a key recommendation at the 2024 BeSafeBeeHoney Conference was to work for

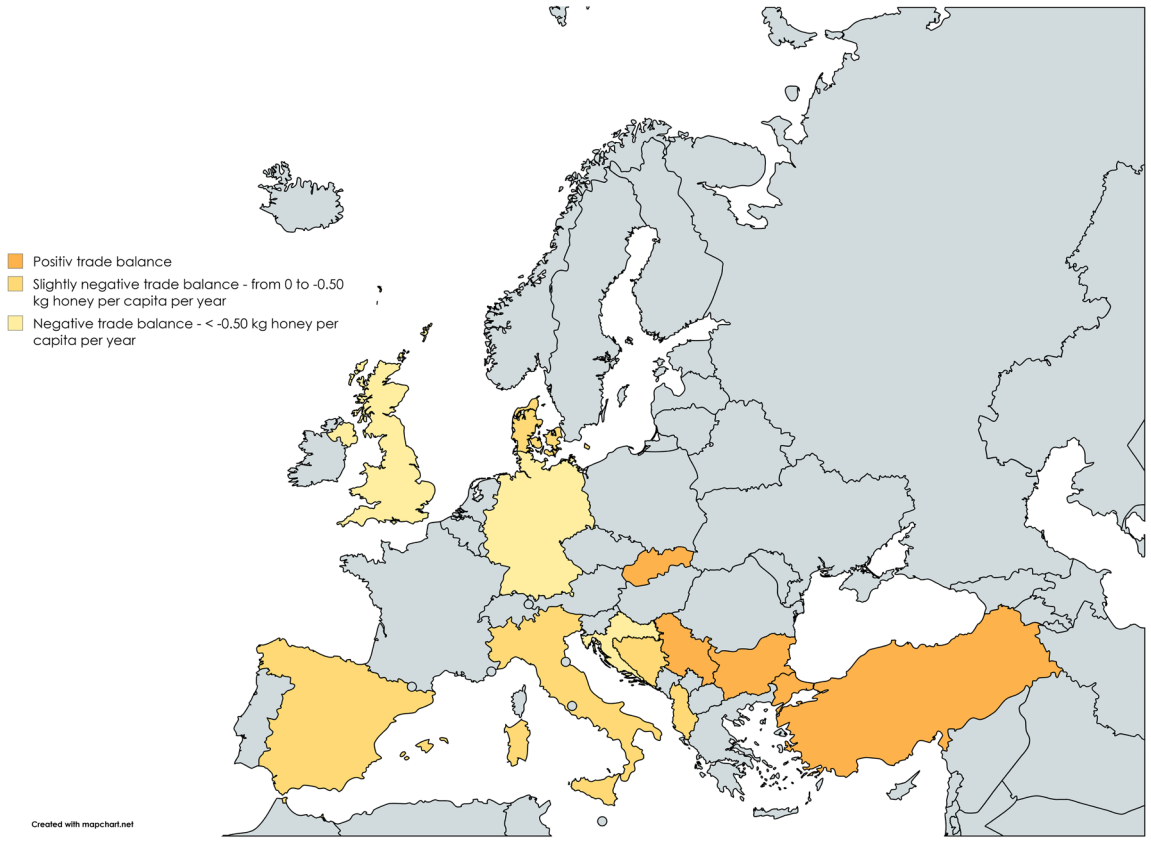

Figure 2. Countries represented in responses to the policy survey, coloured according to the size of their honey trade balance: Dark orange – Positive trade balance, medium orange – slightly negative trade balance (from 0 to -0.50 kg per capita per year, light orange – negative trade balance (<-0.50 kg per capita per year).

Table 3. The number of promoting and deteriorating national policy examples for countries with positive, slightly negative and negative trade balance for honey, with averages per responding country shown in brackets.

	Number of responses (number of responses per responding country)		Comments
	Promotional policies	Deteriorating policies	
Positive	12 (4.0)	3 (1.0)	Four countries: Serbia, Türkiye, Slovakia - no national policies mentioned for Bulgaria
Slightly negative	10 (2.5)	6 (1.5)	Five countries: Bosnia & Herzegovina, Denmark, Spain and Albania - Italy not mentioning national policies
Negative	6 (3.0)	2 (1.0)	Three countries: Croatia and United Kingdom – Germany not mentioning national policies

harmonising of the regulations for registration, trade and use of pesticides within all the EU to avoid farmers buying pesticides in neighbour countries that are illegal in their own country[29].

- **Biotic stressors**

  As beneficial policy example was mentioned a national policy on the control/elimination of Asian Hornets (Vespa veluntina), meaning that a rapid identification and location of attacks lead to appropriate disposal of Asian Hornets' nests and prevent or limit the spread of the Asian hornet (and associated detrimental effects on bees) across the UK.

  Bosnia & Herzegovina as well as Croatia mentioned as example of positive policies that they have veterinarian legislation, that also cover measures to prevent, control and survey bee disease.

- **Disease control**

  Of negative examples were from Danish side mentioned a private scheme to make combatting of the Varroa mite more efficient, but the frustration is that the scheme is ineffective since beekeepers cannot be sanctioned if they do not follow the scheme. Spain also mentions a parallel example of this policy defect.

  A key recommendation given on this issue at the 2024 BeSafeBeeHoney conference was to increase work for more genetic resistant bees and introduce more tight regulation on bee trade, including bee queen trade to avoid contamination[29].

- **Nutrition**

  Some positive policy examples provided are not entirely clear since they refer to the Honey Directive, which is not concerned about bee nutrition. Some examples see EU's regulatory framework in support of biodiversity as positive, as well as EU's Soil Mission, that would mean more healthy foraging possibilities for bees.

  Of negative policy examples were for Bosnia & Herzegovina mentioned that inspection of honey is not any more being a responsibility of veterinarian authorities. Another example pointed at the insufficiency of EU's food regulations, since they alone concern lead contamination of honey, but not regulates other similar contaminants.

- **Production systems and economy**

  No less than 13 examples of positive policies dealt with various form of financial support, for instance a subsidy per beehive in Serbia, an EU regulation making Member States' subsidies of the apiculture sector mandatory, the possibility to use EU's CAP funding for additional support to grow fallow fields with flowers in Denmark, and support for bee queen purchase in Serbia. In addition, one response regretted that subsidies are not available for beekeeping in cities in Croatia, and another response regrets that compulsory EU support for the sector does not prioritise measures to counteract a demography of ageing beekeepers. All in all, the issue of public support for the sector, and the way this support is designed is overall seen as the most important policy measure to sustain healthy markets.

  Respondents considered the issues of labelling and classification as the second most important policy area, and saw this both in relation to the ability to combat fraud and to raise the income from sales of specific high honey qualities. Seven positive policy examples were given, for instance praising EU's quality schemes to protect products under different Designations of Origins, and EU's amendment of the Honey Directive to require the country of origin to be labelled on the honey. There were also provided four examples of counteracting policies, including regrets that EU's Honey Directive[4] does not provide effective solutions for protecting the EU market and prevent imports of cheap and adulterated honey qualities, and another example pointing at the unlucky rules for labelling of organic

food, which confuses consumers to believe the product is local.

The issue of labelling and traceability was also mentioned at the 2024 BeSafeBeeHoney conference, where it was recommended to work for better and more diverse labelling, including labelling for honeys' analysed content of nutraceutical constituents, stronger border control, and to introduce labelling that includes more detailed traceability information[29].

Türkiye mentioned some beneficial policies, including a broad regulation aiming to ensure the sustainability of beekeeping by determining the principles regarding all kinds of production, breeding, accommodation, obtaining breeding material, fixed and migratory beekeeping, taking the necessary measures regarding the transportation of bee colonies, standardisation of tools, machines and materials, development of honey plants agriculture, and training. The regulation covers issues related to project planning, queen bee breeding, artificial insemination of honeybees and registration of honeybee colonies.

It is emphasised that the above points are not attempting to provide a complete overview of provided policy examples, but alone to present some policy examples, including patterns of policy examples, i.e. cases of responded policies dealing with the same issue, although formulated differently.

Conclusions

Qualitative analysis of 74 apiculture sector related policy examples provided on basis of a survey using open-ended questions, highlights three key policy issues perceived as most decisive for the quality of the honey market and its ability to sustain a thriving apiculture sector:

- First, subsidisation schemes are considered crucial for supporting the sector, with respondents noting that such policies can prioritise objectives including education and information dissemination, development initiatives, disease eradication programmes, and investment in beehives. Subsidisation is generally viewed positively, with explicit calls for increased funding. The expansion and mandatory financial support for the apiculture sector within the EU is widely regarded as beneficial. No less than 15 provided policy examples related to the issue of subsidisation and public support to the sector, meaning that this issue was highlighted by almost all respondents.

- Second, evidenced by 11 provided policy examples, there is a strong belief to the importance of enhanced product classification systems and accurate labelling, utilising reliable methods to verify label information with honey quality standards. These measures are considered necessary to combat fraud, promote fair competition, distinguish high-quality honey products rich in nutraceutical components, and reassure consumers about the absence of chemical residues. While this issue garners significant attention, effective laboratory methods for fraud detection have yet to be identified, while traceability requirements may offer more feasible solutions to combat fraud.

- Third, concerns persist regarding overly permissive regulations governing the approval, registration, and use of veterinary medicines and pesticides, which may negatively impact the sector. Although EU regulations are generally regarded as superior to those outside the EU, there remains a need for harmonised regulations across EU Member States. While a total of nine policy examples dealt with this issue, these were characterised by frustration over regulations, that do not prioritise the business interests of the apiculture sector.

The policy survey provides valuable insights into apiculture sector policies regarded as either beneficial or detrimental to a sustainable honey market and the ongoing development of apiculture. Additionally, it highlights challenges within the sector resulting from irregular market mechanisms, with indications that the predominant market actors operate largely beyond public oversight, contributing to concerns about effective regulation and control.

Discussion

Our findings clarify needs for future research in the following areas:

- Public, financial support to the sector is perceived as having a great importance. However, subsidisation is justified by delivery of services of value for the society, and ways to maximise that within the apiculture sector is yet to be thoroughly investigated, especially in consideration of the large part of the honey production and marketing taking place outside public control. With other words, subsidisation should comply with EU's conditionality principles[3], in order to avoid subsidies having effect as merely social security payments, which may be counterproductive to society targets related to other policy areas, e.g. agri-environment, despite from risking to lower productivity and product quality in the apiculture sector.

  For instance in Albania, the recently adopted Law on Beekeeping No 20/2023 and the national financial direct support of 1,000 Lekë (~ 10€) per hive demonstrate an increasing governmental commitment to the apiculture sector. However, this support scheme is not yet aligned with the structure and conditionality mechanisms of the EU Common Agricultural Policy. Albania is therefore in a transitional phase, gradually adapting its regulatory framework to move closer to EU standards while still operating under a distinct national support model. There is a profound need in a country like Albania to investigate, how financial support via conditionalities would maximise its effect in relation to a thriving apiculture sector.

- Research is needed for finding better ways for labelling and classification of honey to document its quality, prevent adulterated honey from being marketed

as native honey, and ensure fair market conditions for beekeepers. Given an inherent difficulty in proving the quality of honey that shows wide variations in its composition and for which there are not identified any precise indicator that can be validated in a laboratory or otherwise, the focus of this research should be given to develop other ways to reach the objectives, including more advanced traceability requirements than already decided.

- The perception is that EU regulations on pesticides and veterinarian medicine is advantageous to that in non-EU countries, but that there is still a need to harmonise it inside EU, avoiding illegal trade between EU Member States. It is a policy research task to identify solutions for a more harmonised pesticide and veterinarian medicine regulation in the EU, without hampering overall food security and competitiveness.

- The efforts to clarify statistics on production, consumption, import and export reflects, as aforementioned, that a large part of the honey production and marketing takes place outside public control. This is a specific charm of the apiculture sector, but it hampers regulation of the sector. Therefore, as part of the suggested investigations to identify the most optimal ways of supporting the sector, it must be considered, how small-size amateur beekeepers can come under public control via subsidisation schemes in smart ways without requiring VAT accounting and the like and without much administration. In this respect, research should identify possibilities for use of state-of-the-art IoT solutions, for instance for identifying and tracking beehives and document their production.

It is emphasised that we find our conclusions as well as the mentioned recommendations for future research areas as valid and well justified by the 74 examples of apiculture related policies collected via the survey using open-ended questions. Our conclusions and recommendations gives a good basis for development of recommendations for shaping of future apiculture related policies.

Many responses pointed at similar policy issues, and we therefore feel that additional responses would not add substantial details and quality to our findings. We had initially hoped for more responses, but despite a general situation of survey fatigue, we do believe the survey responses are representative and sufficiently comprehensive, supporting the validity of our conclusions for consideration in the European apiculture policy dialogue and research efforts.

Ethical approval

Ethical approval and consent were not required.

Data and software availability

Foged, H. L., Hoxha, F., & Majtan, J. (2025). Template and responses of policy survey. In Apiculture sector policies - positive and negative elements to support healthy market conditions. Zenodo. https://doi.org/10.5281/zenodo.17826786.

Author contributions

Henning Lyngsø FOGED: Conceptualisation, Data curation, Investigation, Methodology, Supervision, Validation, Visualisation, Writing – original draft, Writing – review & editing; Fatjon HOXHA: Writing – original draft, Writing – review & editing; Juraj MAJTAN: Writing – original draft, Writing – review & editing.

Acknowledgements

The authors sincerely appreciate the valuable input provided by all respondents, whose contributions form the foundation of this analysis.

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Open Peer Review

Current Peer Review Status: ✔ ? ✔

Version 2

Reviewer Report 20 April 2026

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✔ **Antonio de Jesus Cenobio-Galindo**
Universidad Autónoma del Estado de Hidalgo, Hidalgo, Mexico

The authors adequately addressed the observations made; I have no further comments on this matter.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: honey, stingless bees, food biotechnnology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 25 February 2026

https://doi.org/10.21956/openreseurope.23960.r68911

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? **Małgorzata Dżugan**
Uniwersytet Rzeszowski, Rzeszów, Poland

I highly appreciate the Authors' efforts to reformulate the manuscript to more clearly describe the study's purpose, provide detailed explanations in the methodological section, and emphasize that the responses collected through open-ended questions are not suitable for statistical analysis but for qualitative analysis, aimed at comparing policies implemented in various countries participating in the BeSafeHoneyBee program. The modification introduced, which involved relating the obtained data to the state (trade balances) of the honey market in the respondents' countries, allowed for a more logical and transparent structure of the manuscript.

However, one aspect still requires modification, as it introduces unnecessary confusion in the manuscript and is inconsistent with scientific research methodology: the description of collected policy examples. The authors write, "16 responses were collected, representing 12 European countries, and an interview-based response was additionally collected in one country" (which is consistent with Table 2 and Figure 1, which present 12 countries). It is unclear why the authors state that "One response from Poland was empty, probably due to some technical issue." If this was a design error in the Google form (a mandatory field had to be indicated), the form should be rejected and not included in further analysis. Including this empty questionnaire in the dataset results in further errors, for example, in the sentence "Thus, 74 policy examples were provided by 17 respondents from 13 countries," while there were 12 countries (nothing is known about Polish apiculture sector related policies). And further, "It can also be concluded that each respondent (excluding Poland) on average provided 4.4 examples...."

It is strange that the authors, having data from a Polish respondent (mandatory) and a BeSafeBeeHoney network member, did not bother to obtain data on strategies implemented in Poland.

Once the Authors have reviewed and modified the appropriate number of survey responses in accordance with the caveats outlined above, I am ready to update the article record to "Approved."

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 05 Mar 2026

Henning Lyngsø FOGED

We appreciate your positive comments on the improvements in the second version of our manuscript. We regret your confusion over the description of the responses to the policy survey, including the quantification. Concerning your remarks on a response from Poland: The statement on the response from Poland is part of describing the response we had to the policy survey, which we find relevant. Concerning your statement: " the form should be rejected and not included in further analysis. Including this empty questionnaire in the dataset results in further errors, for example, in the ...." It is unfortunately not clear for us, on which basis you assume an empty submission (apart from "Poland") could be part of the 74 collected policy examples, and we would even see it impossible to categorise some empty fields as being either a positive or negative policy example, or any of the other ways we characterised the collected policy examples? We remind that you also have access to the dataset holding the mentioned 74 responses. We also remind, as stated in the manuscript, that Kosovo is counted as a country (by the respondent, therefore also by us), but not included in figures and tables that are based on statistics, since such are not produced for Kosovo by Eurostat and Faostat. Concerning your questioning why we could not have an answer from Poland, please acknowledge that responding to the policy survey happened on

a voluntary basis. We have mentioned in our manuscript that the response to the policy survey regrettably was limited, considering it having been promoted through the BeSafeBeeHoney network, which comprise more than 40 countries. We would have hoped to have more responses, but do on the other hand consider the response being sufficient for drawing solid conclusions, considering the very clear patterns found in the responses. Please also notice that the policy survey did not require respondents to reveal their identity, for very well considered reasons – and as you have noticed, the only obligatory question was the country. Therefore, logically, since "Poland" was the only text in one response, we cannot know who the response came from and we cannot go back to that person and request another response. Conclusively, we have once again reviewed the manuscript with respect to the description of the responses to the policy survey, including the quantification, and find that all is correct presented. Also, it is not clear for us, on which basis you assume that an empty response could be included in the analysis. Therefore, on the background of the aforementioned information, and with all respect, kindly approve our manuscript as it is. Otherwise, we would be glad for your clarification of the specific amendments you request of the manuscript, including the quantification of survey responses, and we would of course implement these as far as they are correct.

Competing Interests: None

Reviewer Report 11 February 2026

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Ester Noguer-Juncà
University of Lleida, Lleida, Spain

The new document is ok.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: food tourism, food marketing, primary sector and tourism, tourism and gender

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 09 December 2025

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Antonio de Jesus Cenobio-Galindo
[1] Universidad Autónoma del Estado de Hidalgo, Hidalgo, Mexico
[2] Universidad Autónoma del Estado de Hidalgo, Hidalgo, Mexico

Following the evaluation of the manuscript, I present below some comments that require attention to consider the work for publication.
The title presents the study as a policy analysis; however, the document does not demonstrate that the elements are sufficient.
The abstract states that no differences were found between policies and trade balance; however, the survey design is inadequate to support any assessment, especially regarding representativeness across nations.
Regarding the previous comment, the research question cannot be adequately answered due to the methodological design.
The introduction lacks data relevant to the study, such as policies applied to the beekeeping sector or honey market regulations.
It is understood that the survey used open-ended questions, which prevents standardizing responses, hinders comparisons, and therefore does not allow for quantitative analysis.
Procedures for ensuring reliability or coding the data are not described.
It does not mention how incomplete or ambiguous responses were handled.
It is not mentioned whether participation bias was controlled for.
The results in Tables 2 and 3 show numbers, but there is no statistical analysis beyond the count.
The statements made in the results are based on perceptions.
The discussion in general is too brief and does not relate concepts that one would expect to see, such as adulteration in honey, informality in marketing channels, international trade.
The differences between countries and their geographical relevance are not explained.
The conclusions and discussions are not clearly differentiated from each other; likewise, in this section, the reader is not warned that the lack of correlation may be due to the design.
There are no recommendations, nor are the limitations of the work acknowledged.

Is the work clearly and accurately presented and does it cite the current literature?
No

Is the study design appropriate and does the work have academic merit?
No

Are sufficient details of methods and analysis provided to allow replication by others?
No

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?
No

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: honey, stingless bees, food biotechnnology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 18 Dec 2025

Henning Lyngsø FOGED

Thank you for your valuable review of our manuscript. Your comments are very useful for our amendment of the manuscript. You will in the "Notes to readers" find a general description of the revisions made. We understand that our original presentation of quantitative analyses, including trade balances for countries represented in responses, could be interpreted as a statistical analysis. We have consequently restructured the manuscript to stress that such analyses are alone done for the purpose of describing the dataset. We also moved these analyses away from the introduction since they are a part of the research and not background material. In this way we intend the manuscript to have a more logical and clear structure. We notice that you suggest the introduction to include an analysis of policies governing the sector. We stress, and have further substantiated how the manuscript is linked to the BeSafeBeeHoney project, which is funded by the EU, wherefore our geographical focus is Europe, where also the vast majority of BeSafeBeeHoney members are located. We do actually mention the main EU policies, including the Honey Directive, the Breakfast Directive, as well as the EU decision of making support to the sector compulsory via the CAP since 1997. We are not entirely clear on the comment that 'the introduction lacks data relevant to the study, such as policies applied to the beekeeping sector or honey market regulations,' and would appreciate more specific guidance on which aspects the reviewer considers insufficient or missing! We have noted your comment on "Procedures for ensuring reliability or coding the data are not described." To our understanding, reliability is of major relevance to consider when analysing data that are produced in a lab or similar, where observations are made, and you want to be ascertained that a solid calibration was ensured. For open-ended questions, we anticipate all respondents provide different and subjective answers, and we don't want them to calibrate their answers with other respondents since that would lower the quality of the responses. Also, coding is typically something you do for large datasets of the same type as mentioned. However, we did some form of coding for the purpose of describing the policy examples given in the responses, namely in the following ways: 1) country, 2) positive or negative example, 3) the affiliation to the issue of the BeSafeBeeHoney work packages, 4) the

countries trade balance, and 5) the policy type. Likewise, we would like to stress, that in a survey of the nature in question, there are no incomplete answers. There is no defined correct length of the text of an open-ended response. All questions are furthermore voluntary. Regarding the issue of ambiguity, we did not identify any ambiguous responses in our analysis: All responses were clear for us with respect to the mentioned 5 “codings” apart from the issue. There were examples of responses, which we did not understand, such as dealing with renewable energy, but since they were exceptional answers they have not had any effect on conclusions, which point at general patterns in raised policy issues. We would appreciate if you could provide specific examples from the published dataset where ambiguity is perceived that could affect our conclusions, so that we may address them appropriately. In addition, we emphasise, that by using open-ended questions, we do anticipate that all responses are “biased” and subjective, since there is no correct answer, and you cannot respond to such a survey like this in an objective and impartial way. The prerequisite is that respondents are affiliated in one or another way with the apiculture sector and are willing to express their opinions about the policies that influences the sector. Once again, we sincerely appreciate your comments. We acknowledge that the original version of the manuscript lacked sufficient clarity and logical structure. We hope that the revised version adequately addresses these issues. Should any concerns remain, we would be grateful for more detailed guidance on the specific points that require further improvement, taking into account the nature of our research.

Competing Interests: No competing interests were disclosed.

Reviewer Report 27 November 2025

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Małgorzata Dżugan
[1] Uniwersytet Rzeszowski, Rzeszów, Poland
[2] Uniwersytet Rzeszowski, Rzeszów, Poland

The topic addressed in this publication is extremely timely and valuable for the future of the beekeeping market, not only in EU countries. The authors attempted to determine which of the three policies: 1) strategies (implemented or planned), 2) regulations and regulatory standards, and 3) subsidy programs, survey respondents consider crucial for promoting the beekeeping sector. The research was conducted using open web-based survey. The methodology of such research is based on two pillars: a well-prepared, well-thought-out survey questionnaire and a large number of responses (for proper statistical evaluation of observed trends).
In my opinion, both conditions were not met. The survey design does not ensure reliable responses; it relies on open-ended explanations and requires knowledge of the subject from the respondent. To avoid accidental errors, at least 100 surveys or a consensus position of a

beekeeping organization in a given country should have been collected. The low survey response rate (16 in total) absolutely does not allow for correlation of the survey results with the annual trade balance of the honey market per capita. Furthermore, the conclusions should be preceded by a discussion of the results and constitute a summary of the whole publication.
Therefore, I cannot recommend this work for indexing in its current form. Considering the informative value and importance of the topic for the health of the beekeeping sector and probably element of BeSafeBeeHoney COST project realization, I suggest the authors treat their study as preliminary and submit a Short communication that removes the above mentioned correlations and presents examples of policy implementation for the beekeeping sector in various EU countries. I encourage you to expand the group of survey respondents and include a more comprehensive explanation of the policy for the apiculture sector in the online questionnaires, e.g. in the form of a short video tutorial.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and does the work have academic merit?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
No

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Honey and other bee product analysis - quality evaluation and using in apitherapy

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 18 Dec 2025

Henning Lyngsø FOGED

Thank you for your valuable review of our manuscript.

Your comments are very useful for our amendment of the manuscript. You will in the “Notes

to readers" find a general description of the revisions made. In addition, we regret that our manuscript was not sufficiently clear and appreciate the opportunity to clarify, that our research did not intend to determine which of three policies respondents consider crucial for promoting the beekeeping sector. We have in various ways reformulated the manuscript to more clearly describe the objective of the research, especially in the formulation of the objectives. We are of the opinion, that using open ended questions for exploratory purposes does not require more than 100 responses, since it is not intended or even suited for statistical analysis, and we can assure that the design of the questionnaire was thoroughly considered. The methodological section emphasises now more clearly, also by use of a reference, that the use of open-ended questions is a recognised social-science method for exploring perceptions, that these are not meant for statistical analyses, but for qualitative analyses, and that each response is valuable and unique. We understand that our original presentation of quantitative analyses, including trade balances for countries represented in responses, could be interpreted as a statistical analysis. We have consequently restructured the manuscript to stress that such analyses are alone done for the purpose of describing the dataset. We also moved these analyses away from the introduction since they are a part of the research and not background material. In this way we intend the manuscript to have a more logical and clear structure.

Once again, we do appreciate you review comments. We acknowledge that the original version was of insufficient quality and not entirely clear and logically structured. We hope that the revised version adequately addresses your concerns. If any issues remain, we would appreciate further clarification of your specific concerns, given the scope and nature of our research.

Competing Interests: No competing interests were disclosed.

Reviewer Report 14 October 2025

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Ester Noguer-Juncà
[1] University of Lleida, Lleida, Spain
[2] University of Lleida, Lleida, Spain

Dear Authors,
Thank you for the opportunity to review this work. While your paper offers valuable insights, several critical issues remain unaddressed.
The originality of the research is not sufficiently established, particularly regarding its contribution to the existing literature and the research gap it aims to address.
The Introduction section is well-developed. Perhaps the explanation of BeSafeBeeHoney Project

could be detailed.
One of the major weakness of the paper, in my view, lies in its methodology section. The number of surveys is insufficient to generalize the findings. It is necessary to add more information about the processes taken to ensure validity, reliability, and credibility of the results.
The Results section is well-developed, but the information could be detailed.
In my view, the Discussion and conclusion section represents another weak point of the paper.
It is necessary to create two separate sections. There is no connection between the discussion and the background.
The paper also lacks an explanation of its theoretical and practical contributions, as well as a discussion of its limitations and suggestions for future research directions.
The quality of communication and the use of English are adequate.
Given these limitations, I regret to inform you that I reject the manuscript in its current form.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and does the work have academic merit?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
No

If applicable, is the statistical analysis and its interpretation appropriate?
No

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: food tourism, food marketing, primary sector and tourism, tourism and gender

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 18 Dec 2025

Henning Lyngsø FOGED

Thank you for your valuable review of our manuscript. Your comments are very useful for our amendment of the manuscript. You will in the “Notes to readers” find a general description of the revisions made.

In addition, we acknowledge your concern that the original presentation might be interpreted as implying a statistical analysis of the survey responses, alike methods used in for instance biological research disciplines. We have in several ways amended the manuscript to clarify that this is not the intention: The methodological section emphasise more clear, that the data is collected by use of open-ended questions, which is a recognised social-science method for exploring perceptions, that these are not meant for statistical analyses, but for qualitative analyses, and that each response is valuable and unique. It is likewise stressed in the results section, that the three issues that were perceived as being most decisive for a thriving apiculture, were in fact dealt with in most of the responses, wherefore we do not feel that having additional responses would add substantial to the validity or representation of the conclusions. Also, it is now clearer that various quantification of the survey responses are alone having the purpose of describing the dataset. We hope that the amended manuscript cannot any more cause misunderstandings about the social science nature of our research and the use of open-ended questions for explorative purposes. Once again, we do appreciate you review comments. We acknowledge that the original version was of insufficient quality and not entirely clear and logically structured. However, we do hope that you are able to approve the revised version, and that you otherwise will explain in more detail what concerns you have, given the nature of our research.

Competing Interests: No competing interests were disclosed.