

The Chancellor of Ghent University has the honour of inviting you to attend the public defense of the doctoral dissertation of

## Ir. Sofija Vulgarakis Minov

Title of the doctoral dissertation:

### *Integration of imaging techniques for the quantitative characterization of pesticide sprays*

The public defense will take place on July 6<sup>th</sup> 2015 at 14.00 pm in the Amphi Pisani, AgroSup, Dijon  
26 Boulevard Dr Petitjean, 21079 Dijon, France.

There will be a contiguous reception to which you are heartily invited.  
Please confirm your attendance before 2<sup>nd</sup> of July to: [sofija.minov@ilvo.vlaanderen.be](mailto:sofija.minov@ilvo.vlaanderen.be).

### Dissertation Supervisors

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### Board of Examiners

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**AGRO SUP**  
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UNIVERSITÉ DE BOURGOGNE

### Abstract of the doctoral research

In recent years, advances in plant protection have contributed considerably to increasing crop yields in a sustainable way. Easy to apply and rather inexpensive, pesticides have proven to be very efficient. However, when pesticides are applied to crops some of the spray may not reach the target, but move outside the intended spray area. This can cause serious economic and environmental problems.

Most of the pesticides are applied using agricultural sprayers. These sprayers use hydraulic nozzles which break the liquid into droplets with a wide range of droplet sizes and velocities and determine the spray pattern. Small droplets are prone to wind drift, while large droplets can runoff from the target surface and deposit on the soil. One of the main challenges is to reduce spray losses and maximize spray deposition and efficacy by improving the spray characteristics and the spray application process. Because mechanisms of droplets leaving a hydraulic spray nozzle are very complex and difficult to quantify or model, there is a need for accurate quantification techniques.

The recent improvements in digital image processing, sensitivity of imaging systems and cost reduction have increased the interest in high-speed (HS) imaging techniques for agricultural applications in general and for pesticide applications in specific.

This thesis focused on the development and application of high speed imaging techniques to measure micro (droplet size and velocity) and macro (spray angle and shape, liquid sheet length) spray characteristics. The general aim was to show that the spray characteristics from agricultural spray nozzles can be measured correctly with the developed imaging techniques in a non-intrusive way.

### Brief Curriculum Vitae

Sofija Vulgarakis Minov obtained her MSc. degree from the Faculty of Electrical Engineering and Information Technologies (FEIT), Skopje, Macedonia with a professional specialization in Electronics and Telecommunication in 2007. The graduation work was devoted to the AC Motors and their control with Fuzzy Logic. Upon the Master thesis defense, she did an internship in T-Mobile, Macedonia and in Belgian Nuclear Research Center working on Proportional counters. Afterward, she followed advanced Master course in Digital Image Processing at Thomas More, KU Leuven in Geel, Belgium. The course was successfully finished by defending the project "Fall detection of elderly people" in June 2010.

This work inspired her to apply for the PhD fellowship from ILVO and Region Bourgogne. In this PhD she studied the spray characterization with imaging techniques at ILVO and AgroSup in March 2011. In particular, this work concerns the development of high-speed imaging techniques to measure all the spray characteristics in a non-intrusive way.

The results from this study are published in several peer-reviewed international scientific journals and presented on national and international conferences.