



Liquid manure application in spring – are soil conserving techniques available?

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In recent decades, sizes and weights of agricultural machinery increased significantly. Especially under wet soil conditions, high wheel loads cause major concern regarding the risk of soil compaction. Traffic-induced soil compaction is an important factor responsible for soil physical degradation and is able to affect soil functions adversely. The amendment of the German fertilizer ordinance will result in an increase of slurry and fermentation residue application rates in spring. In spring soils often have wet conditions so heavy slurry tanks can cause harmful soil compaction and thus, can affect soil functions.

Aim of this study was to investigate the influence of three different application methods on soil structure and soil functions. The application techniques were 1) tractor with tandem slurry tank (total weight: 28 Mg, tire inflation pressure: 2.5 bar), 2) self-propelled slurry tank with crab steering function (27 Mg, 1.4 bar) and 3) tractor with slurry distribution system (12 Mg, 1 bar). This study took place on a stagnic Luvisol in Lower Saxony, Germany in spring 2017. Wheeling experiments of the three application techniques were carried out to measure soil pressure and soil deformation in three different depths (0.2, 0.35 and 0.5 m). Before and after wheeling, soil sampling of undisturbed soil cores was carried out in the same depths to determine changes in soil structure and soil functions. Tractor with slurry distribution system turned out to be the most soil conserving application technique with low soil pressure (0.8 bar) and low soil deformation (0.1 cm). Although having a much higher wheel load, the self-propelled slurry tank caused low soil pressure and soil deformation (1.2 bar, 0.1 cm) due to the soil conserving crab steering function and tire inflation pressure adapted to soil conditions. Tractor with slurry tank showed highest values for soil pressure and soil deformation (1.5 bar and 0.3 cm). Bulk density also had highest values for tractor with slurry tank (1.55 g cm⁻³) and lowest values for tractor with slurry distribution system (1.49 g cm⁻³). Soil parameters, such as air capacity and total pore volume, showed highest values for tractor with slurry distribution system and lowest values for tractor with slurry tank.

Although, spring is often accompanied by wet soil conditions, slurry and fermentation residue application can be performed soil conserving by choosing an adapted application technique, such as a slurry distribution system.