Evaluation of Water Balance in Bell Pepper Grown Soil Regulated by a Cloud-Based Automatic Drip Fertigation in Fukushima

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Since a fertile top soil in Fukushima prefecture, Japan was contaminated with radiocesium due to the Fukushima Daiichi nuclear power plant accident occurred in 2011, the fertile top soil was stripped off and replaced by a less fertile sandy soil as a decontaminating. There are few studies that irrigated water is evaluated with soil water content and evapotranspiration in a greenhouse simultaneously. The objective of this work was to investigate water uptake of a bell pepper plant along with evapotranspiration and soil water content in the rhizosphere in a greenhouse throughout the growing period.

We applied a cloud-based drip fertigation system, called ZeRo. agri, to grow bell pepper in the less fertile soil in a greenhouse. The Penman-Monteith equation was used to estimate potential evapotranspiration (*ETp*), and time domain reflectometry (TDR) probes were used to observe two-dimensional water distribution in vertical soil. Total 12 TDR probes were inserted below a dripper and the bell pepper plant in 3 rows with 10 cm apart at 5, 10, 20, and 30 cm deep from soil surface. In the greenhouse, air temperature, net radiation at height z=2 m, relative humidity, and soil heat flux at 5cm below the soil surface were measured every 10 min. Mean wind speed at z=2 m was assumed to be 0.6 m s^{-1}. The measurement was lost between DAT = 34 and 85 due to mechanical failures.
Soil water content at 5, 10, and 20 cm deep below the bell pepper plant was smaller than others. The amount of excess water in soil gradually became smaller as time proceeded. Although the daily apparent root water take agreed well with the daily amount of irrigated water regulated by the cloud-based system, the Penman-Monteith equation sometimes underestimated the daily *ETp*. The underestimation might be resulted from the overestimation of the aerodynamic resistance in a greenhouse or soil surface coverage was not enough to apply Penman-Monteith equation.

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