



# UrbanBeesRemote Project Proposal

## 1 Initial Situation

With our current experimental setup, i.e. ca. 200 beehives located on 120 roofs of Lorbrulgrud, beehives belonging to ca. 20 local beekeepers and on which we proceed a few times a year to conduct chemical analyses of the collected honey, we have reached some limitations to conduct insightful research on the bee collapse syndrome. For instance, the urban entomology laboratory of Lindalino University monitors remotely more than 500 beehives and collects much more information that we can analyse. As a consequence, our research work suffers from our limited experimental means and it becomes more difficult to publish in high ranked academic journals.

## 2 Project Objectives

To have an enhanced experimental setup by Q1 2018, which will allow us to monitor remotely external and internal parameters of some 400 to 450 beehives, located on the roofs of Lorbrulgrud, with the goal of remaining key players among the laboratories doing research on the bee collapse syndrome.

## 3 Possible Solutions

This project consists of increasing the number of beehives located on the roofs of Lorbrulgrud from 200 to 400-450, and equipping all the beehives with an instrumentation that is remotely operated.

This instrumentation can be bought off-the-shelves from National Instruments Corp. for instance, or developed with the help of the Department of Engineering (Microelectronics Lab,  $\mu$ ELab) of the university.

The remote operation can either be done by means of the internet connections of the roof owners partners of this project or through the telecom network of BrobTelecom.

## 4 A priori Preferred Solution

### 4.1 Description of the Preferred Solution

The preferred solution consists of developing specific and dedicated instruments based on off-the-shelf electronic components. The data measured by these instruments will then be pre-processed and recorded locally by means of Arduino- or Raspberry PI-based micro-controllers connected to the internet through WLAN. A dedicated MySQL-database server will be set to collect and store data.

It is intended to use the personal WLAN of the inhabitants of Lorbrulgrud who have accepted to host beehives on the roof of their houses. Agreements will have to be complemented to accommodate this new requirement.

### 4.2 Stakeholders and "Approched Project Board" Membership

Typically, three sources of funding are targeted for this project:

- The 2017 University of Broddingnag (UoB) fund for experimental research;
- The City of Lorbrulgrud and its Service for Environmental Protection which is already a partner of the lab;
- The Broddingnag Beekeeper Association (BBA) which is a partner of the Laboratory of Urban Ecology (LUE) and which is still very interested from the outcomes of this future research program.

Manpower resources will be provided by both the Department of Engineering ( $\mu$ ELab) and the Department of Environment Sciences (LUE).

Hence, the approached project board for this project consists of the following members:

- Archibald B. (head of the UoB Laboratory of Urban Ecology);
- Célestine D. (head of the UoB Microelectronics Lab);
- Ernestine F. (head of the Service for Environmental Protection, City of Lorbrulgrud);
- Gustave H. (chairperson of the Brobdingnag Beekeepers Association);
- Léoncie M. (senior researcher in the LUE and possible project lead).

#### 4.3 Phasing, Project Organization, Masterplan

The project will follow the openSE project management and systems engineering methodology promoted by the Quality Support Office (QSO) of the university.

As soon as the project is validated, the study phase will be launched and should last four months. This phase will aim at demonstrating the feasibility of the proposed solution (see § 4.1) and at submitting funding applications (see § 4.2) based on a detailed cost estimate. The few financial resources required for running this study phase (ca. 5000 *groats*) will be charged to the LUE operations budget.

The development (design, build and commission phases) is expected to last ten months. The launch of the development phase is of course subject to obtaining the funding.

#### 4.4 Required Resources

Study phase: 6 p·m (60% LUE, 40%  $\mu$ ELab) + 5000 *groats*

Development phase: ca. 20 p·m + 80 000 *groats*

#### 4.5 Outcomes and Benefits of the Project

This project should raise the following benefits:

- Maintaining the LUE as a key player among the laboratories doing research on the bee collapse syndrome;
- Creating high end experimental data to publish results in key academic journals;
- Maintaining insightful research activities in the LUE and attracting early stage researchers;
- Providing interesting teaching projects to  $\mu$ ELab faculties and students;
- Perpetuating the partnerships with the City of Lorbrulgrud and BBA;
- Contributing to the implementation of UoB strategy in creating transverse projects among university departments.

### 5 Preliminary Risk Register

The following risks were identified:

- Uninsufficient funding, but initial investigations show that stakeholders are likely to fund this proposed project;
- Unrealistic master schedule, but discussions in conferences and workshops have shown that one year to have a experimental setup in operation is realistic;
- Poor project management, but the project team intends to implement openSE;
- Technical problems with instrumentation, but according to  $\mu$ ELab colleagues, the solutions considered are totally feasible;
- Uninsufficient number of beehives/beekeepers, but very unlikely according to BBA;
- Enhanced experimental setups by other labs, but our scientific watch shows that this set-up will be very competitive.

Date	Version	Author(s)	Pages	Comments
2016-06-0X	A	Léoncie M., Nestor O.	—	First draft submitted to Péroline Q. for verification.
2016-06-1X	B	<i>idem.</i>	2	Minor typos corrected; second draft submitted to the approached project board members (§ 4.2) for decision.