

**NEW TECHNICAL AND METHODOLOGICAL DEVELOPMENTS FOR
SUNFLOWER FIELD PHENOTYPING**

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ABSTRACT

INRA is co-developing a set of tools for sunflower phenotyping from leaf to plot level using sensors and imagery based techniques. At the plant level, Mobi-Leaf is a smartphone based application co-developed with Terres Inovia and designed to estimate individual leaf area using the built-in imaging capabilities of the device while collecting the relevant metadata. At plot level, PIETON® is a system designed to measure light transmission using LED based sensors mounted on a stick for simultaneous acquisition of light over and under the canopy to estimate LAI. At the field level, the PHENOME project aims to develop a UAV system for crop phenotyping. The vector is a hexacopter with a payload of 800g. Two sensors combination are available, 1) a high resolution RGB camera, ii) a specially developed 6 band VIS-NIR multispectral camera that can be combined with a thermal infra-red FLIR Tau camera. On sunflower, the first development targeted plant and flower counting and we will now focus on LAI and water stress tolerance using the multispectral camera and thermal IR camera. To overcome the size and weight limitations of UAV, the Phenomobile is an automatic ground vector under development with a 10 m long arm designed to carry a wider range of sensors such as Lidar and spectroradiometers over the canopy. This system, which has active lighting capabilities, will be able to collect data for detailed organ level structure and optical properties and thus complement the canopy approach of the UAV system.

Key Words : high throughput phenotyping, sensor, UAV, image analysis