

## Between economic efficiency and idealism: motivations for beekeepers participating in a honey bee health research project

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Linde Morawetz<sup>a,\*</sup> and Robert Brodschneider<sup>b</sup>

*a Department for Apiculture and Bee Protection, Austrian Agency for Health and Food Safety Institution, Spargelfeldstraße 191, Vienna, Austria*

*b Institute of Biology, University of Graz, Universitätsplatz 2, Graz, Austria*

*E-mail: [linde.morawetz@ages.at](mailto:linde.morawetz@ages.at), [robert.brodschneider@uni-graz.at](mailto:robert.brodschneider@uni-graz.at)*

Studies involving beekeepers have proven to be an effective tool for honey bee health research. The contributory citizen science project "Virus Monitoring" focused on bee virus prevalence in Austria. It was characterised by reliable cooperation with 211 beekeepers and a drop out rate of only 10%. The participating citizen scientists provided their own bee colonies and carried out sampling and symptom observation in the colonies. At the end of the project, we surveyed the citizen scientists in an online questionnaire about their motivations for participation (n=146). We want to understand the successful participant bond and to make it repeatable for future projects. For more than 90% of the beekeepers, both practical reasons, such as improving the health of their own bees at low cost, and idealistic reasons, such as supporting science and the environment and expanding their own knowledge, played an important role. Future citizen science projects should address beekeepers in their multiple roles: as agricultural (micro) entrepreneurs, as people interested in science and knowledge, and as responsible caretakers of an ecologically important pollinator species.

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\*Speaker

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## 1. Introduction

Beekeepers as citizen scientists prove to be effective actors for research on honey bee health [1, 2]. The citizen science project "Virus Monitoring" (part of the larger project Zukunft Biene 2) examined the virus prevalence in Austrian honey bee colonies [2]. They sent bee samples for further molecular analysis once a year and made observations about the health status of the sampled bee colonies as well as about the percentage of winter losses in their observation apiaries. In return, they received the analysis results for their bee colonies, leaflets informing about bee viruses and - if requested - personal advice by our extension workers. Beekeepers worked on this with us for three consecutive years (2018-2020). The participant dwindle was rather low (10%). The survey presented here aims to understand the bond of participants for future similar projects involving beekeepers as citizen scientists.

## 2. Material + Methods

In winter 2017/2018 we advertised for project participation via articles in the main Austrian beekeeper journal, via e-mails to experienced participants from earlier and on-going projects [2, 3] and via announcements on beekeeping events. Out of the around 300 registrations we selected 200 beekeepers for participation with stratified random selection, which reflected the beekeeper distribution among the Austrian federal states.

At the end of the project (autumn 2020), the participants were asked via e-mail to participate in an online-survey about their motivation to participate in the study. The survey was conducted online in German using LimeSurvey and used question/answer design similar as in [4] for comparability. In total, 211 persons were invited for participation, of which 146 persons answered. The data analysis was done with R [5] using 'ggplot2' for graph design [6].

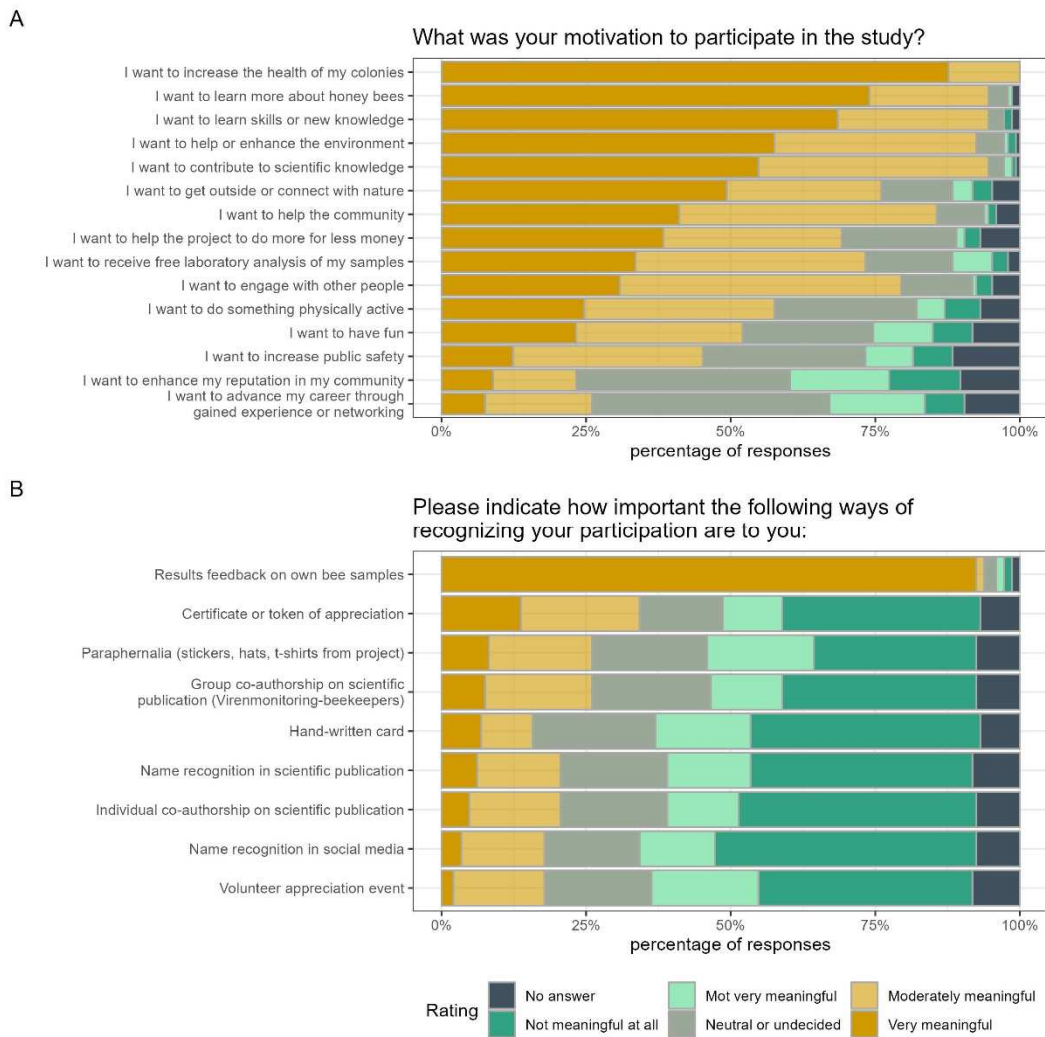
## 3. Results + Discussion

### 3.1 Description participants

The sample consisted of 85% male and 11% female participants (4% no answer), which is typical for the male dominated beekeeping sector in Europe and Austria [7]. The education level of citizen scientists was high: 33% had an academic degree and 49% completed professional training. These data show that the "Virus Monitoring" project attracted persons with academic background, an effect also observed in other citizen science projects with beekeepers [4].

Mostly middle-sized beekeeping operations for the Austrian context participated: 15% of the participants had less than 10 colonies, 69% had between 11 and 50 colonies and 14% had more than 50 colonies (1% no answer). Generally, the majority of Austrian beekeepers have less than 11 colonies [3]. However, one of the preconditions for participation (at least five colonies per participant) presumably affected this bias in participant characteristics compared to the whole population.

Beekeeping education was also high among participants: 48% had professional beekeeping training (master beekeeper, skilled worker, beekeeping teacher), 38% had taken advanced courses, 8% the basic training in beekeeping and only 4% received no training at all (1% no answer). This shows a high interest in highly trained and active beekeepers in the project as beekeepers with professional beekeeping training are seldom in Austria.



**Figure 1:** Participating beekeepers ranked (A) their motivation for participation and (B) their interest in possible incentives (n =146).

### 3.2 Motivation and recognition for participation

The three most important motives for participation of beekeepers were to improve the health of their own honey bee colonies, to gain knowledge - with focus on bee health - and to contribute to science and nature conservation (Figure 1A). Interestingly, the motive of gaining a free lab analysis was ranked relatively late (9th rank out of 15). However, the by far most important recognition for cooperation were the results of the beekeepers’ own bee samples (Figure 1B).

The value of virus tests is also shown by the fact that 84% of the participants would like to carry out virus tests annually. However, only 28% would be willing to pay for analyses. On average, they would spend about 73€ (+/- 60€ standard deviation) for the virus analysis. To give a comparison: one laboratory analysis was calculated at about 180€ in the project.

Thus, beekeepers’ motives for participation were mostly idealistic. At the same time, they saw the free lab analysis as an important by-product and presumably as a main incentive to stay in the project for the whole duration of the project. A similar pattern was also observed in another

beekeeper citizen science project, showing the central importance of detailed feedback to beekeeping citizen scientists [4].

An additional motivation, which has not been addressed in this study, would be if evident virus problems in the respective beekeeping operation increase the willingness to participate and stay in the project. In the given project 12 out of 22 participants, who dropped out of the project, communicated their reasons: stopped with beekeeping (4 participants), high workload or illness (3), problems in receiving or sending out sampling material (3), too few colonies to meet the project conditions (1) and a notifiable disease in the apiary (1). Of the ten participants, where we do not know the reasons for dropping out, six did not send in their sample at the last sampling event of the project – thus we assume a low motivational status at the end of the project.

#### 4. Conclusion

A connection between personal interest and economic profitability can be clearly seen in the answers. The successful commitment of the participants to the project is probably due to the fact that both the idealistic mindset was addressed as well as financial recognition in the form of free laboratory analyses was available.

Future projects should perceive and address beekeepers in their multiple roles: as agricultural (micro-)entrepreneurs, as people interested in science and gaining knowledge, and as responsible caretakers of an ecologically important pollinator species.

#### 5. Acknowledgements

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