Oral sessions | Farming System | O23: Crop Modeling: Recent Progress and Applications

[O23] Crop Modeling: Recent Progress and Applications

Chair: Hiroshi Nakagawa (National Agriculture and Food Research Organization, Japan)
Chair: Xinyou Yin (Wageningen University and Research, Netherlands)
Thu. Sep 9, 2021 5:00 PM - 7:00 PM Room 2 (Oral) (Farming System)

5:55 PM - 6:10 PM

[O23-04]Deep Learning-Based Robust Estimation for Rice Biomass Using Digital Image of Canopy

*Nominated for Presentation Awards

○Kota Nakajima[1], Yu Tanaka[1], Keisuke Katsura[2], Tatsuhiko Shiraiwa[1] (1.Graduate School of Agriculture, Kyoto University, Japan, 2.Graduate School of Agriculture, Tokyo University of Agriculture and Technology, Japan)

Above ground biomass (AGB) is the most fundamental trait to evaluate the crop growth. The objective of this study is to develop a convolutional neural network (CNN)-based AGB estimation model which is applicable for various cultivars grown under two environments. An experiment was conducted with four cultivars at Kyoto University (KU) and with three cultivars at Tokyo University of Agriculture and Technology (TUAT). Images were taken from 1.5 m above the canopy from two weeks after transplanting to one week after heading. Immediately after taking images, we harvested plants and measured its AGB. Data from KU were used for training CNN model. 25728 images and corresponding AGB were input to train the CNN model. Based on standard cultivar "Koshihikari", AGB estimation sub-model was developed to estimate the tentative biomass. Based on four cultivars, plant type evaluation sub-model was developed to adjust the tentative biomass to the final result. Observed AGB was ranged from 2.3 to 1296.2 g m^{-2}. When all cultivars were pooled, root mean square error (RMSE) of tentative biomass estimation was 101.8 and 139.9 g m^{-2} at KU and TUAT, respectively. On the other hand, RMSE of the adjusted biomass estimation was 83.6 and 121.3 g m^{-2} at two environments. The accuracy of the estimation was much improved by adjusting biomass based on the second sub-model at both environments. The proposed model in the present study succeeded to estimate the AGB of various cultivars grown under two different environments.