ELECTRONIC HIVES PROTOCOL

Premise

As part of the Beediversity project, two different types of electronic hives were used and tested: one made by Beehive Monitoring (Slovakia) and the other by Melixa (Italy).

Both devices proved to be functional and shared a feature that measured the fundamental parameters for collecting data on a specific bee colony, e.g. hive weight, internal and external hive temperature, and the number of flights.

There are, however, substantial differences between the two electronic hives: the Beehive Monitoring system also measures humidity, atmospheric pressure and sound emission spectrum; and the Melixa system also measures wetting. Additional differences were that all of the measuring devices (e.g. scales, counters, internal sensors) used by the Beehive Monitoring system communicate with a central unit which uses a SIM card to transmit data wirelessly to the manufacturer's portal.

Although this function appears to be practical at first, it harbours critical operational issues, as the batteries for the various devices need to be replaced or charged periodically, in particular those not powered by photovoltaic panels (e.g. internal sensors), thus making the entire system more delicate and therefore less reliable. In the Melixa system, however, all the devices are connected to a single central unit powered by an adequately sized photovoltaic panel, which therefore powers all the devices. This makes the Melixa system easier to manage, with notable advantages in terms of control and reliability.

Another advantage of the Melixa system is that an additional antenna can be installed onto the central unit, thus significantly improving the SIM's reception when the mobile data network signal is poor.

Furthermore, Melixa proved to be particularly prompt in providing technical support, both by telephone and remotely, to resolve the various problems encountered. It also provided support when the devices were serviced or adjusted at their Trento headquarters, with any issues being dealt with reasonably quickly.

Having said all this, we believe the Bee2gether Project needs only one type of electronic hive so that the data can be collected consistently, synchronised and then displayed in the app.

Although Beehive Monitoring's equipment is valid, we believe that Melixa makes the most suitable system for this project, as it proved to be more reliable.

Furthermore, Melixa and its technical support team is based in Trento and is therefore closer to the areas involved in the project.

Supply and positioning of electronic hives

Each partner will have to purchase their own hives for their area of responsibility.

To do so, contact Melixa directly https://www.melixa.it/

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Recommendation: to ensure better reception of the mobile network data signal, all electronic hives should be equipped with an additional antenna.

As agreed, each partner should purchase three electronic hives, with the exception of NIB, which will not buy any, for a total number of should purchase 12 (check) hives.

Each group of three devices will make up one replication (block) so that a comparison can be made between three different environments;

- Environment 1: one smart hive should be placed in the middle of a natural area in a Nature 2000 site, or a site with comparable characteristics, i.e. no or negligible agricultural practices and human activity;
- Environment 2: one smart hive should be placed in the middle of a farmed area in a Nature 2000 site where sustainable (we hope) agricultural practices are implemented; if no Nature 2000 site is available, an area with comparable characteristics should be chosen;
- Environment 3: one smart hive should be placed in the middle of a conventionally farmed area outside a Nature 2000 site, i.e. where agricultural practices and human activity may be expected to have a major impact.

The partner will be responsible for promptly notifying the LP as to the initial location of the devices, as well as their location should they be moved at a later date. Please provide location with GPS coordinates.

Choice of bee colony

Partners should choose a bee colony that is sufficiently strong and healthy. It should also be representative of the average colony in the local apiary. This will ensure representative and realistic data for the monitored area.

Installation

The Melixa hive has a central unit that collects data from the various cable-connected external devices, e.g. flight counter, scale, temperature and wet-area sensors, which can also be incorporated into the scale or flight counter.

All Melixa hives are equipped with an on/off button and a reset function. Recent models incorporate the central unit into the scale. It is therefore advisable to install the scale so that the on/off button remains on the side of the hive opposite the bee entrance in order to make beekeepers access easier and safer.

Below are some installation tips, but please make sure that you also follow the manufacturer's instructions carefully.

1. The electronic hive's solar panel should be connected to the scale and exposed to the sun for a few hours before installation to ensure that the batteries are charged and the hive functions straight away.

2. Make sure that the hive is positioned on a flat, stable support/surface.
3. To facilitate the following operations, we recommend removing at least the central frames from the hive, or all of them when necessary.
4. Installing the counter: remove the entrance grid. If free width between supports (guides) of the bees entrance its smaller than the counter remove the guides. Pass the temperature sensor wire and the internal sensor through the bee entrance.
5. The temperature sensor should be positioned at the centre of the colony. Screw its metal support onto the inside wall of the hive.
6. Then screw the flight counter outside the front wall of the hive and use the sheets provided to seal off any spaces where the bees could pass in/out, avoiding the flight counter.
7. Position and, if necessary, secure the photovoltaic panel so that it is fully exposed to sunlight and does not hinder beekeeping operations.
8. Connect the cables of all the devices to the scale using the appropriate sockets.
9. Make sure the button is in the “on” position. Initially the LED button flashes quickly to indicate that it is searching for the mobile data network. It will flash slowly once the network has been found.
10. Check remotely that the hive is transmitting data.

Subsequent checks

Once all the electronic hives are up and running, partners are responsible for ensuring that their systems remain operational, especially that data continue to flow continually and regularly.

Should data transmission be interrupted, notify the LP promptly and troubleshoot the issue, contacting Melixa when necessary.

We recommend regular physical checks when you visit the apiary to ensure that the devices are intact and operational.

NB: during events such as swarming, health problems or any issues that may harm or seriously compromise the colony, suitable beekeeping operations should be performed to restore normal conditions (or as normal as possible), including replacing the monitored hive or moving the devices. Please notify the LP promptly should any events occur.