



Exploitation plan

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PoshBee

**Pan-european assessment, monitoring, and mitigation
of stressors on the health of bees**



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Preface

PoshBee will produce a range of outputs and deliverables with exploitation potential, which are envisaged as having a range of different impacts, including further advances in science, regulatory measures, and stakeholder consultancy, to name a few. To achieve maximum impact an Exploitation plan is produced in month 24. Supplements will be prepared to add to the exploitation plan every 12 months at a dedicated workshop at the AGMs to mark concrete actions for the year based on this plan. These supplements will be published together with the plan at: <http://poshbee.eu/documents/1/>.

Summary

This Exploitation plan outlines the actions envisaged within PoshBee towards capitalizing on and ensuring sustainability of results achieved during the project. The plan aims to identify the exploitable results and deliverables and put them in their relevant context of use – on the one hand, as specified in the project’s Grant Agreement: (a) using them in further research activities (outside the action); (b) developing, creating and disseminating a product or process; (c) creating and providing a service, or (d) using them in standardisation activities; on the other, taking into account the specific impact requirements specified in the project call ([H2020-SFS-2016-2017](#)).

This document also identifies the concrete measures that the dissemination and exploitation team will take to further develop the exact steps towards ensuring exploitation, while engaging the large stakeholder community, members of which are part of the PoshBee consortium, and building on results from WP10 Stakeholder engagement. The Exploitation plan of PoshBee will take a stepwise and iterative approach where, each year, exploitation activities will be reviewed at the annual AGM meetings together with stakeholders and partners and an updated version will be created for PoshBee as a whole and for each organisation as a separate entity with its own network, experience and expertise. A final version will be created at the last project AGM in Jan 2023, where final individual exploitation plans will be identified and handed to partners for the years after the project end.

1. Aims of this exploitation plan

The overall objective of PoshBee is to enhance the sustainable health of bees and pollination services and support healthy bee populations, sustainable beekeeping, and sustainable pollination across Europe. The project will do so by:

- providing the first pan-European quantification of the exposure hazard of chemicals to managed and wild bees
- determining how chemicals alone, in mixtures, and in combination with pathogens and nutrition, affect bee health
- meeting the demand-driven need for monitoring tools, novel and innovative screening protocols, and practice- and policy-relevant research outputs to local, national, European, and global stakeholders.

To achieve these goals the project needs a concrete, consortium-wide exploitation strategy that will ensure that timely and sufficient actions are taken across partners in different spheres. This will ensure that results of the project are transferred to the relevant stakeholder community and the necessary capacity is built to secure their uptake and further development beyond the project lifetime.

One of the great strengths of the PoshBee consortium to this end is the heterogeneous community that it brings together, including representatives of the scientific, practice, policy and industry communities operating in the bee health sector. Therefore, this exploitation strategy will focus on making the most of this community by following these steps:

- 1) Define the exploitable project deliverables and results.
- 2) Place them in their relevant context of use to identify their target community and ,respectively, responsible partners within the consortium.
- 3) Define what is considered successful exploitation for each result.
- 4) Outline a year-by-year plan for the concrete measures to be taken to achieve successful exploitation of project results.
- 5) Create individual exploitation plans for partners to be utilised after the project's end.

2. PoshBee's exploitable results and target groups

PoshBee will produce a range of outputs and deliverables within the life of the project that will be actively disseminated to stakeholders throughout the project duration as outlined in [D11.3 Communication strategy and Dissemination plan](#). To maximise the impact of PoshBee, exploitation of project results needs to be ensured during the project and at a longer time scale after the project has finished.

2.1. Thematic groups of exploitable results

Overall, exploitation efforts of PoshBee outputs are envisaged for the following generally defined areas:

1. **Knowledge:** New knowledge on the effects of chemicals and combinations with pathogens or nutrition and field-level effects of stressors to be provided to the scientific community.
2. **Protocols:** New science-based **protocols for regulation** will need to be presented for incorporation into practice and regulatory processes.
3. **Omics:** New '**omics tools** (bee "Health Card" and database) will be developed and brought to practice, as a platform for future development of a potential marketable tool.
4. **Model:** new **model bee species** for regulatory testing and pollination will be developed within PoshBee in an explicit academic-industry partnership.
5. **Air sensor:** A new air sensor tool measuring atmospheric agrochemical exposure in/outside hives will be developed and brought to practice.
6. **Toolkits:** Outputs and knowledge to be synthesised in **practice and policy outputs** to support stakeholders.

Overall among these results the expected topmost Technology readiness level (TRL) level to be achieved is around *TRL5 – Technology validated in relevant environment* meaning that the expected readiness of the different type of results will be on the border between final development and demonstration. Key examples include:

- a novel 'air screen' tool to assess chemical exposure in-hive (predicted progression: TLR2 (Potential Application Validated)-TLR5 (Component and/or Breadboard Validated in Simulated or Realspace Environment));
- a proteomics based tool, or 'health card', that monitors exposure to and effects of chemicals, pathogens, and nutritional stress in managed and wild bees (predicted progression: TLR3-TLR6);
- two new model solitary bee systems for ecotoxicology (predicted progression: TLR2-TLR5);
- new methods and tested protocols for ecotoxicology of bumble bees and solitary bees (predicted progression: TLR2-TLR5)

To that end PoshBee will not produce any marketable results as such and the Exploitation plan will focus on ensuring the further development of PoshBee results.

2.2. Stakeholder target groups

The overall target groups (stakeholders who can potentially use and further develop PoshBee outputs) for the needs of this Exploitation plan can be summarised as follows:

- **Science** – e.g. researchers and NGOs
- **Practice** – e.g. business, industry, beekeepers, farmers
- **Policy** – e.g. government, EC
- **Regulators** – e.g. EFSA, local regulators

The analysis of these groups as well as a detailed mapping of the high influence, high impact stakeholders among these groups can be found in [D10.1 Report on the knowledge exchange and impact strategy for PoshBee](#). The identified stakeholders in D10.1 will be used for the exploitation activities planned for each period in the mapping of exploitable results below.

2.3. Detailed mapping of exploitable results

The deliverables and relevant stakeholders are synthetised in the table below and put in a timeframe to demonstrate the expected developments in each project period and provide a timeline for the exploitation measures outlined in the next sections.

Table 1: PoshBee exploitable results.

	Time	Relevant deliverable / result	Type	Responsible	Target community
Period 1	M24	10.8 Policy entry points and briefs	Toolkits	UREAD	Policy
	M27	3.1 Toxicokinetics of 3 chemicals in bees	Knowledge	INRA	Science, policy, practice
	M27	3.3 Acute/chronic chemical effects and interactions in bees	Knowledge	INRA	Science, policy, practice
	M27	3.4 Toxicokinetics/dynamics of chemicals in bees	Knowledge	EMU	Science, policy, practice
	M27	3.2 Improved protocols for chemical testing in bees	Protocols	EMU	Regulators, practice
Period 2	M34	4.1 Chemical effects on solitary bees	Knowledge	UMONS	Science, policy, practice
	M34	5.1 Nutritional requirements of bees	Knowledge	UMONS	Science, policy, practice
		8.3 Agent based risk assessment model for bumblebees	Models	AU	Science, policy
	M39	6.1 Chemical x pathogen effects on honey bees	Knowledge / Protocols	BERN	Regulators, science, policy, practice
	M39	6.2 & 6.3 Chemical x pathogen effects on bumblebees	Knowledge / Protocols	RHUL	Regulators, science, policy, practice
	M39	6.4 Chemical x pathogen effects on solitary bees	Knowledge / Protocols	MLU	Regulators, science, policy, practice
	M39	7.1 & 7.2 Multiple stressor effects on bees in semi-field	Knowledge / Protocols	WBF	Regulators, science, policy, practice
	M39	8.1 Bee health definition and indicators	Models	SLU	Science, policy
	M39	D2.6 New technology to measure environmental contamination	Air sensor tool	UBx	Science, practice
Period 3	M48	9.14 Honey bee MALDI imaging method	Omics	CNRS	Science, regulators
	M48	10.2 Incentives and barriers to tool adoption	Toolkits	UREAD	Practice

	M51	5.1 Nutritional requirements of bees	Protocols	UMONS	Regulators, science, policy, practice
	M51	5.2 & 5.3 Chemical x nutrition effects on bees	Protocols	UMONS	Regulators, science, policy, practice
	M51	8.2 Chemical effects on bee health model	Models	UNIUD	Science, policy
	M52	4.2 Chemical x pathogen x nutrition effects on solitary bees	Knowledge / protocols	MLU	Regulators, science, policy, practice
	M56	10.3 Synthesis of multiple stressor exposure	Knowledge	ANSES	Science, policy, practice
	M56	10.4 Synthesis of multiple stressor impacts	Knowledge	MLU	Science, policy, practice
	M56	10.5 Synthesis of Omics approaches	Omics	CNRS	Science, regulators
	M56	10.7 Overview of tools, protocols, guides	Toolkits	RHUL	Science, regulators, policy, practice
Period 4	M60	7.3 Multiple stressor effects on bees in field	Knowledge / Protocols	ALU-FR	Regulators, science, policy, practice
	M60	8.4 Risk assessment tool for EFSA	Models	AU	Regulators, policy
	M60	9.15 Use of BeeTyping for monitoring	Omics	CNRS	Regulators, science, practice
	M60	D9.10 Consolidated peptide/protein database and markers	Omics	CNRS	Regulators, science
	M58	10.6 Responses to multiple stressors	Toolkits	BERN	Policy, practice

These periods are defined to ensure that each of them ends with a PoshBee AGM where a workshop will be organized each time to (i) evaluate the results of activities undertaken so far and (ii) feed into a report and update of this strategy to be made publicly available on the project's website.

3. Exploitation actors and pathways

The PoshBee consortium is uniquely constructed from representatives of its main stakeholder groups including:

Research:

- 12 universities
 - o RHUL, UMONS, AU, EMU, ALU-FR, MLU, TCD, UNIUD, UM, SLU, BERN, UREAD
- 9 public research organisations
 - o ANSES, CNRS, INRA, UFZ, NFCSO, Teagasc, CREA, PIWET, WBF Agroscope,

Practice:

- 7 industry representatives (including SMEs; IND)

- Biobest, Pensoft, BIOPARKARCHAMPS, ATPOLL, WILD, RBH, VITA
- 14 are non-governmental organisations (including farmers unions, beekeeping organisations, NGOs)
 - EPKK, EPBKA, ISA, BV ST, Coldiretti, FIBKA, UNAAPI, ADEA-ASAJA, BF, LRF, APIS, USP, BBKA, NFU

Policy and regulators

Additionally, PoshBee's advisory bodies contain key industry (e.g., Bayer, Syngenta), regulatory (OIEE) and policy-making (EFSA) bodies. Towards the end of the life of PoshBee, we will consult these stakeholders to agree mechanisms to encourage further ring-testing of our novel protocols, and their incorporation into the process of developing modified regulatory processes.

While our outputs will remain available on the PoshBee website, our links to key stakeholder groups (e.g., Apimondia, COLOSS, industry, policy-makers, etc.), and the presence of our partners on international (e.g., IPBES) bodies and their action as national and international advisors to policy-making bodies (e.g., EFSA), will facilitate the continued communication of our outputs to relevant stakeholders.

PoshBee proposed an EIP-AGRI focus group on 'Bee health and sustainable pollination', with the vision to establish a unique route for the longer-term distribution of PoshBee outputs through the shared work spaces on the EIP-AGRI website, and a thematic network with Operational Groups which should continue to operate beyond the formal end of the project. Unfortunately, the bid was unsuccessful.

Nevertheless, PoshBee supported members in applications to contribute to the **EIP-AGRI Focus Group on Bee Health and Sustainable Beekeeping**, with Prof Neumann (UBERN), Prof Paxton (MLU), Dr Chauzat (ANSES), Ms Saccardo (Coldiretti), and Prof. Pilar De la Rua (UM) all applying to represent PoshBee on this focus group. Prof. Pilar De la Rua's application was successful. The aim of the focus group is to agree on expert opinions to ensure the sustainability of beekeeping in the face of challenges linked to pests and diseases, agricultural intensification and climate change. These aspects largely coincide with those of POSHBEE and are being developed in mini-papers that will be available to the general public soon on the website: <https://ec.europa.eu/eip/agriculture/en/focus-groups/bee-health-and-sustainable-beekeeping>

Additionally, PoshBee supported members in applications to contribute to the **EFSA Bee Guidance Revision - Expert Knowledge Elicitation panel**, with Ms Attridge (FIBKA), Prof. Yves Le Conte (INRA), and Prof Potts (UREAD) applying to represent PoshBee on this panel. If successful, this will enable PoshBee to contribute its outputs and knowledge directly to an important feeder document for future EC policy development.

3.1. Internal structures and processes to safeguard exploitation, innovation and IP management

Internal structures designed to ensure the successful dissemination and exploitation of the project, including knowledge and IP management, have been established from the beginning of the project and are defined in the Consortium Agreement, where procedures and rules are set for ownership and transfer of results as well as access rights for exploitation of results.

Additionally, the project's [Communication strategy and dissemination plan](#) (D11.3) sets the rules and obligation of partners, as well as defining main dissemination actors to take up responsibility for the project's exploitation and dissemination activities.

With this exploitation plan, an annual short workshop is defined as a main driving force to monitor actions, improve and enrich exploitation activities of PoshBee (see section 3 for details).

4. Exploitation plan

The following table (Tab. 2) outlines the different exploitable results as outlined in section 2.3 alongside the foreseen exploitation routes divided by key audience type. The results of this table were obtained through an online consultation with the key responsible partners for each result.

Table 2: Exploitation pathways

Time	Relevant deliverable / result	Science	Policy / Regulators	Practice	Data
Aug 2020	10.8 Policy entry points and briefs	N/A	Policy briefs, targeted towards: DG SANTE, DG ENV, DG AGRI, EFSA, potentially MS government	Practice abstracts EIP-Agri	N/A
Aug 2020	3.1 Toxicokinetics of 3 chemicals in bees	Presentation at conferences Open access manuscript publication	N/A	N/A	N/A
Aug 2020	3.3 Acute/chronic chemical effects and interactions in bees	Presentation at conferences Open access manuscript publication	Practice abstract on EIP-Agri	Practice abstract on EIP-Agri	N/A
Aug 2020	3.4 Toxicokinetics/dynamics of chemicals in bees	Presentation at conferences Open access manuscript publication	N/A	N/A	N/A
Aug 2020	3.2 Improved protocols for chemical testing in bees	Open access publications, presentations in APIMONDIA,	N/A	N/A	N/A

		EurBee, International Symposium Hazard of pesticides to Bees and local conferences for stakeholders.			
Mar 2021	4.1 Chemical effects on solitary bees	Presentation at conferences Open access manuscript publication	Protocols	Protocols	Where possible data will be deposited in a public repository e.g. dryad
Mar 2021	5.1 Nutritional requirements of bees	Presentation at conferences Open access manuscript publication	Protocols	Protocols	Where possible data will be deposited in a public repository e.g. dryad
Mar 2021	8.3 Agent based risk assessment model for bumblebees	Presentation at conferences Open access manuscript publication	N/A	N/A	N/A
Aug 2021	6.1 Chemical x pathogen effects on honey bees	Open access manuscript publication	N/A	N/A	Open access repository depending on journal requirements.
Aug 2021	6.2 & 6.3 Chemical x pathogen effects on bumblebees	Presentation at conferences Open access manuscript publication	Presentation at conferences Open access manuscript publication	EIP Practice Abstracts	Original data will be deposited in a public repository e.g. dryad
Aug 2021	6.4 Chemical x pathogen effects on solitary bees	Presentation at conferences Open access manuscript publication	N/A	N/A	Original data will be deposited in a public repository e.g. dryad
Aug 2021	7.1 & 7.2 Multiple stressor effects on bees in semi-field	Open access scientific publications	Presentation of findings also at	Presentation of findings also at	N/A

		Presentation at conferences Film material (short video)	workshops/ meetings and/or media (e.g. applied journals) most relevant to stakeholder groups Policy brief	workshops/ meetings and/or media (e.g. applied journals)	
Aug 2021	8.1 Bee health definition and indicators	Presentation at conferences	Directly to EFSA through the PoshBee Scientific Steering Committee, to EC Directorate Generals through meetings	Press release; EIP-Agri Practice abstracts	N/A
Aug 2021	D2.6 New technology to measure environmental contamination	Presentation at conferences Open access manuscript publication	Press release	EIP-Agri Practice abstracts Presentation at practitioner conferences	N/A
May 2022	9.14 Honey bee MALDI imaging method	Presentation at conferences Open access manuscript publication (e.g. ASMS, OurCon, Mass spectrometry, EurBee, Apimondia),	Press Release	Websites (e.g. PoshBee, BioPark). Short video	Support to publication, Shared via repository databases (e.g. MSIMass List (www.maldi-msi.org/mass), a public database of Identifications for Protein MALDI MS Imaging.
May 2022	10.2 Incentives and barriers to tool adoption	Presentation at conferences Open access manuscript publication	N/A	Presentations at practitioner conferences. Exploitation plan for the Bee Health Tool.	Results from surveys, undertaken across 8 partner countries, will directly feed into the exploitation

					plan for the bee health tool.
Aug 2022	5.1 Nutritional requirements of bees	Presentation at conferences Open access manuscript publication	Protocols	Protocols	Where possible data will be deposited in a public repository e.g. dryad
Aug 2022	5.2 & 5.3 Chemical x nutrition effects on bees	Presentation at conferences Open access manuscript publication	Protocols	Protocols	Where possible data will be deposited in a public repository e.g. dryad
Aug 2022	8.2 Chemical effects on bee health model	Presentation at conferences Open access manuscript publication	Recommendations for pesticide registration procedures	N/A	Where possible data will be deposited in a public repository e.g. dryad
Aug 2022	4.2 Chemical x pathogen x nutrition effects on solitary bees	Open access manuscript publication	N/A	N/A	Original data will be deposited in a public repository e.g. dryad
Jan 2023	10.3 Synthesis of multiple stressor exposure	Presentation at conferences Open access manuscript publication	N/A	Practice abstracts.	Open access repository depending on journal.
Jan 2023	10.4 Synthesis of multiple stressor impacts	Open access manuscript publication	N/A	N/A	N/A
Jan 2023	10.5 Synthesis of Omics approaches	Open access manuscript publication, Book chapter on protocols & methods.	Public reports, National & International Conferences and/or Workshops	National & International Conferences and/or Workshops	Shared through repository databases such as Pride (https://www.ebi.ac.uk/pride/), Figshare (https://figshare.com/), or ProteomeXc

					change (http://www.proteomexchange.org)
Jan 2023	10.7 Overview of tools, protocols, guides	N/A	Directly to EFSA through the PoshBee Scientific Steering Committee, to EC Directorate Generals through meetings	EIP Practice Abstracts	N/A
May 2023	7.3 Multiple stressor effects on bees in field	Presentation at conferences Open access manuscript publication	N/A	N/A	Data will be delivered in an open access repository with the publication of the main results for example in Dryad https://data.dryad.org/stash
May 2023	8.4 Risk assessment tool for EFSA	N/A	Directly to EFSA through the PoshBee Scientific Steering Committee, to EC Directorate Generals through meetings	N/A	N/A
May 2023	9.15 Use of BeeTyping for monitoring	Open access manuscript publications, Book chapter on protocols & methods,	Public reports, National & International Conferences and/or Workshops. Video on the procedure	National & International Conferences and/or Workshops Video on the procedure	Development of a dedicated MALDI-MS spectral database for bee health monitoring

May 2023	D9.10 Consolidated peptide/protein database and markers	Open access manuscript publications. Included into the integrated PoshBee database.	N/A	N/A	Web repository
May 2023	10.6 Responses to multiple stressors	“Identification of the most effective policy and practice responses to the multiple stressor effects on bees” – report uploaded to the official part of the PoshBee website. Scientific conferences	N/A	Press release or publication in apicultural magazine of the achievements of the virtual/face-to-face workshop.	N/A

Obstacles and barriers

Table 3: Obstacles and barriers and potential mitigation actions.

Risk:	Level:	Mitigation:
Delays in time plan (due to the COVID-19 crisis)	Medium	Constant collaboration and communication with partners to reschedule and re-plan.
Delays in time plan (due to other reasons)	Low	Constant collaboration and communication with partners to reschedule and re-plan.
Postponed or cancelled key events where PoshBee products are planned to be presented	Medium	Online promotion, including videos and online booths
Difficulties in reaching out to communities outside of research and science	Low	Use of contacts and know-how of consortium members coming from practice: beekeepers, beekeeping associations, farming associations etc.
Difficulties in adequately addressing and involving policy and regulators	Medium	WP in PoshBee is specifically addressing the different stakeholders' communities. Deliverable 10.2

This list of identified obstacles and corresponding mitigation measures will be reviewed at additional clarifying consultations planned for each forthcoming AGM, where the communication leader together with the responsible partner will revisit these intentions and plan for concrete actions for each 12 month period and supplements will be prepared to the exploitation plan. These supplements will be published together with the plan at: <http://poshbee.eu/documents/1/>.

The overall methodology for these consultations is the following for each period [Period 1 (M24 to M32); Period 2 (M32 to M44); Period 3 (M44 to M56) and Period 4 (M56 to M60)]:

- A session held at each AGM to collect information and plan concrete activities in line with the exploitation paths defined for each result in the following period (January)
- Supplement to the exploitation plan published at <http://poshbee.eu/documents/1/> (February – March)
- Feedback form sent to partners to collect achieved results, recommendations and suggestions (November – December)

In May 2024, towards the project's end, all plans and reports on the project exploitation, including the final ones, will be presented to the EC within D11.6 Reports on dissemination activities II.