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Outsmarting climate change: Chateau Kefraya is Lebanon's first vineyard to leverage LoRaWAN™ and the Internet of Things to deal with changing growing conditions.

December, 2017 | Version 1.0

Company name: Libelium
Headquarters: Zaragoza, Spain
Year founded: 2006
Industry sector: IoT sensors and cloud solutions

Company name: Libatel
Headquarters: Beirut, Lebanon
Year founded: 1977
Industry sector: ICT

Smart agriculture is a fast-expanding segment of IoT-network deployments. Worldwide, the smart combination of communication networks, sensors and applications brings unprecedented tools and solutions for environment monitoring and decision-making processes, so as to improve farming, harvesting and production. Being able to regularly monitor atmospheric pressure, air and soil temperatures, rain and soil humidity, and luminosity helps in predicting production, by modelling the conditions of growth for the different seasons, and in anticipating the right decision to take to increase crop productivity, quality and efficiency. Moreover, facing increasing events related to climate change, such solutions will play a key role in empowering farmers to optimize the use of fertilizers, pesticides and other plant-protection products, and optimize natural options to vine harvest.

The Challenge

In that setting, **precision viticulture** aims at ensuring the highest standards of grape quality, to provide the best production of wine and grant its oenological grade, while optimizing vineyard yield. Temperature and hydrological stress are identified by experts as the most critical factors driving optimum growth of grapes, which may be limited by heavy rain, dryness, or unusual temperatures.

Facing such challenges, producers have to redefine the way they monitor their terroirs to react quickly and influence growing conditions that could affect grape growth, and especially the key parameters that give character and quality to the wine. For example, wine color comes from tannins and anthocyanin-pigment concentration, which directly depends on ambient humidity and carbon- dioxide concentration levels. Wine acidity, a key factor for its preservation, also depends on stable climate conditions and can, for example, be modified by variations in temperatures.

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Château Kefraya vineyards in Beqaa Valley, Lebanon

These considerations are currently at stake for more and more famous wineries, especially around the Mediterranean Sea, the historical birthplace of wine production. Lebanon has been one of these vine-growing countries for centuries and its production has spreads around the Mediterranean region since antiquity.

Recently rebranded, **Chateau Kefray**a is one of the most modern wineries in Lebanon. Located in the Beqaa Valley, its vineyards cover more than 300 hectares at an average altitude of 1000 meters above sea level. Known for its high-quality wines, Chateau Kefraya is the first Lebanese company to deploy an agriculture sensor system focused on precision viticulture, becoming the first Smart Vineyard in Lebanon.

"Improving automatic data collection enables us to obtain real-time information, expand our knowledge and allow us to better manage our time and resources", explains **Château Kefraya representative.**

The Solution

The project has been led by **Libatel**, a privately held company established in Beirut, with offices in Qatar, Saudi Arabia and United Arab Emirates. Libatel delivers advanced systems, communications and software integration for public and private businesses of all sizes in various industries.

In collaboration with **Ogero Telecom** and **Saint-Joseph ESIAM**, Libatel developed an agriculture sensor network and dedicated applications so Chateau Kefraya could compile soil and climate information and model their effects on grape growth and maturity.

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"Lebanon is ripe for implementing smart-agriculture applications that provide our producers real-time information to better manage crop maintenance, water consumption and fertilizer and pesticide applications", said **André Chkeiban, country manager for Libatel Lebanon**, an Information and Communications Technology (ICT) provider. "This improved efficiency supports sustainable-agriculture, while maximizing yields for producers, and this project with Chateau Kefraya will demonstrate specifically how the IoT can benefit Lebanese vineyards."

Vineyard information and growing conditions are automatically collected by sensors and **Libelium's** Wapsmote Plus & Sense! Smart agriculture PRO nodes. The equipment is connected to a private Internet of Things network powered by a **Kerlink Wirnet™ Station gateway** via the LoRaWAN™ communication protocol. Kerlink's gateway then transmits the data through an embedded 3G internet connectivity (SIM card) to **Actility's** cloud server, and then to Libatel's servers.

Libatel team installing Kerlink's LoRaWAN™ Wirnet™ Station

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Libelium's nodes are deployed in different locations in the vineyard, directly on the vine trunk at grape level. The node support leg is stuck in the ground to collect soil information, while the nodes itself, being at the same height as the grapes, monitor complementary parameters. The configuration also takes into account data related to each parcel: altitude, soil type, plantation density, vigor of vine, slope and the irrigation system.

"Wapsmote is a horizontal sensor platform that allows us to add many sensors to one sensing node. The Libelium IoT sensor platform offers exceptional interoperability, and the fact that Libelium, Kerlink and Actility have already partnered in other projects determined our decision to move forward", explained **Maher Choufani, IoT Project Manager at Libatel.**

Waspmote Plug & Sense! Smart Agriculture PRO positioned at the vine trunk

When the compiled real-time data is transmitted to Libatel's back-end platform, it is analyzed and displayed in alerts, monitoring charts and predictive results that guide Chateau Kefraya's vineyard-management decisions. This information is accessed easily through advanced user interfaces on a laptop or smartphone.

Combined with other external information such as meteorological forecasts and reports, harmful-insect presence and sun exposure, planned pesticide or fertilizer applications, Chateau Kefraya's smart-agriculture system helps vineyard managers maximize grape health and yield.

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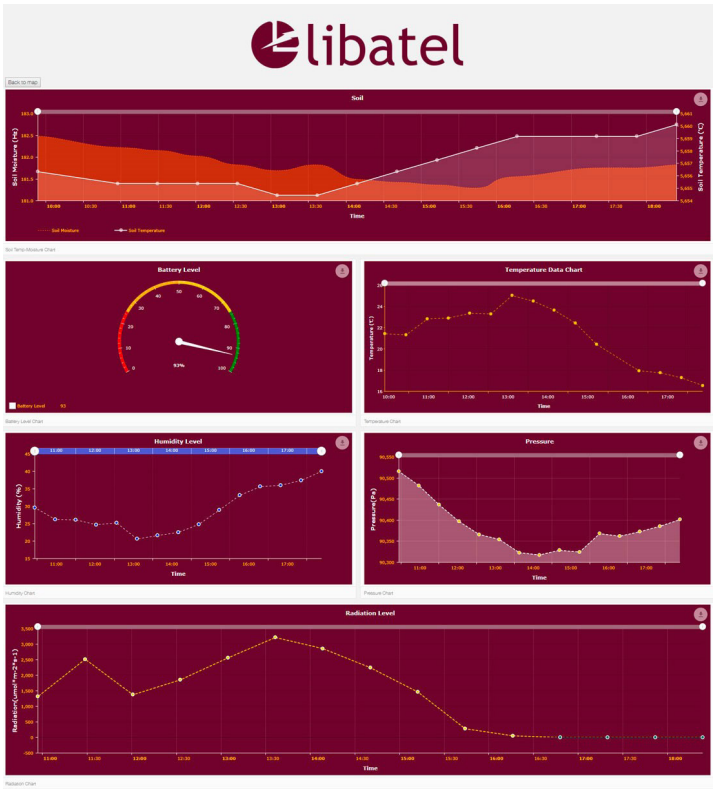
The Benefits

This solution leverages LoRaWAN™ key differentiators to power efficient data collection: long-range coverage (Kerlink's two-way gateways can easily cover distances up to 15 km), cost-efficient connectivity and energy-saving consumption, which are critical for the deployment of remote, battery-powered sensors. Partnering with tier-one players like Kerlink and Libelium, Libatel in partnership with Ogero Telecom ensured the best design in network deployment, performance and reliability, and consequently in accurate and regular data collection.



Chateau Kefraya's smart-agriculture solution aims at **increasing vineyard productivity and efficiency** by leveraging technology to adapt to external events and elements with maximum flexibility and efficiency. Ultimately, it **improves wine quality** and **raises customer satisfaction**. Up to now, such parameters were measured and collected manually though a lengthy, limited and costly process. Remote data collection using the Internet of Things makes this **process simpler and faster.**

With automated and instant access to actionable information, mixing various parameters, vineyard managers can **make informed decisions**. This leads to increased production and improved grape quality, and it optimizes resources. This information also informs decisions on maintaining **yield capacity** and **parcel quality** – and the distinctive characteristics of each wine. More broadly, this system helps producers in many agriculture sectors how to **adapt to climate changes** and learn from their experience on the ground.

"Kerlink's low-power, wide-area network solutions can be customized for virtually any project, from nationwide deployments to small local networks and indoor applications," said **Stephane Dejean, chief marketing officer for Kerlink.** "Working with Libatel, Ogero, Libelium and Actility on Lebanon's first smart-vineyard IoT deployment provides a real-world case study that illustrates the flexibility of our solutions. Kerlink delivers highly performant, reliable and easy to scale solutions for demanding environments, to help businesses to collect key information that matters for their operations."

Read more:

Chateau Kefraya: www.chateaukefraya.com

Libatel: www.libatel.com

Libelium: www.libelium.com

Ogero Telecom: www.ogero.gov.lb

Actility: www.actility.com

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