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Comparison of Total Biomass and Leaf Areas of Two Rice Cultivars with Terrestrial Laser Scanner (TLS)

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[Introduction]

Biomass of plant was considered the most important agronomic trait in crops but measuring biomass was difficult task during growing seasons because plant needed to destruct for weight samples. Recently, measuring height of a plant based on image analysis showed promising results. Further, estimate biomass with image based phenomics methods are needed to explore.

[Materials and Methods]

Two rice cultivars were planted in experimental rice paddy field station that located at the RDA (Wanju, Jeollabuk-do). Five plants for each cultivar obtained three-dimensional images data with territorial laser scanner (TLS) at one time point. Also, selected individual plant was measured for dried weight, number of leaves, total leaf area, and number of branches. The whole process was repeated in seven times in various growth stages of rice. The canopy structure data were extracted from 3D images and the SCENIC software was utilized.

[Result and Discussion]

The data analysis indicated that robust relationship between canopy structure data and total biomass. The correlation between the canopy data and biomass of plants showed significant result ($R^2 = 0.91$). In further analysis, relationship between the canopy and biomass within same cultivar showed higher correlation ($R^2 = 0.96$). Also, the correlation between the canopy data and total leaves areas of plants showed significant result ($R^2 = 0.90$). The result indicated that the TLS could utilized estimating biomass without scarifies plants. Later, it might be worth to investigate whether each cultivar has specific growth pattern and discriminate specific cultivar among in various cultivars in rice paddy fields.

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