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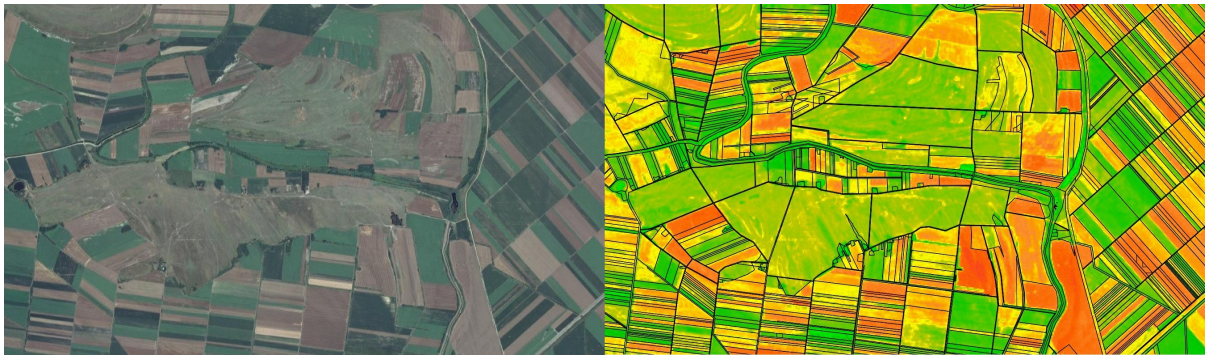
A multi-sensor system



Title	A multi-sensor system
Title (native language)	
Category	• Recording or mapping technology
Short summary for practitioners (Practice abstract) in English)	In this paper we reported a multi-sensor system for high throughput phenotyping in plant breeding. The system comprised five sensor modules (ultrasonic distance sensors, thermal infrared radiometers, NDVI sensors, portable spectrometers, and RGB web cameras) to measure crop canopy traits from field plots. A GPS was used to geo-reference the sensor measurements. Two environmental sensors (a solar radiation sensor and air temperature/relative humidity sensor) were also integrated into the system to collect simultaneous environmental data. A LabVIEW program was developed to control and synchronize measurements from all sensor modules and stored sensor readings in the host computer. Canopy reflectance spectra (by portable spectrometers) were post processed to extract NDVI and red-edge NDVI spectral indices; and RGB images were post processed to extract canopy green pixel fraction (as a proxy for biomass). The sensor system was tested in a soybean and wheat field trial. The results showed strong correlations among the sensor-based plant traits at both early and late growing season. Significant correlations were also found between the sensor-based traits and final grain yield at the early season (Pearson's correlation coefficient r ranged from 0.41 to 0.55) and late season (r from 0.55 to 0.70), suggesting the potential use of the sensor system to assist in phenotypic selection for plant breeding. The sensor system performed satisfactorily and robustly in the field tests. It was concluded that the sensor system could be a powerful tool for plant breeders to collect field-based, high throughput plant phenotyping data.
Short summary for practitioners	
Website	
Audiovisual material	
Links to other websites	
Additional comments	
Keywords	Farming equipment and machinery
Additional keywords	High throughput field phenotyping; Canopy reflectance; Canopy temperature; LabVIEW; RGB image
Geographical location (NUTS)	EU
Other geographical location	Global
Cropping systems	Arable crops
Field operations	Crop and soil scouting
SFT users	Farmer | Contractor

Education level of users	Secondary education | Apprenticeship or technical school education | University education
Farm size (ha)	0-2 | 2-10 | 10-50 | 50-100 | 100-200 | 200-500 | >500

Scientific article

Title	A multi-sensor system for high throughput field phenotyping in soybean and wheat breeding
Full citation	Bai, G.; Ge, Y.; Hussain, W.; Baenziger, P.S.; Graef, G. (2016). Computers and Electronics in Agriculture, DOI:10.1016/j.compag.2016.08.021

Effects of this SFT

Productivity (crop yield per ha)	No effect
Quality of product	No effect
Revenue profit farm income	Some increase
Soil biodiversity	No effect
Biodiversity (other than soil)	No effect
Input costs	No effect
Variable costs	No effect
Post-harvest crop wastage	No effect
Energy use	No effect
CH4 (methane) emission	No effect
CO2 (carbon dioxide) emission	No effect
N2O (nitrous oxide) emission	No effect
NH3 (ammonia) emission	No effect
NO3 (nitrate) leaching	No effect
Fertilizer use	No effect
Pesticide use	No effect
Irrigation water use	No effect
Labor time	No effect
Stress or fatigue for farmer	Some decrease
Amount of heavy physical labour	No effect
Number and/or severity of personal injury accidents	No effect
Number and/or severity of accidents resulting in spills property damage incorrect application of fertiliser/pesticides etc.	No effect
Pesticide residue on product	No effect
Weed pressure	No effect
Pest pressure (insects etc.)	No effect
Disease pressure (bacterial fungal viral etc.)	No effect

Information related to how easy it is to start using the SFT

This SFT replaces a tool or technology that is currently used. The SFT is better than the current tool	no opinion
The SFT can be used without making major changes to the existing system	no opinion
The SFT does not require significant learning before the farmer can use it	disagree
The SFT can be used in other useful ways than intended by the inventor	agree
The SFT has effects that can be directly observed by the farmer	no opinion
Using the SFT requires a large time investment by farmer	no opinion
The SFT produces information that can be interpreted directly	disagree

View this technology on the Smart-AKIS platform

This factsheet was generated on 2018-Apr-03 11:57:16.