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Utilization of UAV Remote Sensing in Small-scale Field Experiment : Case Study in Evaluation of Plat-based LAI for Sweetcorn Production

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[Abstract]
Traditional agriculture mostly focused on activity in the field, but current agriculture faces problems such as reduction of agricultural inputs, labor shortage and so on. Accordingly, traditional agricultural experiments generally considered the simple treatment effects, but current agricultural experiments need to consider the several and complicate treatment effects. To analyze such several and complicate treatment effects, data collection has the first priority. Remote sensing is a quite effective tool to collect information in agriculture, and recent easier availability of UAVs (Unmanned Aerial Vehicles) enhances the effectiveness. LAI (Leaf Area Index) is one of the most important information for evaluating the condition of crop growth. In this study, we utilized UAV with multispectral camera to evaluate plant-based LAI of sweetcorn in a small-scale field experiment and discussed the feasibility of a new experimental design to analyze the several and complicate treatment effects. The plant-based SR measured by UAV showed the highest correlation coefficient with LAI measured by a canopy analyzer in 2018 and 2019. Application of linear mix model showed that plant-based SR data had higher detection power due to its huge number of data although SR was inferior to evaluate LAI than the canopy analyzer. The distribution of plant-based data also statistically revealed the border effect in treatment plots in the traditional experimental design. These results suggest that remote sensing with UAVs has the advantage even in a small-scale experimental plot and has a possibility to provide a new experimental design if combined with various analytical applications such as plant size, shape, and color.

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