Spatial variations of soil properties under corn field in Kentucky, USA

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Abstract

Precision farming involves modifying the rate of fertilizer, herbicides, and irrigation in response to crops' requirements. For precision management, a better understanding of spatial variability of soil properties within a field is important. To fully utilize cultivation and site-specific crop production technology, it is crucial to understand the dynamics of soil properties spatially. Several factors, such as unequal fertilizer and manure application, erosion, tillage, and inborn variances formed during soil development, can contribute to spatial variation. The purpose of this study was to evaluate the spatial distribution of selected soil properties in the four border rows, the plot's center, and its surroundings. Seventy-two soil samples were collected from corn field of Murray State University Farm in 135×150 m^2 size. Six sites were used in this study, including the border rows, center, and sod site. All soil samples were taken from the depth of 0 to 7.5 cm and 7.5 to 15 cm. Soil characteristics measured include soil organic carbon, bulk density (BD), soil water holding capacity (SWHC), soil water content at field capacity (SWFC), porosity, soil pH, all were determined during winter 2023. The highest spatial variability as indicated by coefficient of variation (CV) of bulk density was found in the border rows (25%). However, the highest spatial variability for SWHC (48%) and SWFC (36%) was observed at the sod site. The center site provided the lowest spatial variability for all measured properties, while border rows had inconsistent spatial variability. This study has future implementation to predict the optimum soil ability to support favorable soil environment for crop production and sustainability.

Keywords: Acidity, Bulk density, Corn field, Organic Carbon, Soil Variability, Soil water retention.