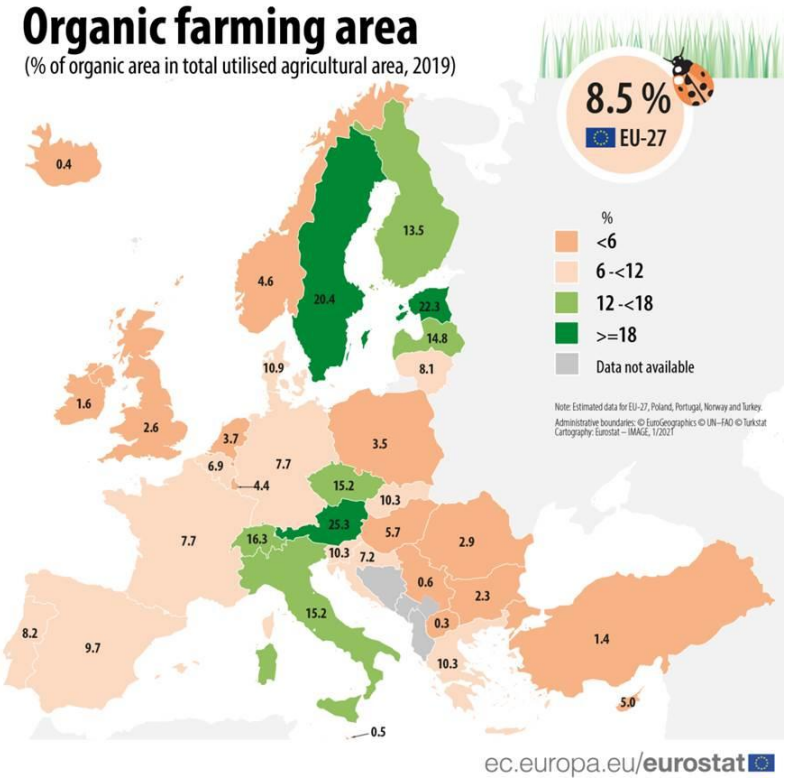
Precision agriculture and automatic irrigation in organic crops with Libelium's IoT technology

The combination of Libelium sensors and actuators connected to a WiFi network allows an organic farming plant to lower costs and increase the quality of production

Organic farming is a production method with the objective of obtaining food, natural substances and processes.

The total organic cultivation area in the European Union (EU) was 13.8 million hectares in 2019, which corresponds to 8.5% of the total agricultural area used. This represents a 46% increase between 2012 and 2019.

This increase is largely due to the introduction of innovative technologies such as the Internet of Things and Machine Learning.



In Sardinia, Consulmedia, a systems integrator with valuable experience on this Italian island, has developed an Agriculture 4.0 project using data from Libelium sensors. Its client, the Agribio social cooperative, owns more than 5 hectares of land for cultivation and 5 greenhouses with a total covered area of approximately 6,000 square meters.

The installation is designed to measure the essential aspects of an ecological plantation reducing the limited environmental impact by:

- the responsible use of energy and natural resources;
- improving soil fertility;
- maintaining water quality.

Consulmedias' system, named Biots, controls, measures and analyzes the Agribio greenhouse with the data provided by Libelium's network of high-end sensors for water and soil. The project includes a combination of Plug & Sense! Smart Water and Plug & Sense! Agriculture Xtreme powered by solar panels.

Plug & Sense! Smart Agriculture Xtreme:

- Temperature, air humidity and pressure
- Conductivity, water content and soil temperature
- Leaf saturation
- Solar radiation (PAR)
- Ultraviolet radiation

Plug & Sense! Smart Water:

- Conductivity sensor
- pH sensor
- Oxidation-Reduction Potential

Connected to these Plug & Sense! there is a wireless weather station that sends the detected data to the Biots platform regarding:

- temperature, humidity and pressure
- wind speed and direction
- rain

The sensor data is sent via a WiFi connection to the customer's gateway and from there to the Biots cloud platform, developed by Consulmedia.

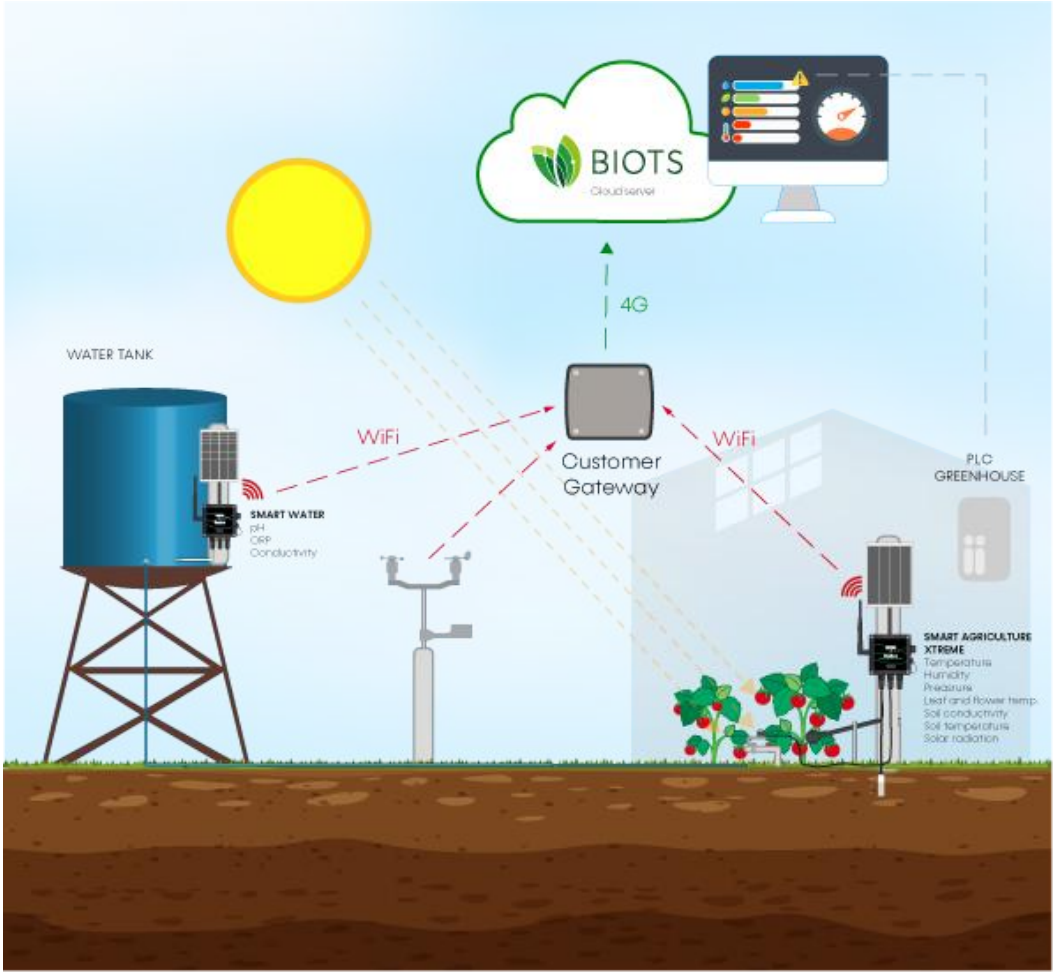
Precision Agriculture perspectives

This data is used from three different perspectives:

Data for the farmer
The information can be consulted in real-time for remote monitoring. Enabled users can see the trend of the parameters measured by the sensors (temperature, humidity ...) in personalized graphs, schedule alerts and make decisions based on them.

Data for actuators
Based on established threshold values, the system can automatically activate the solenoid valves for soil irrigation and other systems (humidification, lighting ...) through the data sent to the greenhouse PLCs.

Data for the algorithm
The platform uses the data for the design of predictive models thanks to learning algorithms. This learning is shared equally with the farmer and with the actuators to optimize the greenhouse resources to the maximum.

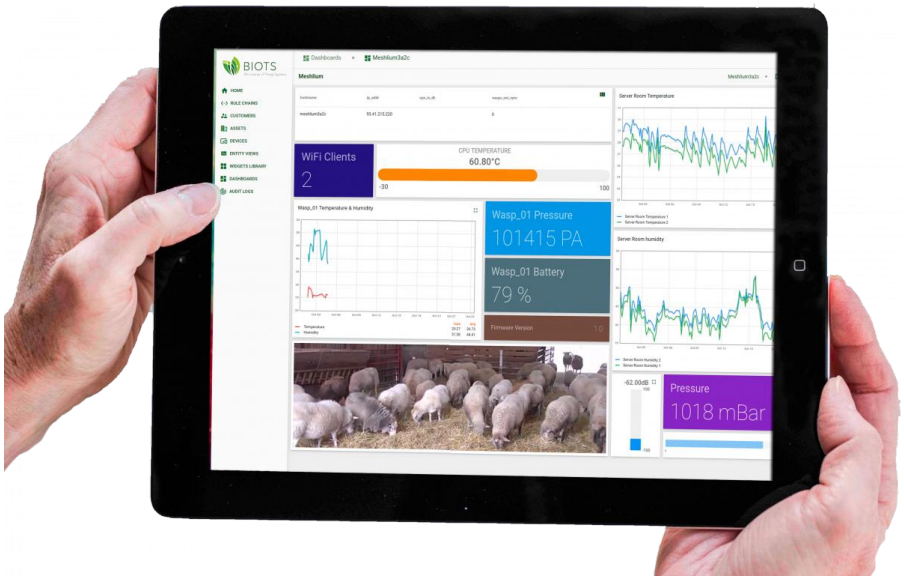


Moreover, Agribio greenhouse, and organic farming, have plenty of opportunities to get a return of investment from the Internet of Things technology:

- **In terms of time**, farmers do not have to go to the greenhouse or to the crop every day. They can see plant performance from their phones and computers. They can also activate remote controls without using on-site resources.
- **In economic terms**, it allows saving costs with smarter management decisions based on data collected in situ (for example, in irrigation) and optimizes production thanks to the adoption of models capable of preventing the appearance of common plant diseases.
- **In terms of productivity**, this modern cultivation method leads to higher crop yields. Globally, organic agriculture can produce an average of approximately 30% more food per hectare than conventional agriculture.

Giorgio Oggianu, manager of the cooperative, highlights the importance of the Biots control and monitoring system developed by Consulmedia, based on Libelium's IoT technology. “The application of precision agriculture techniques and methods allows us to automate a series of management processes. It also supports decision-making thanks to the use of evaluation models that, based on real-time surveys of various parameters, **provide useful information for the implementation of actions aimed at improving the growth of crops**, especially tomatoes in greenhouses.”.

But there are other incalculable benefits as well. By **making agriculture easier, more profitable and attractive**, depopulation in rural settings slows down. In addition, this project also has a great social impact since Agribio is a rural project employing disadvantaged people or those at risk of social exclusion.



More info:

- For technical details on Waspmote Plug & Sense! Smart Agriculture Xtreme: Waspmote Plug & Sense! Smart Agriculture Xtreme Technical Guide.
- For technical details on Waspmote Plug & Sense! Smart Water PRO: Waspmote Plug & Sense! Smart Water Technical Guide.
- For technical details on Waspmote Plug & Sense! Smart Environment: Waspmote Plug & Sense! Smart Environment Technical Guide.
- Read more about Libelium sensor product lines in the Waspmote, Waspmote Plug & Sense! Sensor Platform and Meshlium Gateway websites.
- For technical details on WiFi networking: WiFi networking guide

References:

Goals of organic farming: ec.europa.eu
Agro Sociale – Precision Agriculture: coltiviamoagricolturasociale.it