

## Detection and mapping of Fusarium head blight in wheat and barley fields

The detection and mapping of Fusarium head blight (FHB) in wheat and barley is the backbone task to be delivered under [POSHMyCo ICT-AGRI-FOOD Project](#), which aims at establishing a novel solution to reduce the risk of mycotoxin [e.g., Deoxynivalenol (DON)] contamination in grains by adopting smart farming technologies. One of the challenges of the project is developing an on-line (tractor mounted) system for the detection of the spatial distribution of FHB at the field level, which will be utilised for successful separation of grain into different DON contamination classes. Therefore, POSHMyCo project has developed and successfully implemented an on-line measurement system of FHB, which was used to scan several commercial fields in Lithuania and Belgium. The system consists of a Specim FX 10 hyperspectral camera (Specim, Finland), with a wavelength range of 400–1000 nm, a thermal camera (FLIR A655sc, USA), and a differential global positioning system (DGPS) (version CFX-750, Trimble, USA). The camera was positioned at a height of 75 cm above crop canopy using a custom-built metal frame attached to a tractor as depicted in Figure 1. A representative number of ground-truth points (approximately 25 per field, depending on the field size) was randomly selected in the field to evaluate the percentage coverage of FHB. Two techniques were utilized at the ground-truth locations to assess the presence of FHB: a visual inspection of the number of infected ears in a 1 m<sup>2</sup> area, and RGB images assessment for the same evaluated spot.



Figure 1. The custom-built metal frame, attached to a tractor during on-line measurements using a multi-sensor box.

The hyperspectral data was analyzed following the methodology suggested by Whetton et al. (2018). Maps of the percentage coverage of FHB were obtained by ordinary kriging, after semivariogram analysis. Figure 2 shows the FHB maps for one field measured in Belgium, as an example, comparing between maps derived from visual estimation method (a), RGB images assessment (B), and hyperspectral data (C). Early results of **POSHMyCo ICT-AGRI-FOOD Project** confirms the feasibility of the hyperspectral camera for FHB detection and mapping. Future works will attempt to predict and map DON for planning the route of a combine harvester for selective harvest, to enable dividing yield into different quality categories, having different DON contamination levels.

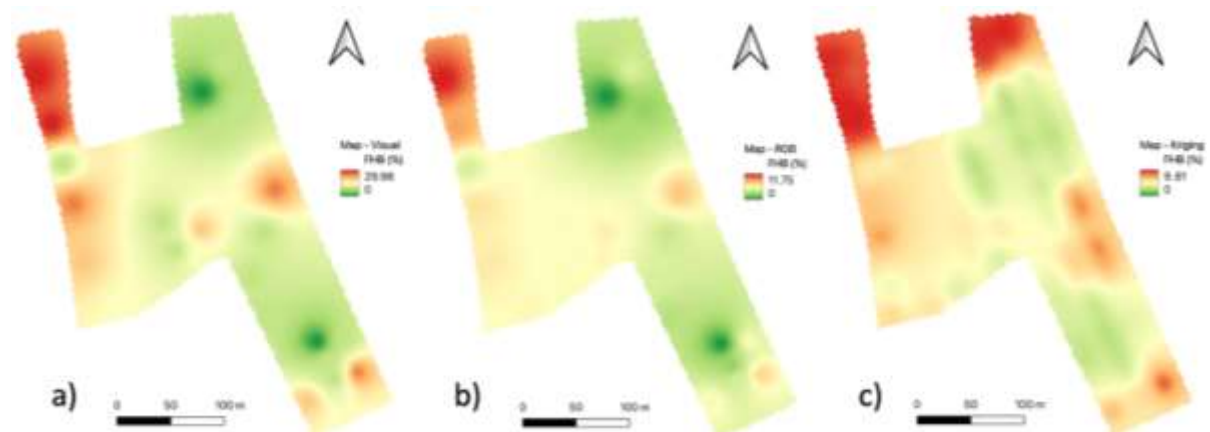


Figure 2. Maps of the percentage coverage of fusarium head blight (FHB) in a field in Belgium. Maps are derived from visual estimation method (a), RGB images assessment (B), and hyperspectral data (C).

## References

Whetton, R. L., Waive, T. W., & Mouazen, A. M. (2018). Hyperspectral measurements of yellow rust and fusarium head blight in cereal crops: Part 2: On-line field measurement. *Biosystems engineering*, 167, 144-158.

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