



## QCAP team publishes first measurement results of trace gas detector in Sensors

**Radboud University, in collaboration with NKT and VCBT, published a research article in the open-access journal Sensors in May. This article exploits the development, validation, and application of the first QCAP trace gas sensor, attracting more than 200 views from all around the world in two days.**

The development of the first QCAP sensor prototype at Radboud University in Nijmegen, the Netherlands, is a new step towards practical applications for real-time quality control of stored fruits. The team at Radboud University implemented a novel broadband mid-infrared laser – a supercontinuum source – into the

prototype, opening up the possibility to detect multiple volatile species simultaneously. After two years of work, this new technology has now been successfully applied in real pear storage conditions. The measurements show very promising performance, achieving a sensitivity better than 1 ppmv (part per million by volume).

Based on the feedback obtained from VCBT, the QCAP team at Radboud University is currently building the second sensor prototype with improved stability and sensitivity. This new sensor will be completed in early July, and it will be transferred to the Esteburg Obstbauzentrum in Jork, Germany, for applications in blueberry and apple storage.

# QCAP monitoring system will have a significant impact in German fruit region 'Altes Land'



Rolf Kirchhof

When developing a technology for fresh agro products, one automatically involves 'Altes Land', the biggest contiguous fruit-producing region in North Europe. In the region family farms, grow about 10.000 ha of mainly apples, but also cherries, pears, plums and berries. An interview with Rolf Kirchhof from the Fruit Advisory Service of the Altes Land, who has been working as a storage consultant for more than 31 years.

*"The most important function is to bridge the gap between science and practical farming"*

## What are the most important tasks of Fruit Advisory Service of the Altes Land?

"We work for approximately 1000 fruit farmers in Northern Germany. Our advisory service begins with a variety recommendation, one of the most fundamental decisions for a fruit farmer. Once a particular variety has been chosen, problems of its cultivation, crop protection, fertilization, harvest procedures and storage - my specialisation, become important. Advice is given individually and in many group events, including pre-harvest excursions, winter conferences and some 140 guided plant protection tours of orchards throughout the season. Direct contact and exchange with growers is essential for us."

## How did you become a QCAP Associate Partner?

"At Esteburg research station in Jork, LWK Niedersachsen and the Fruit Advisory Service of the Altes Land collaborate in a very close way. The LWK department of fruit quality and storage managed by Dr. Dirk Köpcke works on scientific questions, which the Fruit advisory service implements in practical farm processes. So when LWK became QCAP project partner, it was only logical that we would participate in the project as an associate partner."

## What is your contribution to the QCAP project?

"The most important function is to bridge the gap between science and practical farming. The grower contacts are essential for the implementation of the QCAP storage trials, which I help to organize and to maintain. Once the gas sensor is available for growers, I will assist with the installation and usage in the storage rooms, check the functionality during my farm visits and plan new storage experiments with the new system."

## What will be the impact of the QCAP monitoring system for the fruit farmers that you work with?

"Up until now, the atmosphere in blueberry storage rooms is often controlled with standard CA ULO or DCA techniques, including the necessary measurement of alcohols in juice of fruit samples. The QCAP sensor system would make it possible to control every room in realtime without lab analysis. This will ultimately result in better prices for their products. In apple storage, the stability of fruit for long-term storage is mostly analysed by the growers. Only for DCA storage sporadic fruit samples are taken to show the content of alcohols measured with a gas chromatograph. So also for apples, the QCAP gas sensor system would be a very effective and user-friendly alternative to secure the crop and to avoid losses."

## A study evening on 'Storage innovations' by QCAP partners



Study evening Storage Innovations

Frans Harren, the coordinator of the QCAP project, held a presentation in which he explained the principles and the potential of the developed gas sensor. Afterwards, Pieter Verboven of MeBioS gave an overview of the numerous commercial techniques that were used to make it possible to dynamically control atmospheric preservation. Until now, these techniques were based on measuring a single signal. The QCAP multi-gas sensor will open a new dimension of possibilities to this technique. Then, Eugene Rokx of Storex delved deeper into the technical conditions that storage rooms must adhere to

On Thursday 28 March, VCBT together with MeBioS and KU Leuven held a study evening on the topic of storage innovations. In particular, they paid attention to the desired results of the QCAP project and which possibilities may open up to farmers as a result of the new sensor technology. The event was held in Sint-Truiden, Belgium. Attendees included fruit growers and grower organisations that represented installers of storage technology.

before they can successfully implement this innovative storage technique. Afterwards, the first lines of contact were established for creating new implementations for growers. Brainstorm sessions were also held to imagine further steps of the development of the multi-gas sensor and to establish new research projects. Overall, this was a very interesting study evening which maintained a good balance between directly usable and practical information for growers with a look at a new generation of storage methods.

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## First ideas for QCAP follow-up project at ÉPRISE roadshow

**The QCAP monitoring system contains state-of-the-art sensor technology. By sending a laser light through an atmosphere sample and detecting the light output on the other side, it can determine traces of gases in complex gas mixtures. It will be used to investigate the health status of fruit and vegetables during storage. QCAP programme leader Frans Harren presented this system in Amsterdam at the two-day research and technology event ÉPRISE roadshow.**

ÉPRISE stands for 'Empowering Photonics through Regional Innovation Strategies in Europe'. It brings together researchers and companies in photonics, technology based on



the detection of light. As this roadshow was completely dedicated to applications in Agriculture and Food. It was an excellent opportunity to present the opportunities created by the

QCAP project. Frans Harren: "We met several representatives from companies and agricultural research institutes, who would like to co-invest in such a sensor."

At the event, Frans Harren also planted the first seeds for a follow-up project. Frans Harren: "This INTERREG project has brought the sensor to TRL6 and has demonstrated that it

can operate satisfactorily in realistic environments. To develop a commercial system, further investment is needed. This, we want to realize in a H2020 'Fast Track to Innovation' project, together with the companies connected to QCAP and other industry." The QCAP project ends June 2020; it expects to have follow-up funding available by that time.

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## Meet Angel Medina-Vaya, Senior Lecturer in Food Mycology at Cranfield University

### What is your expertise?

"My research has focused on the impact that environmental stress has on the function of fungi. At Cranfield I had the opportunity to collaborate with colleagues in the Plant Science Laboratory on the early detection of fungal pathogens in stone fruits and strawberries. This is when my interest for the use of VOCs as biomarkers became one of the priorities in my research."

### Why do you participate in the QCAP project?

"Having worked in the identification of fungal pathogens in stone fruits for 2 years, it was fantastic to read the first draft of the proposal. It made sense to apply the knowledge we gained in the previous project to a new crop; in this case potatoes. I could immediately see the economic gain for the farmers and the other stakeholders in the potato food chain."

### What is your most important challenge in this project?

"The most important challenge has been to develop the research under real industrial conditions. This for example means they are stored



Angel Medina-Vaya

at low temperatures – 4 to 10°C – when only small compounds are volatile and the fungal pathogens grow slower. Thanks to the QCAP partners, most of the problems have now been solved and we are confident we will be delivering the expected results."

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