Assessing the spatial variability of soil physical properties under a corn field in Kentucky, USA

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Analyzing soil physical properties is crucial for advancing sustainable and precision agricultural practices in today's world. Sustainable agriculture emphasizes responsible resource utilization and preservation. Precision agriculture utilizes technology, data, and targeted decision-making to optimize resource usage and minimize environmental impacts. Assessing soil property variability aids in efficient input application, irrigation adjustment, nutrient runoff reduction, and fertilizer management. This approach prioritizes soil conservation, boosts sustainability, and supports long-term agricultural productivity. This study aimed to evaluate the spatial distribution of specific soil physical properties across the four border rows, central corn field area, and sod area. Seventy-two soil samples were collected from Murray State University's western Pullen Farm, covering a 135×150 m² corn field, during the winter of 2023. The following soil physical properties were considered for the research analysis: soil pH, soil color, soil organic carbon (SOC), porosity, bulk density (BD), compaction, soil water holding capacity (WHC), and soil water content at field capacity (SWFC). Statistical analysis revealed that the coefficient of variation for the SWHC (48%) and SWFC (36%), in the sod site, and the bulk density of border rows (25%), showed the highest spatial variability. After examining all soil properties, the lowest spatial variability was observed in the center of the field, and inconsistent variability was observed in border rows. This research contributes to the development of effective soil management practices and promotes the adoption of precision agriculture and sustainable production methods in the future.

Keywords: Acidity, Corn field, Organic Carbon, Physical properties, Precision agriculture, Soil Variability, Sustainable agriculture.