Partnering with University of Buffalo to Adapt Precision Agricultural Tools for Improved Irrigation Management in Vegetable Crops

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Water and nutrient management are key to sustainable and profitable vegetable production. The water- and nutrient-holding capacities of soils are directly related to the soil properties. Current irrigation and nutrient management programs in vegetables in western NY employ field-wide water and nutrient application schedules without accounting for site-specific variations in the soil characteristics. CVP specialist, Darcy Telenko has partnered with Environmental Geophysicist, Erasmus Oware from the University of Buffalo in a NYFVI sponsored project to identify and account for sub-field soil variability for efficient water and nutrient management practices. The project employed electromagnetic soil mapping to create sub-field management zones (MZ) to guide the application of precise amount of water and nutrient to reduce water, energy, and fertilizer expenditures (Figure 1). Once management zones were identified infiltration tests were then used to determine optimal operating range of soil water content for each management zone in a field (Figure 1).

During 2017, three farms participated in the soil mapping and data collection. An example of the ECa contour map that was generated is pictured in Figure 2 where two distinct zones were identified – dark green and light green regions. Within these management zones irrigation tests are then performed at selected locations (red dotes) to calibrate the water-holding characteristics representative of each zone. Results of the irrigation tests suggest that the two soil zones have different water-holding characteristics and, hence, should be irrigated differently. For instance, the water depletion profiles of the sensors found in the same soil zone behaved similarly compared to those found in different zone (Fig. 4). The drainage profiles from both the 10 cm and 30 cm sensors reveal poor drainage of soil zone 1 dark green (MZ1S1 & MZ1S2) in contrast to those of soil zone 2 light green (MZ2S1 & MZ2S20), suggesting short but frequent irrigation in the dark green zone and long but infrequent irrigation in the light green zone.

The knowledge of spatial variations in soil characteristics can instruct site-specific water and nutrient management decisions to reduce input costs (when water is not need), but also while increasing productively by irrigating at the right time and amount for the crop in a sustainable and environmentally friendly approach. We aim to continue to refine the use of these tools to help our growers become more judicious in their irrigation practices, which is critical in light of recent erratic weather conditions that have impacted water availability in recent years.

We are looking for additional cooperators for 2018, please contact Darcy Telenko for more information.

Figure 1: The electromagnetic instrument mounted in a sled that is drawn across the field for soil variability mapping and irrigation experiment with soil moisture monitoring at the 10 cm and 30 cm depth of the soil profile.

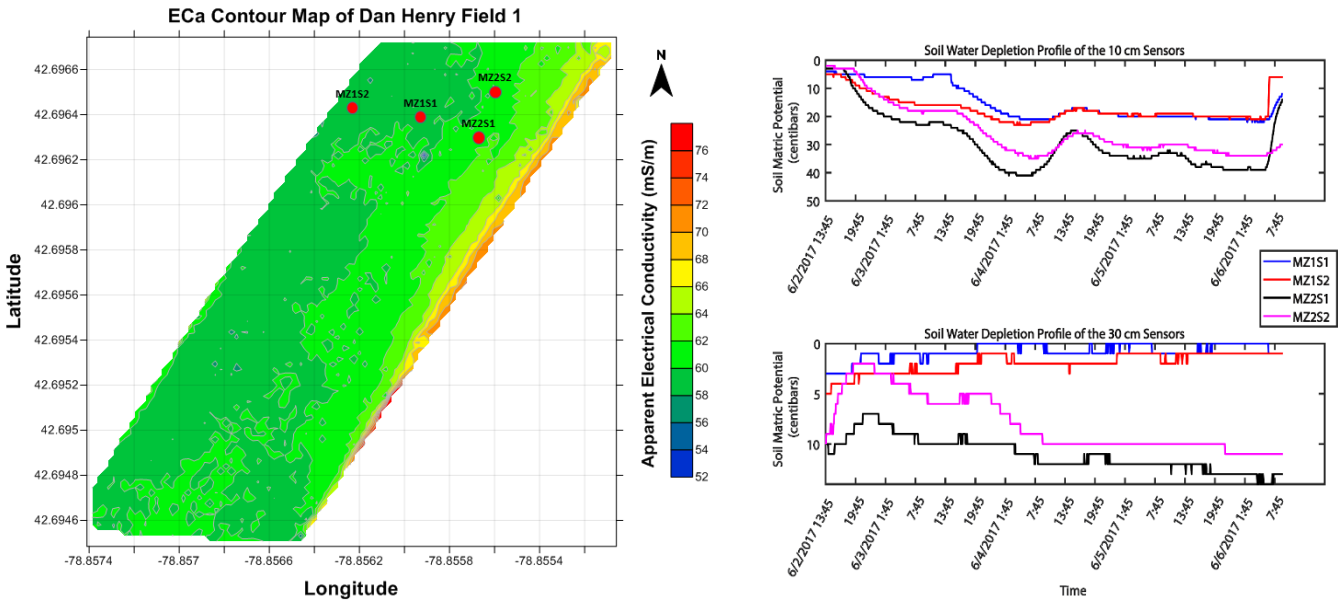

Figure 2: The red circles mark selected locations in the two soil zone for irrigation experiments to determine their respective water-holding capacities. The plots of the soil water depletion profiles of the 10 cm (top) and 30 cm (bottom) sensors for the irritation experiments at Field 1.