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Deliverable 2.2

Inventory of priority practices and innovations bottom-up

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Abstract	Deliverable 2.2 is the result of a bottom-up survey analysis carried out by B-THENET, the first Thematic Network for EU Beekeepers. The deliverable consists of two documents: • The present summary report, meant to support and contextualise the results of the survey included in the database; • The database (Excel document) containing the results of the survey concerning the priority practices, as ANNEX 2. A specific survey was set-up to prioritize practices and was distributed to EU beekeepers. We received 2,094 answers from beekeepers of 22 EU countries. The most relevant practices according to beekeepers needs were related to: 1. For the Good Beekeeping Practices category: - “Properly place hives in the apiary” (24 practices); - “Proper comb storage” (13 practices). 2. For the Biosecurity Measures category: - “Optimize the efficacy of anti-varroa treatments” (29 practices); - “Produce nuclei and swarms with no clinical signs of varroa” (5 practices).
Keywords	EU Survey System, EU beekeeping, Bottom-up approach, Good Beekeeping Practices, Biosecurity Measures in Beekeeping, Inventory, Priority Practices

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Table of abbreviations

Abbreviation	Meaning
WP	Work Package
TN	Thematic Network
GBPs	Good Beekeeping Practices
BMBs	Biosecurity Measures in Beekeeping

1 Executive Summary

Deliverable 2.2 is the result of the survey analysis carried out by B-THENET, the first Thematic Network for EU Beekeepers. The deliverable consists of two documents:

- the present summary report, meant to support and contextualise the results of the survey included in the database;
- the database (Excel document) containing the results of the survey concerning the priority practices, as ANNEX 2.

In the survey, EU Beekeepers were asked to rate practices according to their experience as beekeepers, and to suggest new relevant practices if those were not present in our list. The bottom-up approach allowed B-THENET researchers to identify the most relevant practices in Europe according to beekeepers needs. Moreover, it provided material to compile an inventory of priority practices, which will then be fully developed at the digital level (using three online platforms, the "Practices", "Research and Innovation" and "Exchange" Platforms) and at the physical level (B-THENET centres, the project' hubs for discussion, refinement and dissemination of Best Beekeeping Practices), to be finally stored in the "Repository" Platform.

In order to be able to discuss with EU beekeepers all main topics of honey bee management, beekeeping practices were clustered in "*themes*" to be investigated in the 4 years of the Thematic Network.

In 2023, based on their relevance, the following two themes were addressed: "*Apiary set-up and management/maintenance*", for the Good Beekeeping Practices (GBPs) category, and "*Varroosis*" for the category Biosecurity Measures in Beekeeping (BMBs).

A specific survey was set-up to prioritize practices and was distributed to EU beekeepers.

A total of 2094 answers were received, coming from 22 EU countries.

The most relevant practices according to beekeepers needs were related to:

1. For the Good Beekeeping Practices category:

- "Properly place hives in the apiary" (24 practices);

- "Proper comb storage" (13 practices).

2. For the Biosecurity Measures category:

- "Optimize the efficacy of anti-varroa treatments" (29 practices);

- “Produce nuclei and swarms with no clinical signs of varroa” (5 practices).

In total, during the first year of the Thematic Network, 71 best practices will be discussed, validated and stored in the “Reposity” Platform, able to be used for training of EU beekeepers and advisors.

In ANNEX 2 is reported the detailled list of beekeeping practices obtained with the EU beekeepers’ support with a bottom-up approach. Those practices will be fully developed in the first year of B-THENET.

2 Introduction

B-THENET is a thematic network involving 18 EU partners, including research institutes, universities, and beekeeping associations. B-THENET aims to harmonise the EU beekeeping sector by collecting and fully developing beekeeping practices across Europe with a bottom-up approach. Moreover, B-THENET strives to modernise this exchange of information by providing beekeepers, advisors and other relevant stakeholders in beekeeping, with digital platforms where practices and innovations can be collected, developed, discussed, tailored and validated at the country-specific level. At the end of this process, they will be stored in a "Repository platform" where they can serve as training material for beekeepers and advisors.

In the present deliverable, are described the methodology and results of the first 2023 survey distributed to EU beekeepers in order to make the inventory of priority practices. The survey was developed by consortium partners, translated in 15 languages, and distributed across the partner countries. Beekeepers were also asked to provide new practices that they felt were not considered in the survey.

ANNEX 2 contains the inventory of priority practices as expressed by EU beekeepers.

3 Methodology

3.1 Survey design

In Chapter 5, the 2023 B-THENET survey is available. It was set-up and distributed using the EU Survey System and represented the tool that enabled us to identify the priority practices in EU with bottom-up approach. Surveys were distributed using EUsurvey system (https://ec.europa.eu/eusurvey/), an online survey management system for creating and publishing forms available to the public.

In order to assess what practices met beekeeper's needs in Europe, and could therefore be considered "Priority Practices", we developed and distributed surveys in 15 languages (Swedish, German, Greek, Hungarian, French, Flemish, Italian, Slovakian, Latvian, Spanish, Polish, Slovenian, Danish, Austrian and English) by the project partners, from the 1st of March 2023 to the 15th of March 2023.

The GBPs and BMBs provided for rating were extrapolated from a previous publications based on a previous SusAn ERA-NET project entitled "BPRACTICES" (Pietropaoli *et al.*, 2020a; Pietropaoli *et al.*, 2020b; Rivera Gomis *et al.*, 2019). These documents set-up an extensive list of practices (ANNEX 1) categorized as Good Beekeeping Practices (GBPs) and Biosecurity Measures in Beekeeping (BMBs). All the above-mentioned practices were clustered in "*themes*" to be investigated in the 4 years of the Thematic Network.

In the focus of the 2023 survey, we identified the following two "*themes*" based on their relevance: "*Apiary set-up and management/maintenance*", for the Good Beekeeping Practices (GBPs) category, and "*Varroosis*" for the category Biosecurity Measures in Beekeeping (BMBs).

"*Practice Containers*" were used to group similar practices. These containers facilitated the rating process by providing beekeepers with fewer practices to assess.

Table 1 shows how different themes are categorized and scheduled across the 4 years of B-THENET TN.

Table 1 - Themes discussed in the TN

THEMES	*CATEGORY* *(GBPs or BMBs)*	*YEAR*
Apiary set-up and management/maintenance	*GBPs*	2023
Varroosis	*BMBs*	
Colony set-up and daily management/maintenance	*GBPs*	2024
American foulbrood	*BMBs*	
Record-keeping	*GBPs*	2025
Bee feeding and watering		
EU foulbrood	*BMBs*	
Routine (preventive) hygiene practices	*GBPs*	2026
Nosemosis + Small Hive Beetle + Vespa velutina	*BMBs*	

3.2 Survey analysis

In B-THENET survey, beekeepers were asked to rate "*practice containers*" according to their opinion, using a scale going from 1 star (least relevant) to 5 stars (most relevant), including 0 stars (no opinion/no value).

If the respondents had no opinion on the containers, they could leave it empty (no stars). The value of the ratings were: 1 star = 1 point; 2 stars = 2 points; 3 stars = 3 points; 4 stars = 4 points; 5 stars = 5 points; no stars = no value (empty cell).

Moreover, beekeepers were also provided with the opportunity to describe in few words one most relevant practice that they felt was not included in our list, and to also suggest the most significant innovation that may be applicable to one of the listed practices.

3.2.1 Practice containers

Practices to discuss in 2023 were organized in the following "*practice containers*":

For GBPs:
1.Properly place hives in the apiary
2.Avoid drifting and robbing
3.Proper comb storage
4.Proper hive transportation
5.Safe working procedures in a healthy working place
6. Create a quarantine apiary.

For BMBs:
1.Produce nuclei and swarms with no clinical signs of varroa
2.Guarantee best efficacy of anti-varroa treatments, especially with organic compounds
3.Recognition of the disease
4.Select and breed colonies that are varroa-tolerant/resistant.

Answers were analysed in a two-stages process. First, each new practice proposed by beekeepers was checked to understand if it could be grouped under an already existing practice container, or if it could generate a new one. This task was carried out to ensure that if new practice containers applicable to year one' themes were found, a second round of survey could be distributed, allowing beekeepers to rate the new practice containers.

3.2.2 Priority practices

The second part of the analysis focused on understanding what are priority practices in Europe according to beekeepers. By rating practice containers, beekeepers were effectively providing insights on what operational activities they deemed as most important to discuss in B-THENET. At the end of the rating, the most voted "practice containers" in the category of GBPs and BMBs were selected, considering overall mean ratings at the EU level.

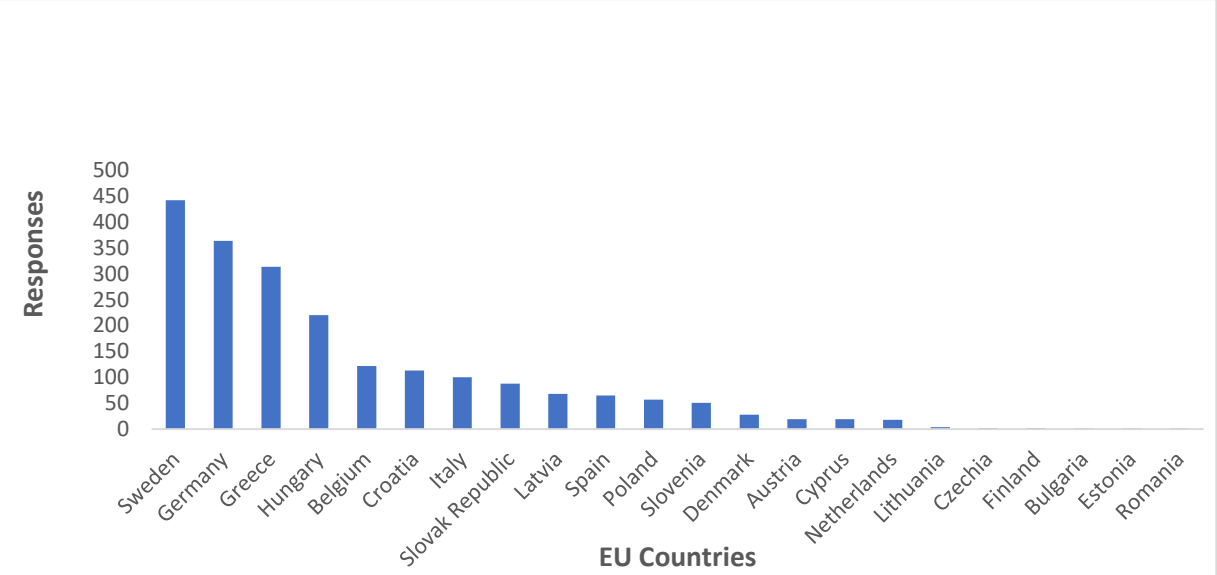
For 2023 survey we decided to develop the practices in the two best rated "*practice containers*" per category, based on the number of practices that needs to be described at the end of the beekeeping season 2023 (at least 20).

4 Results

4.1 Survey responses

We received 2,094 answers in total, coming from 22 EU countries (Sweden, Germany, Greece, Hungary, Belgium, Croatia, Italy, Slovak Republic, Latvia, Spain, Poland, Slovenia, Denmark, Austria, Cyprus, Netherlands, Lithuania, Czechia, Finland, Bulgaria, Estonia and Romania).

Fig. 1 shows the distribution and counts of responses per EU country involved in the project.



Sweden	442
Germany	363
Greece	313
Hungary	220
Belgium	122
Croatia	113
Italy	100
Slovak Republic	88
Latvia	68
Spain	65
Poland	57
Slovenia	51
Denmark	28
Austria	19

Cyprus	19
Netherlands	18
Lithuania	4
Czechia	2
Finland	2
Bulgaria	1
Estonia	1
Romania	1

Figure 1. Responses of EU beekeepers to B-THENET survey. Counts for each country are shown.

4.2 New practices proposed by beekeepers

A total of 189 new practices were suggested by beekeepers, even though most of them were already included in the extensive list considered for each container. More in detail, out of those, 23 new GBPs and 19 BMBs were identified with the support of the National B-THENET Centres.

4.3 Practice containers

All the new beekeeping practices suggested did not make up new practice containers, because they could be sorted in those already proposed in the survey. Therefore, a second round of survey to rate the new practice containers was not necessary.

4.4 Priority practices

As no new practice containers were identified by beekeepers, prioritisation could be carried out considering the already existing containers. Point 4.3.1 and 4.3.2 highlight which were the most highly rated practice containers among EU beekeepers. For the full inventory of priority practices, consisting of 71 practices including both practices provided by B-THENET and new ones provided by beekeepers, see **ANNEX 2**.

4.4.1 Results for prioritisation of GBPs

In the theme "*Apiary set-up and management/maintenance*", the two most voted "*practice containers*" were: "*Properly place hives in the apiary*" (mean: 4.47 stars) and "*Proper comb storage*" (mean: 4.32 stars) (**Fig. 2**).

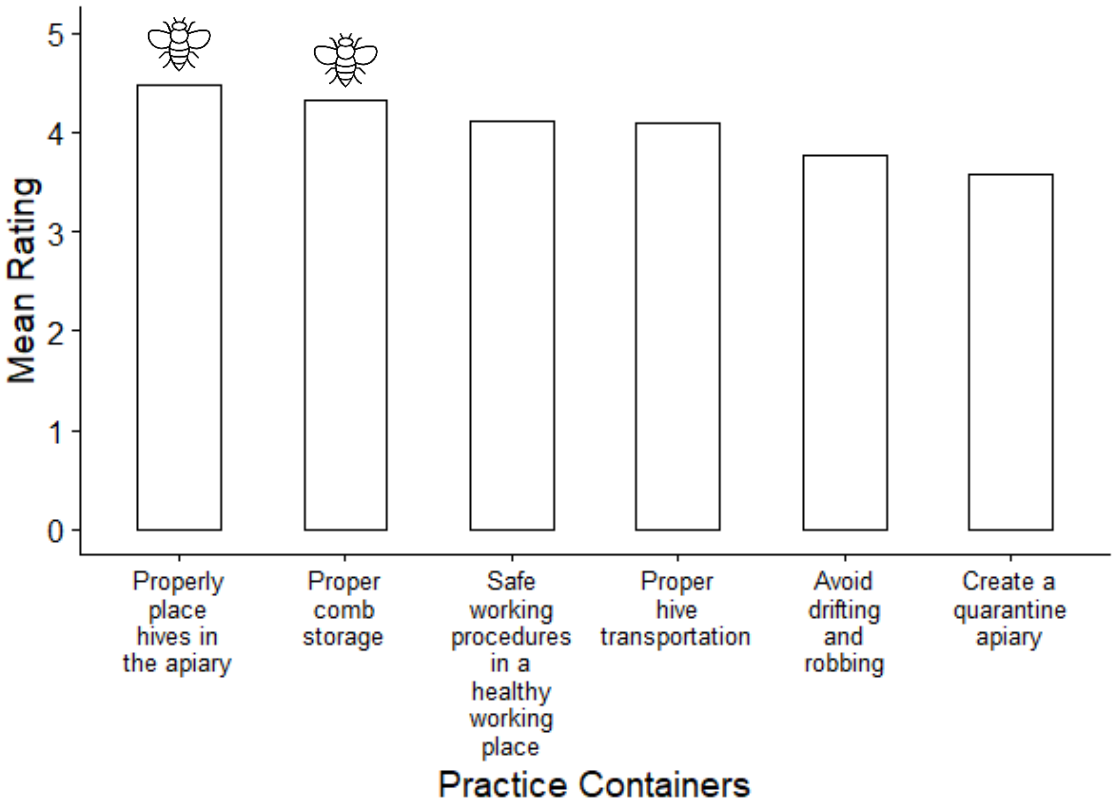


Figure 2. Rating of practice containers provided by EU beekeepers in B-THENET survey for the theme "*Apiary set-up and management/maintenance*" (GBPs category). The two most rated practice conainers are marked with the bee symbol.

4.4.2 BMBs – Varroosis

In the theme "*Varroosis*", the two most voted practice containers in Europe were "*Optimize the efficacy of anti-varroa treatments*" (mean: 4.46 stars) and "*Produce nuclei and swarms with no clinical signs of varroa*" (mean: 4.36 stars) (**Fig. 3**).

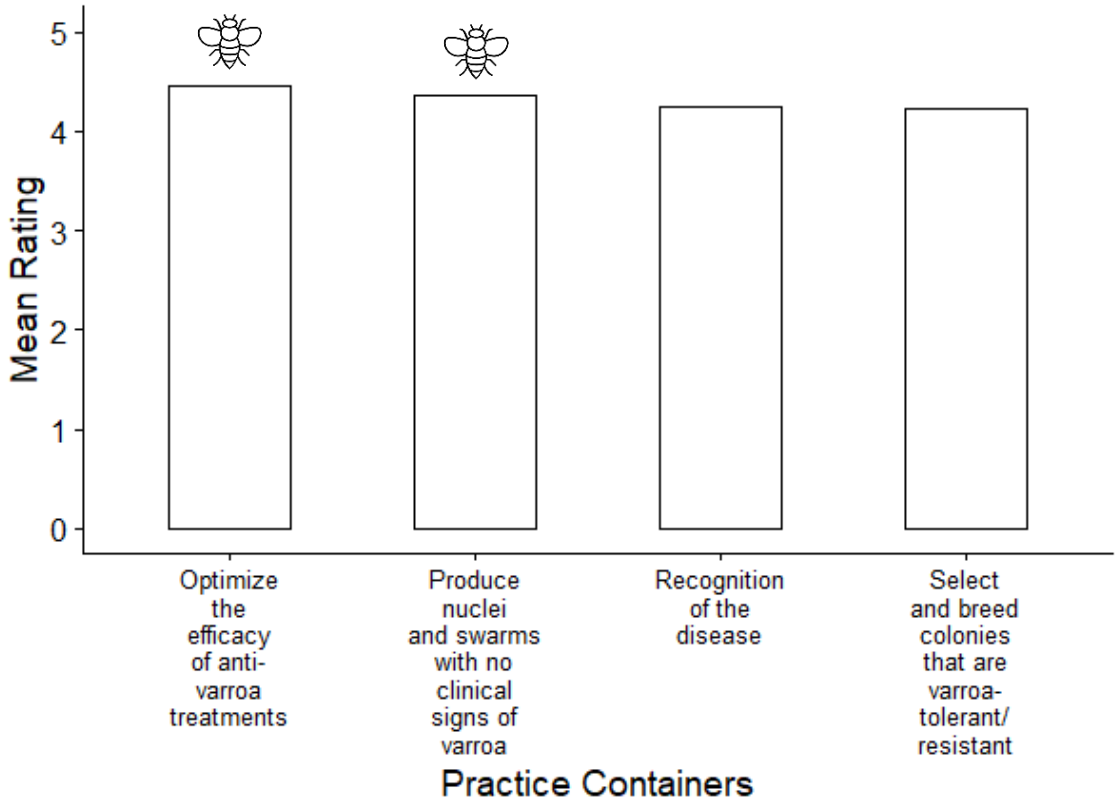


Figure 3. Rating of practice containers provided by EU beekeepers in B-THENET survey for the theme "*Varroosis*" (BMBs category). The two most rated practice conainers are marked with the bee symbol.

5 The 2023 B-THENET survey

Please select your country
Drop-down LIST OF COUNTRIES

Dear Beekeeper,

This survey is designed to allow for rating the most relevant practices and innovations to be applied in beekeeping. The methodology for rating the practices follows a bottom-up approach.

From February to March 2023 the project will address the following themes:

- Apiary set-up and management/maintenance
- Varroosis

In the following 3 years, other themes will be addressed.

In the category Good Beekeeping Practices:

- Colony set-up and daily management/maintenance
- Bee feeding and watering
- Record-keeping
- Routine (preventive) hygiene practices

In the category Biosecurity Measures:

- American foulbrood
- EU foulbrood
- Nosemosis
- Small Hive Beetle
- Vespa velutina

Theme: Apiary set-up and management/maintenance

Rate each group of practices below, according to your opinion as beekeeper, from very relevant (5 stars) to slightly relevant (1 star). If you have no opinion or if the practice is of no value for you, leave the field empty.

Practices to:

- Properly place hives in the apiary (e.g. avoid moisture, wind, pesticides, toxic plants, pests and guarantee optimal sun exposure, water resources, vehicle accessibility)

- Avoid drifting (e.g. hive placement, hive marking) and robbing
- Proper comb storage
- Proper hive transportation (e.g. avoid overheating, dust and guarantee watering)
- Safe working procedures in a healthy working place (e.g. avoid lifting excessively heavy boxes, avoid inhalation of toxic fumes)
- Create a quarantine apiary (e.g. segregate newly introduced colonies)

If missing, please add the name of a practice that you consider relevant……..

Please describe the most relevant innovation or improvement that could be applied to one of the above-listed practices (specifying which one it relates to) ……..

Theme: Varroosis

Rate the groups of practices below, according to your opinion as beekeeper, from very relevant (5 stars) to slightly relevant (1 star). If you have no opinion or if the practice is of no value for you, leave the field empty.

Practices to:

- Produce nuclei and swarms with no clinical signs of varroa (and related diseases like virosis)
- Guarantee best efficacy of anti-varroa treatments, especially with organic compounds
- Recognition of the disease (signs, monitoring of infestation levels, icing sugar, CO2, mite fall, etc. and after acaricide treatments)
- Select and breed colonies that are varroa-tolerant/resistant

If missing, please add the name of a practice that you consider relevant……..

Please describe the most relevant innovation or improvement that could be applied to one of the above-listed practices (specifying which one it relates to) ……..

6 Conclusions

The current study sheds light on the result of the first EU-wide, bottom-up investigation of beekeeping practices that are most relevant according to beekeeper's needs. We received 2,094 answers in total, representing the opinion of beekeepers from 22 EU countries. From the analysis of the above-mentioned answers, we deduced that among GBPs, EU beekeepers deemed as most relevant the practice containers "*Properly place hives in the apiary*" and "*Proper comb storage*". In the BMB category, the practice containers "*Optimize the efficacy of anti-varroa treatments*" and "*Produce nuclei and swarms with no clinical signs of varroa*" were the two most relevant.

The resulting inventory of priority practices consists in a list of 71 practices across the themes of "*Apiary set-up and management/maintenance*" (GBPs category) and "*Varroosis*" (BMBs category). This list will be used to fully describe, discuss and refine beekeeping practices in 2023 at the digital level (using three online platforms, the "Practices", "Research and Innovation" and "Exchange" Platforms) and at the physical level (B-THENET centres, the project' hubs for discussion, refinement and dissemination of Best Beekeeping Practices), to be finally stored in the "Repository" Platform.

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ANNEX 1 Original list of GBPs BMBs

Good beekeeping practices (GBPs) and Biosecurity Measures in Beekeeping (BMBs) to investigate in 2023

Good beekeeping practices (GBPs)

- Place apiary in an area accessible to vehicles
- Place apiary in a firm area
- Place apiary in a dry area
- Keep a number of hives well-proportioned with the amount of melliferous plants/sources of the area where apiary is located
- Evaluate the melliferous capacity of the area and the availability of water resources
- Avoid areas where allergenic plants (e.g. Ambrosia trifida and Artemisia vulgaris) can be found in a significant quantity.
- Avoid areas where toxic (e.g. with pyrrolizidine alkaloids) plants (e.g. Echium spp., Eupatorium and Senecio spp.) can be found in a significant quantity
- Avoid areas pollutants (e.g. pesticides, heavy metals, etc.) in the environment where the apiary is placed
- Avoid windy areas to place apiaries
- Orientate hive entrance in a way that sun can reach them since the early morning hours;
- Number of hives in the apiary according to season, pollen, nectar, honeydew resources
- Number of hives within a flight range according to season, pollen, nectar, honeydew resources
- Evaluate the melliferous and pollen capacity of the area and the availability of water resources

- Prevent drift phenomenon: paint/draw numbers or identification signs on the front and entrance of the hive
- Prevent drift phenomenon: avoid keeping too many colonies in a single row
- Prevent robbing: Avoid having broken or not well-maintained hives with openings

- Do not have beekeeping material abandoned in the apiary
- Remove and process wax of all combs from dead, affected colonies

- During transport provide adequate watering if needed
- Transport hives avoiding the warmer hours of the day, providing adequate openings for air circulation in the hives
- Transport/move only healthy colonies

- Limit the weight lift (e.g. when harvesting supers or when moving hives) and, if needed, use back protector devices

- Keep colonies of new introduction separate from the existing stock for an appropriate period (at least 1 month) to monitor them for diseases and infestations in order to prevent transmission of diseases
- Keep purchased or weak colonies in a quarantine apiary

Biosecurity measures in beekeeping (BMBs)

Varroosis

- Nucleus and swarms should originate from colonies with no clinical signs of diseases (AFB, EFB, DWV, SBV, etc.)
- Treat nuclei and swarms (no brood) with oxalic or lactic acid

- Prepare your colonies before treatment to get the highest possible efficacy, depending on type of treatment and product
- Treat the varroosis always according to the national situation of legislation and registration
- Treat according to an integrated pest management concept taking varroa thresholds into account
- Use preferably biological methods like selection and breeding Varroa tolerant colonies, Varroa sensitive hygiene, etc.
- Use preferably medicines allowed in organic farming to control Varroa
- Treat simultaneously all colonies of the apiary and in the same area
- Perform at least 2 treatments per year.
- Maintain the number of varroa below the harmful threshold in each colony
- Rotate veterinary medicines active principles to avoid varroa resistance
- Provide sufficient number of healthy spare bee colonies to reinforce weaker colonies when the varroa infestation level is too high.

- Adopt diagnostic tools for measuring varroa infestation levels (for example, ice sugar method, CO2 test, mite fall, etc.) after treatments and during the year (for example, in Spring at the beginning of beekeeping season or before harvesting)
- Monitor efficacy of acaricide treatments: verifying varroa fall after treatment
- Monitor efficacy of acaricide treatments: verifying varroa mite presence in the brood, after treatment
- Monitor efficacy of acaricide treatments: verifying the absence of varroosis symptoms in the colony (for example, presence of varroa mite on adult honey bees) after treatment
- Adopt/provide hives with screened bottom boards
- Good knowledge of the symptoms of varroatosis and virosis
- Good knowledge of the transmission ways of varroatosis and virosis

- Try to select and breed colonies that are more varroa tolerant/resistant

- Check the health status of drones producing colonies, especially for viruses

Good beekeeping practices (GBPs) and Biosecurity measures (BMBs) to investigate in 2024

Good beekeeping practices (GBPs)

Colony setup and daily management/maintenance

1. Practices to ensure that when transferring bees and/or frames they come from healthy colonies
2. Practices to equalize the hives without unbalancing the proportion between nurse bees and brood
3. Practices to fortify weak (but healthy) colonies
4. Practices to improve colonies resilience and resistance to diseases (selection)
5. Practices to manage queens: how, how many, and when to replace (except those of high genetic value)
6. Practices to manage queens: how and when marking queens
7. Practices to inspect colonies during the active season to reduce bee stress
8. Practices to inspect/monitor colonies in winter to reduce bee stress
9. Practices to perform correct hive maintenance when populated (e.g. close cracks)
10. Practices to perform correct hive maintenance when NOT populated (e.g. close cracks)
11. Practices to balance the colonies' strength in springtime
12. Practices to prevent swarming
13. Practices to balance the colonies' strength in summertime
14. Practices to balance the colonies' strength in autumn time
15. Practices for wintering colonies: insulation
16. Practices for wintering colonies: food storage measuring
17. Practices to identify the age of combs
18. Practices to manage combs that hosted brood (e.g. use of *Bacillus thuringensis*)
19. Practices to avoid brood in honeycombs (e.g. use of queen excluder)

Biosecurity measures in beekeeping (BMBs)

American foulbrood (AFB)

1. Practices to prevent AFB outbreak
2. Practices to confirm clinical outbreak of AFB in the apiary.
3. Practices to quickly intervene on hives that show clinical symptoms of AFB.
4. Practices to check *P. larvae* in asymptomatic colonies.
5. Practices to disinfect lever and smoker after inspection of AFB infected colonies
6. Practices to disinfect hives from colonies that died of AFB
7. Practices to disinfect feeders from colonies that died of AFB
8. Practices to disinfect combs/frames from colonies that died of AFB
9. Practices to process wax from colonies that died of AFB.
10. Practices to shook swarm (according to national legislation) hives that show clinical symptoms of AFB.
11. Practices to prevent contamination of healthy colonies and beekeeping equipment after a clinical outbreak
12. Practices to select and breed colonies that are AFB-tolerant/resistant.

Good beekeeping practices (GBPs) and Biosecurity measures (BMBs) to investigate in 2025

Good beekeeping practices (GBPs)

Record-keeping

1. Practices/systems to record colonies strength
2. Practices/systems to record colonies characteristics
3. Practices/systems to record colonies ID
4. Practices/systems to record colonies status
5. Practices/systems to record health status
6. Practices/systems to record breeding activities
7. Practices/systems to record position and movements
8. Practices/systems to record purchases of colonies
9. Practices/systems to record treatments
10. Practices/systems to record feeding
11. Practices/systems to record production periods, batches and quantities
12. Practices/systems to record certificates and documents

Bee feeding and watering

1. Practices to avoid pathogens contamination through feeding
2. Practices for artificial feeding during springtime
3. Practices for artificial feeding during times of shortage
4. Practices for artificial feeding to build up winter storage

5. Practices for artificial feeding of nuclei and swarms
6. Practices for artificial feeding preparation
7. Practices for ensuring access to water sources

Biosecurity measures in beekeeping (BMBs)

EU foulbrood (EFB)

1. Practices to prevent EFB outbreak
2. Practices to confirm clinical outbreak of EFB in the apiary.
3. Practices to quickly intervene on hives that show clinical symptoms of EFB.
4. Practices to check *M. plutonius* on asymptomatic colonies.
5. Practices to disinfect lever and smoker after inspection of EFB infected colonies
6. Practices to disinfect hives from colonies that died of EFB
7. Practices to disinfect feeders from colonies that died of EFB
8. Practices to disinfect combs/frames from colonies that died of EFB
9. Practices to process wax from colonies that died of EFB.
10. Practices to shook swarm (according to national legislation) hives that show clinical symptoms of EFB.
11. Practices to prevent contamination of healthy colonies and beekeeping equipment after a clinical outbreak
12. Practices to select and breed colonies that are EFB-tolerant/resistant.

Good beekeeping practices (GBPs) and Biosecurity measures (BMBs) to investigate in 2026

Good beekeeping practices (GBPs)

Routine (preventive) hygiene practices

1. Practices in the routine management of colonies (e.g. use disposable gloves)
2. Practices for cleaning lever and smoker
3. Practices for cleaning of protective gear (suit, boots and gloves)
4. Practices for renewing 30% of the hive combs every year
5. Practices for spotting clinical symptoms of bee diseases thorough inspections (how often during spring? how often during summer? how often during autumn?)

Biosecurity measures in beekeeping (BMBs)

Nosemosis

1. Practices to prevent *Nosema* outbreak
2. Practices to confirm clinical outbreak of Nosemosis in the apiary.
3. Practices to quickly intervene on hives that show clinical symptoms of Nosemosis.
4. Practices to check Nosemosis on asymptomatic colonies.
5. Practices to disinfect lever and smoker after inspection of *Nosema* infected colonies
6. Practices to disinfect hives from colonies that died of *Nosema*
7. Practices to disinfect feeders from colonies that died of *Nosema*
8. Practices to disinfect combs/frames from colonies that died of *Nosema*
9. Practices to process wax from colonies that died of *Nosema*
10. Practices to prevent contamination of healthy colonies and beekeeping equipment after a clinical outbreak
11. Practices to select and breed colonies that are *Nosema*-tolerant/resistant.

Small Hive Beetle

1. Practices to prevent SHB outbreak where SHB is endemic
2. Practices to prevent SHB outbreak where SHB is NOT endemic
3. Practices to confirm clinical outbreak of SHB in the apiary.
4. Practices to quickly intervene on hives that show clinical symptoms of SHB.
5. Practices to check SHB on asymptomatic colonies.
6. Practices to monitor SHB where SHB is endemic
7. Practices to select and breed colonies that are SHB -tolerant/resistant.

ANNEX 2

LEGEND	B-THENET practices
	New practices suggested by beekeepers

Category	Theme	Practice Container	Beekeeping practice
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Place apiary in an area accessible to vehicles
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Place apiary in a solid ground
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Place apiary in a dry area
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Keep a balanced ratio of the number of hives installed with the amount of melliferous plants/sources of the area where the apiary is located
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Evaluate the melliferous and pollen capacity of the area and the availability of water resources
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Avoid areas where allergenic plants (e.g. Ambrosia trifida and Artemisia vulgaris) can be found in a significant quantity
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Avoid areas where toxic (e.g. with pyrrolizidine alkaloids) plants (e.g. Echium spp., Eupatorium and Senecio spp.) can be found in a significant quantity
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Avoid pollutants (e.g. pesticides, heavy metals, etc.) in the environment where the apiary is placed
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Avoid windy areas to place apiaries
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Orientate hive entrance in a way that sun can reach them since the early morning hours
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Number of hives in the apiary according to season, pollen, nectar and honeydew resources
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Maintenance of ground surronding the apiary
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Apiary setup away from other apiaries
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Leaving the bees without obstacles near the entrance of the hive
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Knowledge of the location of other apiaries and their sanitary status to keep adequate distance in order to prevent excessive concentration of bees and at the same time spreading of diseases
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Size of the apiary, or density of bees in the environment
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Proper stands with space for honey supers to allow hygienic management of the honey during the inspection of the colony
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Make sure that the apiary has a good water supply within 100 m radius. This makes the bees gentler, more vivid and thus they might collect more nectar
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Location of storage rooms/houses for working tools
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Planting trees between bee colonies and creating shade during hot weather.
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	If possible have a fence around the apiary
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Keep safe distance of the colonies from houses/ villages
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Protection against strong sun, shading of hive lines (mobile roof)
Good Beekeeping Practices	Apiary set-up and management/maintenance	Properly place hives in the apiary	Protection against strangers (preventing the theft of bees)
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Do not have beekeeping material lying abandoned in the apiary
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Remove and process wax of all combs from dead and/or affected colonies
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Secure bees do not have any access to bee products outside the boxes.
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Storage of different honeycombs in our famuous construction "kozolec"
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Store only correctly constructed combs, introduce a mandatory inspection of combs for paraffin adulteration and strict sanctions for counterfeiters
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Long-term cooling and sedimentation of the wax during processing into honeycomb foundation
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Recycling and processing of the wax of the apiary to avoid wax contamination due to inadequate treatments of other beekeepers
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Air-conditioned rooms with humidity control can be used
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Preserve bee combs for the winter by freezing them to 100% prevents the development of Galleria mellonella / wax moth larvae
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	If refrigeration is not possible, combs removed for winter storage can be sorted according to type (light, dark, for brooding, honeycomb). Pack the prepared combs in packs of 10 and wrap tightly in plastic wrap, so-called stretch film. Place out of reach of mice. The foil protects against the wax moth, provided that the treatment is carried out immediately after removing the combs from the hive. This will make next season's work much easier.
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Develop simple storage boxes for frames with built wax combs. The boxes should be foldable for easier storage. This is particulary good for small scale beekeepers who lack good storage facility during winter.

Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	Light storage boxes for frames with wax combs. Easy to stack both empty and full, quick to open and close to prevent bees from finding the frames.
Good Beekeeping Practices	Apiary set-up and management/maintenance	Proper comb storage	The transition to combined modern beekeeping, as a result of which the storage of honeycombs in the off-season will be simplified, there is no need to use chemical preparations, as the honeycombs are virgin. Honey from such combs is certainly cleaner and more fragrant. Bee colonies thrive better on high brood combs.
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Prepare your colonies before treatment to get the highest possible efficacy, depending on type of treatment and product
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Treat the varroosis always according to the national situation of legislation and registration
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Treat according to an integrated pest management concept taking varroa thresholds into account
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Use preferably biological methods like selection and breeding Varroa tolerant colonies, Varroa sensitive hygiene, etc.
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Following a standard treatment strategy.
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Use preferably medicines allowed in organic farming to control Varroa
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Treat simultaneously all colonies of the apiary and in the same area
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Perform at least 2 treatments per year
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Maintain the number of varroa below the harmful threshold in each colony
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Rotate veterinary medicines active principles to avoid varroa resistance
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Provide sufficient number of healthy spare bee colonies to reinforce weaker colonies when the varroa infestation level is too high
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Chelifer cancroides, the house pseudoscorpion, for varroa treatment
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Use of ultrasonic frequencies for varroa control
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Copper wire for varroa control
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Development and registration of lithium chloride, a new varroacide
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Alternative varroa control methods such as heat treatment
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Drone brood removal for high varroa loads
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Stopping brood rearing via queen caging
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Oxalic acid vaporization
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Using natural enemies (predatory mites,...) against varroa
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Brood removal and artificial brood free periods
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Artificial swarms as biotechnical measure to control varroa
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Have strong colonies. They can cope with varroa. Plus work frames.
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Varroa treatments applied at one time, to beekeepers in one district (cooperation with beekeepers in the neighbourhood to integrate varroa control)
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Methods with formic acid evaporation
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Varroa control by means of natural enemies (Pseudoscorpion, book scorpion)
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Beekeeping without any treatments against varroa
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Natural pest control
Biosecurity Measures in Beekeeping	Varroosis	Guarantee best efficacy of anti-varroa treatments	Alternative methods agains varrosis (building frame, lavender briquettes, biotechnological methods)
Biosecurity Measures in Beekeeping	Varroosis	Produce nuclei and swarms with no clinical signs of varroa (and related diseases like virosis)	Nuclei and swarms should originate from colonies with no clinical signs of diseases (AFB, EFB, DWV, SBV, etc.)
Biosecurity Measures in Beekeeping	Varroosis	Produce nuclei and swarms with no clinical signs of varroa (and related diseases like virosis)	Treat nuclei and swarms (no brood) with oxalic or lactic acid
Biosecurity Measures in Beekeeping	Varroosis	Produce nuclei and swarms with no clinical signs of varroa (and related diseases like virosis)	Total brood removal
Biosecurity Measures in Beekeeping	Varroosis	Produce nuclei and swarms with no clinical signs of varroa (and related diseases like virosis)	Create artificial brood free periods.
Biosecurity Measures in Beekeeping	Varroosis	Produce nuclei and swarms with no clinical signs of varroa (and related diseases like virosis)	Varroa control through splitting and treating

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