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EDITORIAL

Editorial

Georg Bareth[1,2] · **Peter Krzystek**[1,3]

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Since 2010, research on monitoring crop traits increasingly utilized sensors mounted on Unmanned Aerial Vehicles (UAVs) and employed photogrammetric analysis methods, Structure from Motion (SfM) and Multiview Stereopsis (MVS). Publications on using Digital Surface Models (DSMs) or 3D point clouds to derive structural crop traits grew exponentially since then. To our knowledge, the first paper introducing SfM/MVS-derived DSMs to monitor crop height and crop growth was published by Bendig et al. (2013) in the PFG 2013/6 issue 10 years ago. It also turned out that for some structural crop traits, e.g. biomass and canopy height, these new analysis approaches are more robust compared to optical, in most cases multispectral approaches using the visible and near-infrared domain. Therefore, we dare to say that a slow paradigm change occurred over the last 10 years and photogrammetric analysis methods are now established methods in crop phenotyping and crop management. In the same period, machine and deep learning analyses have been getting more in the focus of remote sensing research, and in numerous studies the structural, SfM/MVS-derived crop traits are among the most important features to estimate e.g. biomass or N-uptake.

In remote sensing, the investigation of structural parameters of forests has a long tradition. In contrast, in agricultural systems the focus has been on optical approaches, even though e.g. in grasslands compressed sward height is an established structural estimator for yield since the 1960s. However, the idea of transferring forest or tree metrics on agricultural systems is quite new and so far only a small number of publications are addressing this topic. In this PFG Special Issue on "Ultra-high resolution remote sensing of crops using unmanned and manned airborne systems", Hütt et al. (2022) are investigating the potential of forest metrics to derive crop traits using data acquisition with a UAV-LiDAR (https://doi.org/10.1007/s41064-022-00228-6). The authors present promising results and conclude that there is an unexploited potential for developing robust crop monitoring methods. Further latest developments in UAV-based crop monitoring are combined with approaches using structural and biochemical traits in a machine or deep learning environment. Consequently, Hassani et al. (2023) present in this PFG Special Issue a combined analysis for winter wheat traits (https://doi.org/10.1007/s41064-022-00229-5). The authors conclude that for structural traits SfM/MVS-derived plant height outperformed optical approaches, but latter performed better for biochemical traits. However, they also find that "… relatively simple UAS-derived VIs and SfM are good options for developing operational monitoring approaches for winter wheat over the growing season". The third contribution in this PFG Special Issue by Yin et al. (2022) is focusing on machine learning to estimate chlorophyll content in potatoes (https://doi.org/10.1007/s41064-022-00218-8). For biochemical traits, optical methods are necessary and the authors can show that Random Forest (RF) is outperforming, support vector (SVR) and partial least squares regression (PLSR) analysis.

For the DGPF 2024 annual conference in March 2024, we will again organize conference sessions on remote sensing of forests, crops, and grasslands. Depending on the feedback on those sessions, we will announce new calls for PFG Special Issues on forest and agriculture related topics. So, we are welcoming contribution for the next DGPF conference. Updates will be announced on the DGPF website (https://www.dgpf.de).

Georg Bareth and Peter Krzystek

✉ Georg Bareth
g.bareth@unikoeln.de

Peter Krzystek
peter.krzystek@hm.edu

[1] DGPF Working Group "Remote Sensing Applications for Forestry and Agriculture", Cologne, Germany

[2] Department of Geoinformatics, University of Applied Sciences Munich, 80333 Munich, Germany

[3] GIS & RS Group, Institute of Geography, University of Cologne, 50923 Cologne, Germany

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