

➤ BECO

Bees and Dialogue. Seeing Floral Resources as a Common Good to Reconcile Agriculture, Beekeeping and Biodiversity

Métaprogramme BIOSEFAIR

Project report: 2021 - 2024

June 2024

The BECO project seeks to better understand the interactions between beekeeping, farming, and the conservation of wild bees at the landscape scale, through the lens of floral resources (nectar, pollen) used by bees.

Driven by changes in agricultural practices, climate change, and the growing number of beekeepers and hives, some regions are experiencing increasing tensions over these floral resources. Recent scientific studies suggest that these resources, long considered unlimited, may actually be subject to competition—both interspecific, between wild and managed bees, and intraspecific, between managed bee colonies. Landscape ecology research also shows that the composition and spatial organization of landscapes shaped by farming influence the dynamics of floral resources, bee populations, and associated ecosystem services, especially pollination. This perspective invites us to view floral resources as a common good that requires collective management, bringing together beekeepers, biodiversity managers, and farmers who directly influence the availability of these resources.

To advance our understanding of these issues and the associated socio-ecological systems, we developed a transdisciplinary approach combining:

- (i) spatial ecology, to measure and characterize competition between bees over floral resources,
- (ii) landscape ecology, to assess the impact of farming practices on landscapes and floral resources,
- (iii) social sciences, to understand and facilitate social interactions around the management of this common good, and
- (iv) participatory approaches, involving stakeholders from the Cévennes National Park study area, in order to co-produce actionable knowledge.

Two PhD theses were conducted within this project, in partnership with the Cévennes National Park.

The first thesis (Léo Mouillard-Lample, defended in December 2023), focused on competition between wild and managed bees, explored the interactions between beekeeping and wild bee conservation around the question: to what extent is it relevant to consider floral resources as a common good? From an ecological perspective, field surveys suggest that competition among bees does occur in the study area—meaning that, ecologically speaking, floral resources can indeed be seen as common goods. From a social perspective, while most beekeepers claim not to perceive this competition, interviews reveal evolving representations, with some beekeeping practices already aiming to reduce competition. A role-playing game (Agorapi serious game) was developed and tested in the Cévennes National Park to foster collective reflection among beekeepers and managers on innovative, collaborative approaches to managing floral resources at the landscape scale.

The second thesis (Gabriel Gonella, defended in January 2025), focused on interactions between beekeeping and farming through floral resources, aimed to identify barriers and levers for developing agricultural landscapes rich in floral resources that support beekeeping. The first part of the thesis, grounded in territorial agronomy, examined techno-economic barriers and levers, proposing to conceptualize farming and beekeeping systems as interacting production systems. The second part, grounded in human geography, investigated social interactions between beekeepers and farmers, their representations of floral resources, the values they attach to them, and their motivations to reconcile (or not) agriculture and beekeeping.

Results

Léo Mouillard-Lample's PhD invites us to view floral resources as a common good requiring collective management. It builds on an innovative conceptual framework (see below) and tests it in the Cévennes region.

Semi-structured interviews conducted with a diverse range of beekeepers were used to study their representations of floral resources. The results show that they are currently undergoing a paradigm shift. Indeed, they are becoming aware that resources they once considered

unlimited are in fact subject to competition, and therefore need to be managed collaboratively.

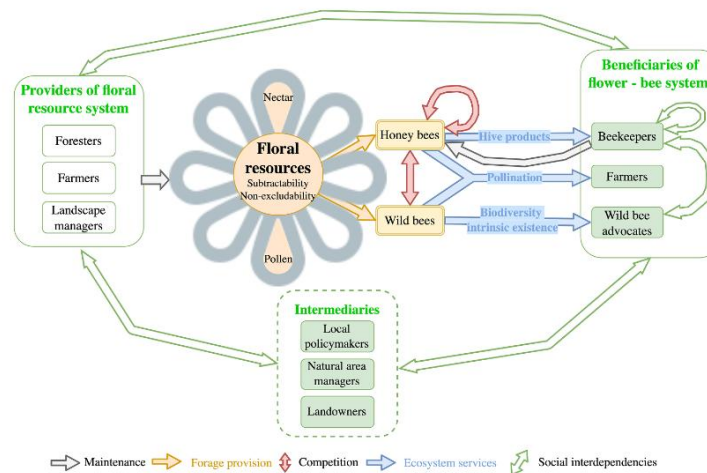


Fig. 1. Conceptual model of the human-bee-flower social-ecological system drawing on common-pool resource theory (Ostrom, 1990) and a framework by Barnaud et al. (2018) on ecosystem services and social interdependencies.

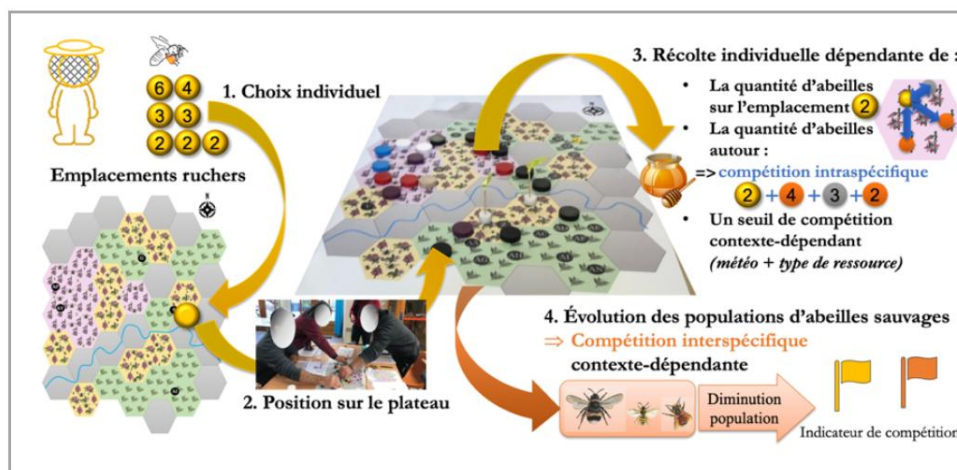


Figure 31 : Actions des joueuses et leurs résultats. (1) Les joueuses choisissent la répartition de leurs jetons abeilles sur leurs emplacements disponibles de façon individuelle. (2) Les joueuses positionnent leurs jetons sur le plateau commun. Chaque couleur de jeton est associée à un(e) joueur·euse. (3) En fonction de la quantité d'abeilles par jeton déposées sur une tuile les apicultrice·rices récoltent le miel produit sur la tuile qui dépend de la ressource, de la compétition avec les autres « abeilles » et de la météo. Par exemple, le joueur·euse jaune qui a déposé deux abeilles récupère 2 fois la quantité de pot de miel produite par abeille quand 11 abeilles sont positionnées (somme des abeilles des joueur·euses jaune, rouge et gris). (4) En fonction des jetons « abeilles » déposés et de la compétition interspécifique qui en résulte la population des abeilles sauvages évolue. Quand elle descend sous un certain seuil des indicateurs de compétition sous forme de drapeaux de couleur sont positionnés sur les tuiles impactées.

- Ecological findings suggest the existence of competition between wild and managed bees over certain floral resources in the Cévennes National Park.
- A role-playing game (Agorapi) was created and implemented to stimulate collective reflection among beekeepers and managers on innovative forms of collaborative management of floral resources at the landscape scale.

Gabriel Gonella's PhD produced the following main results:

- A system agronomy approach was proposed to consider beekeeping and farming as two interacting production systems. Based on semi-structured interviews with beekeepers and farmers in Mont Lozère, this work shed light on beekeepers' rationales, the floral resources they rely on, and the impacts of farming systems on

these resources. It revealed that the floral resources used by beekeepers are threatened by dominant agricultural development pathways—namely, the intensification of farming practices in cultivated areas and the extensification of grazing in rangelands. By contrast, “frugal” farming systems—based on low inputs, modest investments, and labor-intensive practices such as intensive pasture use—prove to be the most favorable to floral resources.

- A social analysis of beekeeper–farmer interactions (mutual representations, social relations) show that their interaction over floral resources concern mainly the access to these resources (search for hive locations), and very little regarding their actual production.

Scientific perspectives.

Operational perspective: to develop a simplified and transferable version of the game, and disseminate it to potential users (nature managers and beekeeping organizations).

Research perspective: to produce generalizable knowledge on social mechanisms linked to the emergence of a common good—through the organization and analysis of multiple game sessions, exploring how awareness of interdependencies develops, how collective reflection on co-management rules takes place, and which barriers and levers shape this collective approach.

Dissemination and valorization

Gonella G., Leoni E., Aubron C., Decourtye A., Deconchat M., Mouillard-Lample L., Barnaud C. (2024). Beekeeping and Agropastoralism Interactions through Floral Resources in the French Mount Lozère. *Agronomy for Sustainable Development* 44, n° 5 (2024): 49. <https://doi.org/10.1007/s13593-024-00985-1>.

Mouillard-Lample L., Gonella G., Decourtye A., Henry M., Barnaud C. (2023-06-08). Competition between wild and honey bees: Floral resources as a common good providing multiple ecosystem services. *Ecosystem Services*, 62, 101538, <https://dx.doi.org/10.1016/j.ecoser.2023.101538>, <https://hal.inrae.fr/hal-04153262>, OA

Communications in conferences :

Léo Mouillard-Lample, Gabriel Gonella, Christophe Le Page, Fabrice Allier, Axel Decourtye, Cécile Barnaud (2024). Les ressources florales, un bien commun? Étude de l'émergence d'un bien commun à partir du jeu sérieux AGORAPI. Colloque Jeux et enjeux, juin 2024.

Gonella G., Léoni E., Mouillard-Lample L., Aubron C., Deconchat M., Decourtye A., Barnaud C. (2022-04-08). *Interactions between beekeeping and livestock farming systems in agropastoral landscapes : a floral resources centered approach*. Presented at : 14th European Farming Systems Conference: Farming systems facing climate change and resource challenges (IFSA 2022), IFSA, Évora, Portugal (2022-04-08 - 2022-04-14), <https://hal.inrae.fr/hal-03815634>

Mouillard-Lample L., Gonella G., Le Page C., Henry M., Decourtye A., Barnaud C. (2022-10-05). *Le jeu sérieux AGORA: Accompagner la Gestion et l'Organisation du partage des*

Ressources Apicoles. **Presented at** : Groupement de Recherche PollinEco « Pollinisation, réseaux d'interactions et fonctionnalité des écosystèmes », 4ème rencontre, Paris, France (2022-10-05 - 2022-10-07), <https://hal.inrae.fr/hal-03807254>, OA

Gonella G., Léoni E., Mouillard-Lample L., Decourtye A., Deconchat M., Barnaud C. (2022-10-05). *Des pratiques aux paysages, des fleurs aux usages apicoles : les ressources florales dans les systèmes de production agropastoraux..* **Presented at** : Groupement de Recherche PollinEco « Pollinisation, réseaux d'interactions et fonctionnalité des écosystèmes », 4ème rencontre, Paris, France (2022-10-05 - 2022-10-07), <https://hal.inrae.fr/hal-03807846>

Mouillard-Lample L., Gonella G., Le Page C., Henry M., Decourtye A., Barnaud C. (2022-07-11). *Beekeep calm and think common. A game for the governance of floral resources use among beekeepers.* **Presented at** : IALE 2022 European Landscape Ecology Congress, Warsaw (online), Pologne (2022-07-11 - 2022-07-15), <https://hal.inrae.fr/hal-04166148>, OA

Mouillard-Lample L., Gonella G., Henry M., Decourtye A., Barnaud C. (2021-11-16). *Compétitions inter-spécifiques et intra-spécifiques : l'apport des travaux sur les biens communs. Enquêtes sur le territoire du parc national des Cévennes.* **Presented at** : GDR Pollineco, Toulouse, France (2021-11-16), <https://hal.inrae.fr/hal-03593813>

Technical articles

Mouillard-Lample, L., A. Decourtye, M. Henry, F. Allier, and C. Barnaud. 2023, September 26. Le partage des ressources florales : tragedie ou auto-gestion de biens communs ? <https://itsap.asso.fr/articles/le-partage-des-ressources-florales-tragedie-ou-auto-gestion-de-biens-communs>

Mouillard-Lample, L., A. Decourtye, M. Henry, F. Allier, and C. Barnaud. Le partage des ressources florales : tragédie ou auto-gestion de biens communs ? Article publié sur le site de l'ITSAP, institut de l'abeille. 26 septembre 2023. Rédacteurs : <https://itsap.asso.fr/articles/le-partage-des-ressources-florales-tragedie-ou-auto-gestion-de-biens-communs>

➤ A Science communication activities and societal interactions

Serious game Agorapi

Press article – GEO, Décembre 2020 (écrit par Yann Chavance) « Nos abeilles, un danger pour la nature »

Press article – 2020 Terre Sauvage n°390 (écrit par Yann Chavance) « Précieuses butineuses »

Press kit INRAE "Les abeilles au cœur des transitions" based on the thesis of Léo Mouillard-Lample, and the paper Mouillard-Lample et al. (2023) Ecology & Society <https://www.inrae.fr/dossiers/abeilles-au-coeur-transitions>