

MANURE APPLICATION IMPACT ON IRRIGATED AND DRYLAND CROPLAND

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ABSTRACT

This study evaluated the impact of manure application on selected soil physical properties and spatial variability in cropland. The study was conducted on Pullman clay loam (fine, mixed, thermic, Torrertic Paleustolls) and Olton clay loam (fine, mixed, thermic, Aridic Paleustolls) soils. Manure was applied to the irrigated wheat-corn silage-wheat rotation (3 crops in 2 years) every other year at 15 t/ac (total 75 t/ac) under the center pivot, and to the dryland wheat in corners every 3 years at 11 t/ac (total 33 t/ac). Triplicate samples were collected at 6 intervals from the pivot edge in both dryland and irrigated cropland. Soil organic carbon (SOC), organic N, P, K, Ca, Mg, and Na were determined, as were soil hydraulic properties and aggregate size distributions. A sigmoidal, 3-parameter Hill equation was used to estimate the impact of P addition rate ($\text{t ac}^{-1} \text{ yr}^{-1}$) on soil test P. Cattle grazing wheat had the greatest impact on soil physical and hydraulic properties, increasing bulk density, decreasing hydraulic conductivity, and changing the aggregate size distribution (creating more large aggregates, or "clods"). Soil OC was negatively correlated with bulk density, but positively correlated with plant available water, and with aggregates of 0.01 to 0.25 in diameter. These are the aggregates associated with granular structure in soils. No spatial dependence was found for several of the soil management systems with the sampling scale employed.