



## CASE STUDY

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PRECISION BEEKEEPING  
WITH WIRELESS TEMPERATURE MONITORING

## Introduction

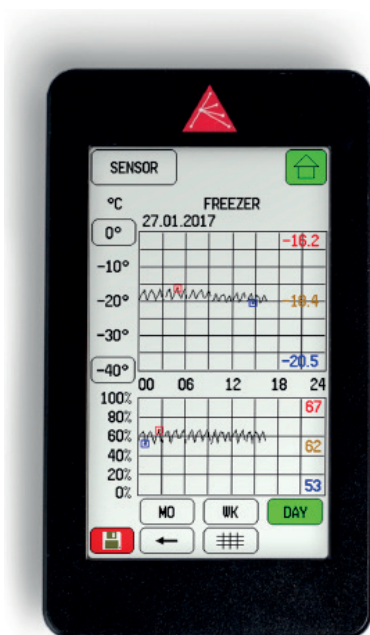
During the past few years, IoT has enabled numerous industries and businesses to increase efficiency by implementing centralized monitoring solutions for the most important processes. One such example can be found in apiculture or beekeeping.

Honeybees are insects of large economic value and provide a vital service to agriculture by pollinating a variety of crops. In addition, bees provide us with valuable products such as honey, beeswax, propolis, bee venom, etc.

Monitoring of honeybee colony health, population, productivity, and environmental conditions affecting the colony health have always been exceedingly difficult tasks in apiculture.

Research has shown that even small deviations (by more than  $0.5^{\circ}\text{C}$ ) from the optimal temperatures have a significant influence on the development of the brood and the health of adult bees.

The latest advancements in temperature monitoring technologies have finally lead to economically feasible applications in beekeeping. Continuous data gathering and analysis can be used to monitor individual beehives.



*Aranet MINI with Aranet T-probe sensor*

## User

The Research department of the Latvian University of Agriculture is currently examining precision beekeeping technologies. As part of this project they tested the Aranet T-probe wireless temperature sensors with an Aranet MINI base station to monitor the inside temperature of a brood nest.

The project aims to define precision beekeeping and create a management strategy based on gathering real-time data about the characteristics and development trends of individual beehives. That would help beekeepers minimize beehive resources while maximizing output.

## Testing process description

The temperature of the colony is a vital factor, and is controlled with precision. Honeybees maintain the temperature of the brood nest between 32°C and optimally 35°C so that the brood develops normally.

Research has shown that even small deviations (by more than 0.5°C) from the optimal brood temperatures have a significant influence on the development of the brood and the health of adult bees.

Researchers placed Aranet wireless sensor probes inside the brood nest to remotely monitor temperature and beehive activity with Aranet MINI. Usually, accessing a beehive disturbs the colony, which can affect its activities and reduce honey production by 25%. The probe approach significantly reduces any disturbance.

### Aranet wireless monitoring systems offer:

- Wireless temperature, humidity and CO2 monitoring in large areas, with just one base station that can support 1-100 wireless sensors within line-of-sight range of 3km/1.9mi;
- Receiving alerts via phone or e-mail for critical sensor readings;
- Simple and quick installation;
- Cost-effective solutions with included data analysis software
- Optimised UI/UX for desktop and mobile use;
- Operating as a safe, private network with an embedded local web-server that's not dependent on any third party service provider.



## Results

By using Aranet wireless monitoring systems the researchers gained valuable real-time data about the temperature of the brood nest, overall health and development of the bees. Centralized data aggregation during the testing process helped researchers save time and resources, as they could simultaneously view data from different beehives.

In addition, examining historical data helped the beekeepers make process optimization and help improve the productivity of the bees.

“With the instalment of the Aranet wireless temperature probe, we avoided causing extra distress to the beehive and loss of valuable heat inside the brood nest. Moreover, the Aranet systems provided us with valuable data necessary to monitor beehives 24/7.” Aleksejs Zacepins, research LLU

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