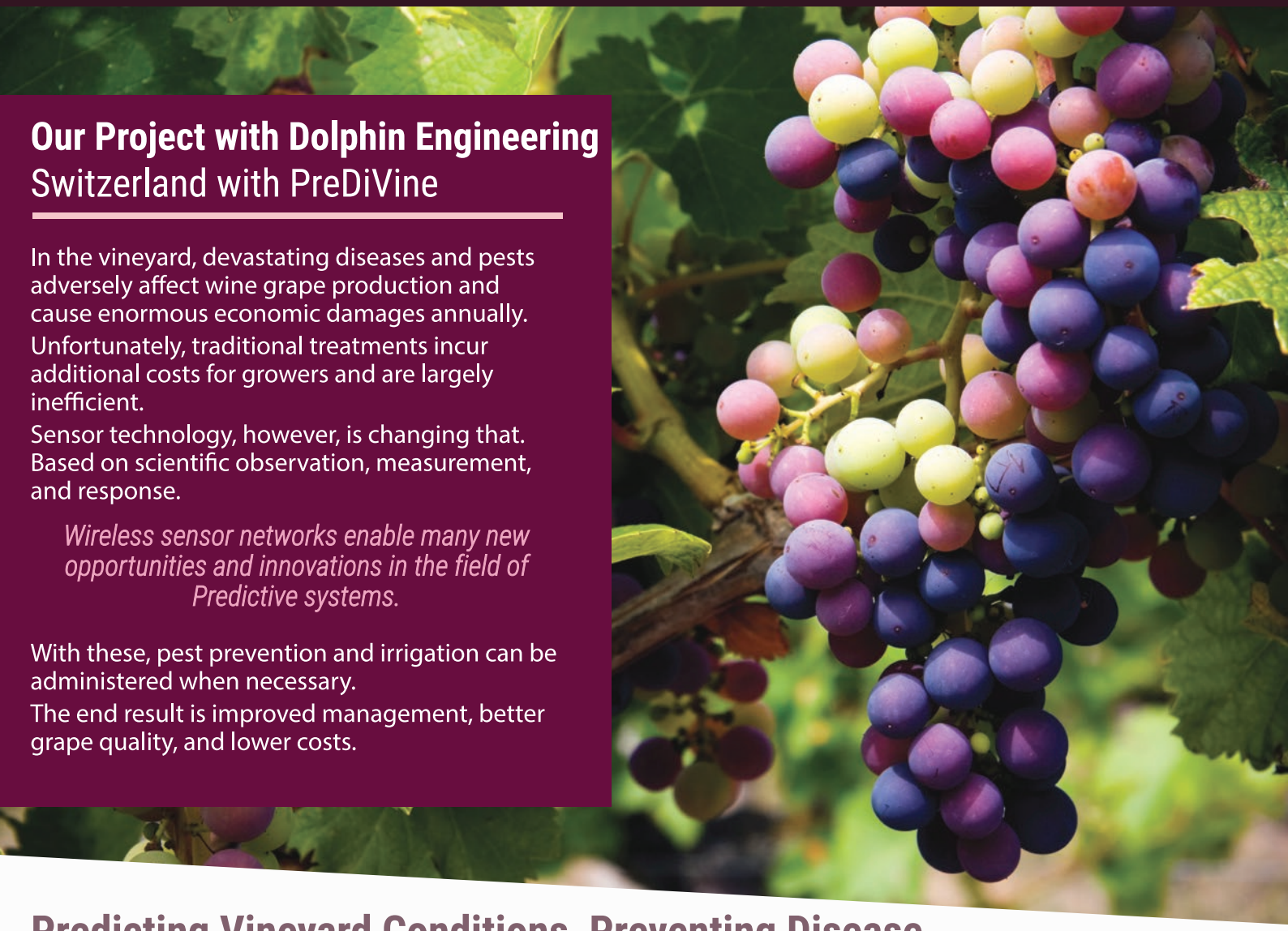
Agriculture
Smart Vineyards

libelium



Our Project with Dolphin Engineering Switzerland with PreDiVine

In the vineyard, devastating diseases and pests adversely affect wine grape production and cause enormous economic damages annually.

Unfortunately, traditional treatments incur additional costs for growers and are largely inefficient.

Sensor technology, however, is changing that. Based on scientific observation, measurement, and response.

Wireless sensor networks enable many new opportunities and innovations in the field of Predictive systems.

With these, pest prevention and irrigation can be administered when necessary.

The end result is improved management, better grape quality, and lower costs.

Predicting Vineyard Conditions, Preventing Disease

Predicting Diseases of Vine

Using a dedicated wireless sensor network based on Libelium's Waspmote sensor platform and complex prediction algorithms, Dolphin Engineering's PreDiVine system can predict the evolution of some of the most serious diseases, and also suggest "just-in-time" and targeted treatments needed to keep vineyards healthy and profitable.

Self-adaptive management

In essence, PreDiVine is a Decision Support System (DSS) that monitors microclimate conditions in the vineyard to predict the spread of grapevine pests and diseases. Among the microclimate conditions it monitors are air temperature, humidity, leaf wetness and rainfall.

Vineyard disease control for three threats

- The North American leafhopper insect -Scaphoideus titanus- is the vector for Flavescence dorée (FD), one of the most destructive bacterial diseases of grape vines, also known as yellows disease. In Switzerland, if an FD cluster occurs (i.e. more than five vines per 100m^2 are affected), it is mandatory to notify the Cantonal Plant Protection Service.
- Plasmopara viticola (Downy Mildew)
- Oidium (Powdery Mildew)

Smart Vineyards
Switzerland with PreDiVine

Dolphin Engineering, hosted at the Startup Incubator of the University of Lugano in Switzerland, is active in precision agriculture. The young company offers services that monitor the microclimate conditions of crops to predict plant diseases.

Their founders Mauro Prevostini and Antonio Taddeo, selected **Libelium's Waspmote** sensor platform because they were familiar with Arduino-based electronics. In fact, working on projects to train high school students preparing engineering careers at the University of Lugano, they discovered **Libelium and Waspmote Smart Agriculture**.

PreDiVine is the result of a **Smart Vineyard R&D project** spanning nearly three years and funded by the Commission of Technology and Innovation (CTI) of the Swiss Confederation.

"We found the Libelium Waspmote platform ideal for our purposes because of its flexibility in programming the firmware and the possibility of adding sensors.

The online code generator and the examples provided by Libelium were very helpful in developing the firmware to satisfy our needs."

Mauro Prevostini from Dolphin Engineering

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For continuous improvement of vineyard management policies and practices, the PreDiVine DSS presents a web-based Adaptive Management framework. The system is dynamic, learning from the outcomes of actual conditions and in-field activities and observations.

PreDiVine installed in grapevines

PreDiVine Vineyard Installation

PreDiVine prediction dashboard

Farmers and growers can adapt their actions to the current situation in the field by means of a dialogue between the grower and the crop. PreDiVine generates and sends notification messages with predicted dates of phenological events, to enable and organize monitoring activities and allow the growers to prepare insecticide applications.

An initial installation of PreDiVine is located in the canton of Ticino in southern Switzerland, where severe outbreaks of Flavescence dorée have occurred and the control of the FD vector is mandatory. After the success in Ticino, PreDiVine has been validated in other wine growing regions, and is now deployed in the Romandie region of western Switzerland, in northern Italy (Veneto), and in France. The system has also been validated in Piemonte and Tuscany.

In these areas the wine growers can monitor the health of their vineyards continuously. **Waspmote Smart Agriculture** nodes monitor multiple environmental parameters, and transmit the sensor data to a data center equipped with sets of algorithms, where the system stores and elaborates the data and provides predictions as results. End users can read the results by accessing the PreDiVine system on a computer, a tablet, or a smartphone.

Looking ahead, Dolphin Engineering is working to extend the capabilities of the system, and has partnered with an important international consortium to provide risk predictions for other vineyard diseases like downy- and powdery mildew, both of which are now integrated in the PreDiVine DSS.

Diseased grapevine

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